

MINISTRY FOR ENVIRONMENT AND
SANITATION

PERMANENT TECHNICAL SECRETARIAT FOR
INSTITUTIONAL FRAMEWORK FOR ENVIRONMENT
ISSUES MANAGEMENT

REPUBLIC OF MALI
ONE PEOPLE – ONE GOAL – ONE FAITH



ELEMENTS OF NATIONAL POLICY FOR ADAPTATION TO CLIMATE CHANGE

FINAL REPORT



May 2008

Contents

INTRODUCTION	1
I. OBJECTIVES OF THE STUDY	2
II. ANALYSIS OF THE TERMS OF REFERENCE	2
III. METHODOLOGY :	2
IV. GENERAL CHARACTERISTICS :.....	3
4.1 LOCATION.	3
4.2. RELIEF	3
4.3. CLIMATE	5
4.4 VEGETATION	7
4.5. DEMOGRAPHY	8
4.6. SOCIO-ECONOMIC SITUATION	8
V. UN FRAME CONVENTION ON CLIMATE CHANGES (UNCCC) AND THE KYOTO PROTOCOL	ERROR!
BOOKMARK NOT DEFINED.	
5.1. UNCCCAND THE KYOTO PROTOCOL : SYNTHETIC RECALL	11
5.2. THE KYOTO PROTOCOL :	12
VI. ANALYSIS OF THE EFFECTS CLIMATE ON SOCIO-ECONOMIC DEVELOPMENT SECTORS :.....	13
6.1. AGRICULTURE AND WATER RESOURCES :	13
6.2. NATURAL RSSOURCES : WATERS, FORESTS,BIODIVERSITY,SOILS	13
6.3. ENERGY SECTOR	15
6.4. HEALTH :	16
6.5. INFRASTRUCTURES	16
VII. UPDATE ON PROGRAMMES AND PROJECTS ON CLIMATE CHANGE :.....	17
7.1.IMPLEMENTED PROJECTS PROJETS EXECUTES :.....	17
7.2. ON-GOING PROJECTS :	18
7.3. PLANNED PROJECTS	18
VIII. ANALYSIS FO MALI'S NATIONAL SOCIO-ECONOMIC DEVELOPMENT POLICIES	18
8.1. ENP VISION 2025	20
8.2. MDG	20
8.3. STRATEGIC FRAMEWORK FOR POVERTY ALLEVIATION	21
8.4. PROJECT FOR MALI'S ECONOMIC AND SOCIAL DEVELOPMENT (PDES)	22
8.5. THE DECENTRALIZATION POLICY	24
8.6. THE NATIONAL ENVIRONMENT PROTECTION POLICY	25
IX. ELEMENTS OF THE NATIONAL POLICY ON CLIMATE CHANGE	29
9.1. JUSTIFICATION OF THE NPCC	29
9.2. VISION ET OBJECTIFS DE LA PNACC.....	29
9.3. ELEMENTS THE SECTORIAL POLICY	
9.3.1THE AGRICULTURE SECTOR	30
9.3.2. WATER RESOURCES SECTOR	31
9.3. 3.NATURAL RESOURCES (FORESTS, SOILS, FAUNA).....	31
9.3.4. ENERGY SECTOR.....	32
9.3. 5. HEALTH SECTOR	33
CONCLUSIONS AND RECOMMENDATIONS	
BIBLIOGRAPHICAL REFERENCES	

INTRODUCTION

Since the United Nations Conference on Environment and Development (UNCTAD) held in Rio de Janeiro in June 1992, climate change issues have become of great importance in environmental protection at the level of both industrialized countries and developing countries, with various measures aimed at mitigating effects and at adjusting themselves to accordingly.

If since times immemorial, human beings have been struggling for adjusting themselves to climate variations, the current rapidity and intensity of the latter are far beyond the adaptation capacities of societies. Traditional measures are no longer enough and the societies involved become still more vulnerable according to two factors:

- The fragility of the natural environment vis-à-vis meteorological extreme events and climate change ;
- The poor adaptation capacity of the population.

The very destitute population of developing countries particularly suffers from the effects of climate deregulation because their survival directly depends on natural space, agriculture, water resources that are seriously disrupted by continuous climate change. The situation of the poorest is still exacerbated by the effects of climate change.

Thus, combating the negative effects of climate change should be part and parcel of the socio-economic development of the countries involved, with poverty alleviation as the central axis.

For showing its commitment to combat climate change, Mali has paved the way by achieving a number of facts, viz:

- The signing of the United Nations Convention on Climate Change on September 22, 1992 and its ratification on December 28, 1994 ;
- **The signing of the Kyoto Protocol, on January 1999 and its ratification on March 28, 2002;**
- The elaboration of its initial national communication in the year 2000 ;
- The designation of a focal point for climate change in 1992 ;
- The establishment of a Designated National Authority (DNA) and of a Clean Development Policy (CDP) in 2003 ;
- The elaboration of its National Action Programme for Adaptation (NAPA) to the harmful effects of climate change in 2007.

Mali continues to honour its commitments relating to the Convention and to the Kyoto Protocol. With the support of the Netherlands, Mali initiated studies on the vulnerability and the adaptation of the country to the harmful effects of climate change, in the framework of a project entitled "Programme for Assistance to Studies on Climate, NCAP"

The studies were conducted in two phases:

1. The first phase of 18 months was completed in 2003.
2. The second phase, composed of two parts of 18 months each, forecasts, inter alia, the formulation of the elements of a National Climate Change Policy as well as the socio-economic evaluation of options retained in Phase I.

This consultancy is therefore meant for attaining one of the expected results of NCAP

The document is structured in four (4) main parts.

- the objectives of the study and the methodological approach ;
- The state of art of the issue ,including the description of characteristic features of Mali and the analysis of the effects of climate change
- the update on the programmes and projects on climate change ;
- the elements of the policy, including mainly : the vision, the objectives, the principles and strategic axes as well as the proposed sectors and adaptation measures .

The document ends with recommendations by way of accompanying measures for implementing the policy..

I. OBJECTIVES OF THE STUDY

This study, entitled « **Elaboration of the elements of a National Strategy for Adaptation to climate change** » is aimed at elaborating the elements of a national policy for adaptation to the effects of climate change.

More specifically, the point is to :

- Define the principles, the strategic axes, and the accompanying measures of the policy. ;
- Define the sectors and measures for adaptation to the harmful effects of climate change.

II. ANALYSIS OF THE TERMS OF REFERENCE

The analysis of the Terms of Reference (TOR) calls for no comment. However, given the delay in the selection of consultants, it will be necessary to extend the duration of the contract by one week (7days).

III. METHODOLOGY

The methodology of the study consists of 3 main phases: :

- ✓ Making contacts with competent technical services (Permanent Technical Secretariat of the Institutional Framework for Environmental Issues Management, the National Directorate, CNRST, etc..)
- ✓ documentation and information :
 - collection of information on Mali and other relevant countries, including through the INTERNET ;
 - analysis and interpretation of data and information collected ;
- ✓ report drafting.

IV. GENERAL CHARACTERISTICS

The main characteristics of Mali are described in several documents. The descriptive elements retained in the framework of this consultancy are essentially drawn from the report on the status of the environment (ME, 2006). This description deals with the location, the relief, the climate, the demography, and the socio-economic situation.

Location

With a land-area of 1,241 ,238 sqkm, Mali is a vast Sahelian country located between the 10th and 25th parallels of latitude North and between the 4th degree of longitude East and the 12th degree of longitude West.12 t. Landlocked at the heart of West Africa, the country is sharing over 7,000 kilometers of border with 7 neighbouring countries. It stands as a strategic connecting country between the Arabo-Berber North Africa and black Sub-Saharan Africa (cf Map 1) .

Relief

The relief is characterized by the predominance of sandstone table lands of the Manding Plateau which is stretching out from. north of the River Niger to the border of Senegal .It reaches 800 meters at its highest point at the Koutiala Plateau which is stretching out from south of the Upper River Niger to the border of Burkina Faso. The highest point reaches 791 meters in the Bandiagara cliffs. This relief is expanded towards East by a series of residual highland blocks in the Hombori area where is the highest point in Mali is reached at 1,155 meters.

The central part of the country is occupied by a vast alluvium plain referred to as the River Niger Inner Delta.

In the Goundam area, sand dunes and little rocky hills delineate the delta plains where lakes are formed. A second set of plains is stretches out East of the delta between the bend of the river Niger and the Dogon plateau in the South. This set of plains is called Gourma .

At this level, one can observe fixed and small lines sand dunes emerging from stony or sandy plains. .

In the North-East, the Adrar of Iforas which reaches 890 meters is an extension of the crystal highlands of Central Sahara. It is bordered on the West by the Tilemsi

fossil valley. South-East of the highlands, one can observe the Tamesna plateaus and plains as well as in the North-East of the Azouak valley.

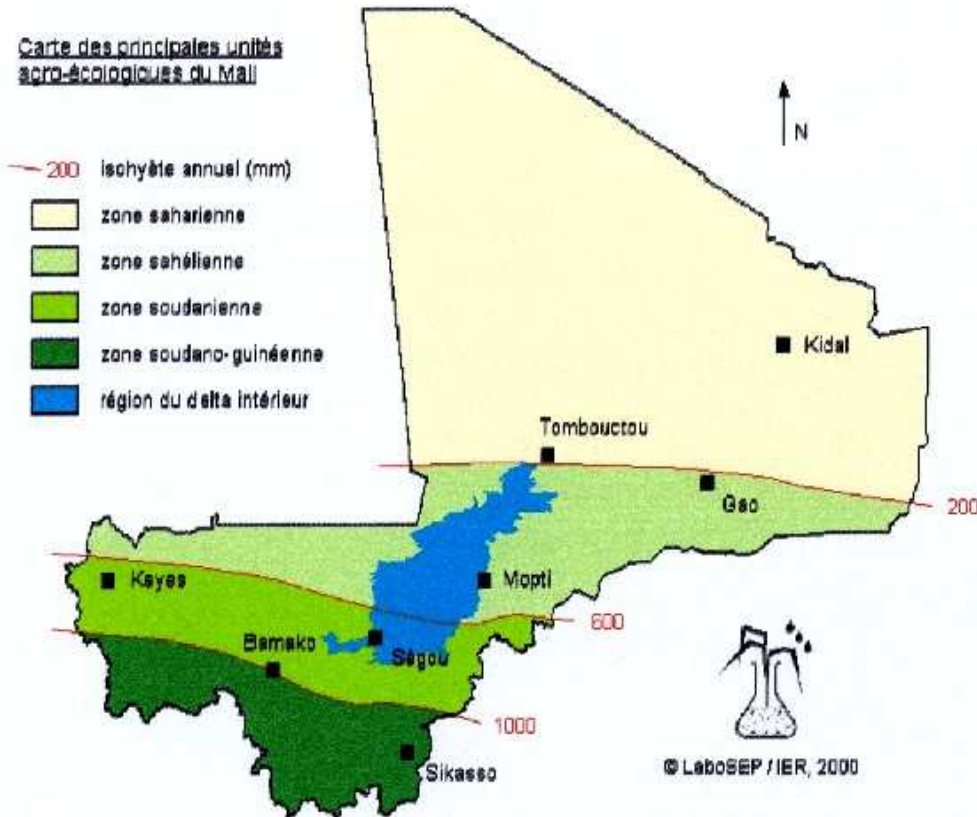


Map N°1 : Location Map of Mali

Climate

The climate is a dry tropical one. There exist four types climate, viz :

- Saharan climate in the North (annual rainfall < 200 mm) ;
- Sahelian climate in the central part (annual rainfall ranging from 200 mm to 600 mm) ;
- Sudanian climate (annual rainfall ranging from 600 mm to 1000 mm) and ;
- sudano-guinean climate in the North (rainfall > 1000 mm).

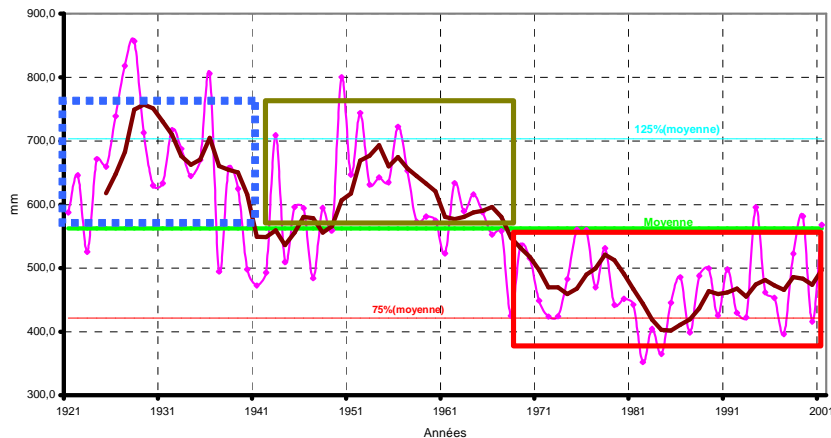


Map 2 : Map of eco-climatic zones (Source : National Directorate of Meteorology (DNM))

The various climate problems in Mali are translated by:

- A regular decrease in rainfall quantity and a greater spatio-temporal distribution ;
- Sahel-characterized squall lines focused from North to South on 500 to 700 km often coupled with strong winds and heavy rains which are sometimes disastrous ;

Figure 3: EVOLUTION DE LA PLUVIOMETRIE AU SAHEL - MALI



- A very strong radiation all over the year with little differentiated average temperatures ;
- An increase in temperatures from South-West towards North-West with maximum temperatures recorded in the course of the year that can reach or exceed 45°C while minimum temperatures are rarely below 10°C ;
- High values of potential evapo-transpiration (ETP) owing to high temperatures, low relative moistures, and strong winds. ;

The persistence of droughts from 1970 , entailing sufficiently important rainfall deficits and an shifting of isohyets towards the south ;a fact because of which migration has increasingly become a strategy in view of these new precarious climatic and environmental conditions .

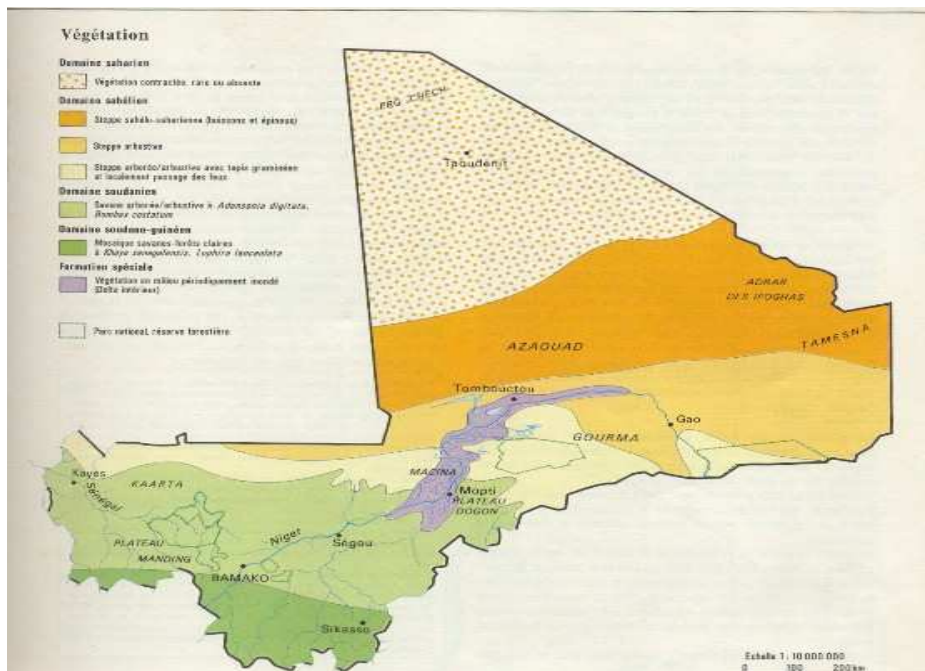
The monthly rainfall analysis shows a random distribution of rainfall at the beginning of the rainy season. The average annual rainfall is very variable and is decreasing from north to south.

Maximum temperatures vary little during the year in a given place, the variation coefficient being lower than 10% in almost all cases. The absolute maximum is 51°, and maximum averages are ranging between 35 and 45° whereas the variation coefficient of minimal temperatures is between 10 and 13% all the year round.

An analysis of the monthly data of minimal temperatures shows an upward trend. As for parameters such as the wind, Evaporation and potential Evapo-transpiration (ETP),their inter-annual and intra-annual variabilities are not much sensitive.

Vegetation

Vegetation distribution is essentially association with the variation of climatic conditions and particularly that of rainfall. The main vegetation types which are variable from north to south are the following. :



Map
n°3 :
Vegetation
map
of
Mali
Sources:
Atlas

Jeune Afrique

- Thorny steppes with *Acacia raddiana* and grassy steppes with *Cenchrus biflorus*, *Panicum turgidum* and *Aristida spp* in the sub-saharan or desert-prone zone which covers 57 % of the territory ;
- Shrub steppes with *Combretum glutinosum* in the sahelian zone covering 18% of the territory ;
- Aquatic grasslands with perennial gramineae such as *Echinochloa stagnina*, *Oryza barthii*, *Vossia cuspidata* in the flood plains of the river Niger, mainly in the Inner Delta ;
- Shrub savannas with *Combretum glutinosum* in the sudano-saheleian zone which covers 14% of the territory. One can also find there plant formations with *Guirea senegalensis*, *Balanites aegyptiaca*, and woody parks with *Acacia albida*, et *Borassus aethiopicum* ;
- Woody savannas with *Bombax costatum*, *Vittelaria paradoxa* and *Isoberlinia doka*, in the sudanian zone which covers 24% ;

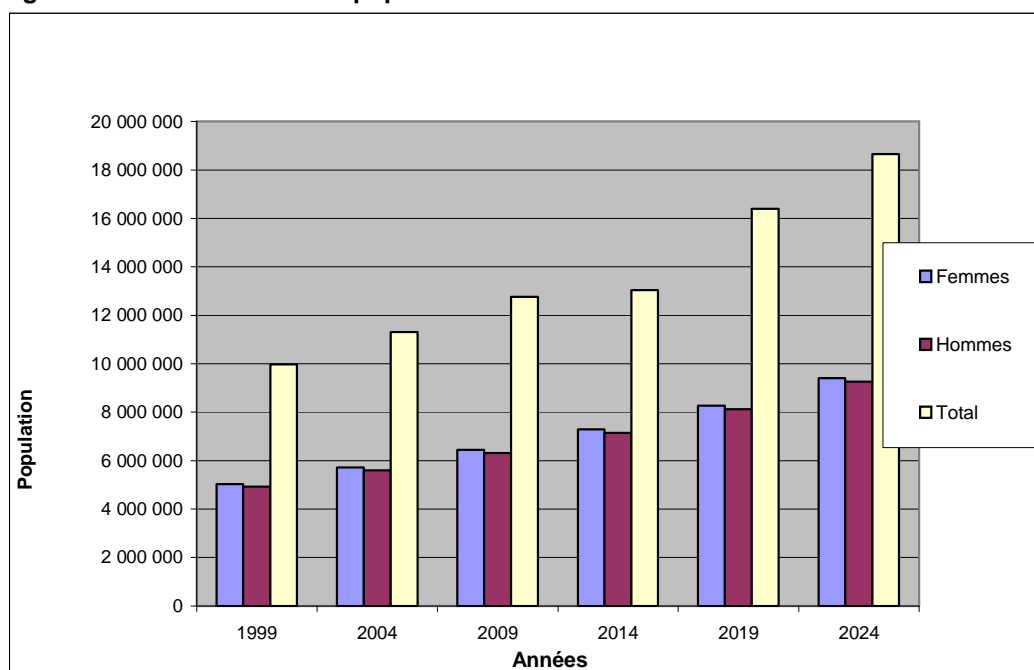
- Woodlands in the sudano-guinean zone which covers 11% of the territory in the south of the country. Plant formations are given by woody species

Demography

The population of Mali was estimated at 11,1 million inhabitants in 2003, including 50,5 % of women with a special emphasis in the Kayes region which records the lowest proportion of resident males and the Sikasso region being an exception because that is where males represent 52% of the population. The population growth rate is 2,2%. Between the two last censuses, from 1987 to 1998, the population shifted from 7,7 million to 9,8 million inhabitants. Projections give about 12,500,000 inhabitants in 2008. The population of Mali will be reaching 18,655,076 inhabitants by the year 2024.

In 2020, the rural area will have a population of 9,295,872 inhabitants while the urban area will have a population of 7,482,068 inhabitants; which corresponds to an urbanization rate of 44,6% against 24% in 1996 according to the administrative census. The female population which was 5,034,696 in 1999 will reach 9,400,510 in 2024 against 4,934,237 and 9,255,411 for men for the same period.

Figure n°2 : Estimation of the population of Mali 1999-2024.



Source : DNP Annual Report 2002

Socio-economic situation

Since 1992, Mali has been implementing various reform programmes that allowed achieving significant progress in the liberation of economy, reduction of macro-economic unbalances and restoring conditions for a sustainable and sustained growth of the economy.

The Malian economy is mainly based on the primary sector (agriculture, livestock, and fisheries) which involves 80% of the working population.

Agricultural production is based on cereals which are the main food crops, viz : millet, sorghum, rice, maize, fonio (digitaria spp) ,and wheat .

Agricultural crops are important in the agricultural policy of the country. As the number one industrial crop and number one export product, cotton accounts for 10% of the GDP of the primary sector and nearly 58% of export earnings

Concerning productivity, several matching data indicate a decrease in the yield reflecting the impoverishment and the progressive soil degradation

It appears clearly that initiatives for mechanization, expansion of land-clearing and massive use of fertilizers and pesticides should integrate « environmental protection » in their planning and their implementation.

Livestock accounts for about 10% of national GDP with nearly 20,402,621 heads of small ruminants and 7,531,727 of heads of cattle, is the most important in West Africa. Livestock is the third export product of Mali, following gold and cotton. .

The two vital sectors-agriculture and livestock, are very vulnerable to risks of natural disasters which affect the country, viz: floods, droughts and recurrent locust invasions.

Forest exploitation is important in the national economy and contributes to GDP for 4,9% (forestry production)). It also provides 25% of exports. According to the statistics of DNEF, if one accounts of the proceeds of fruit gathering, wild fruits and tree species for pharmacopoeia, the estimated value of the products of the forestry sector apart from arboreal fodder would be up to the tune of 70 billions FCFA per year.

Wild fauna plays an important role in the economic life of the country. It is a promising subsector in several areas (pharmacopoeia, food security, trade, handicrafts)

The fauna is characterized by the diversity of species and the reduced number of strengths. It is composed of not less than 136 species of mammals, of which 70 species are big mammals. Some of these species are currently in decrease, and even in total disappearance. One can count at least 640 bird species and 143 fish species. .

The richest biodiversity sites experienced various protection status since the fifties((1950s.) but the rich and varied heritage is mainly endangered by anthropic actions (land-clearing, overgrazing, poaching, illicit fishing, bushfires, pest and bird chemical control(pesticides),population growth) and climatic hazards (mainly rainfall deficits) .

Fishing remains one of the pillars of the national economy, thanks to river Senegal, river Niger and their tributaries. It makes Mali a major producer of fresh water fish (tilapia, captians, etc) in the sun-region despite droughts and erratic rainfalls .The annual fish production can reach 100,000 tons in wet year).

Mines sector represents an asset for Mali which has diversified mineral resources (ferrous and non-ferrous metals and precious metals). Gold production has been increased remarkably, shifting from 6,291 kg in 1995 to 44,584; 517 kg in 2004. This production is equivalent to an overturn of 30 billions FCFA. Thus, gold becomes the first export product, followed by cotton that had been bringing so far half of the foreign currencies earned by the country. .

Mining can have impacts on the environment, and health: wastes, pressure on arable lands, use of mercur and cyanide (gold washing, sound nuisance... Since 2003, Ecological Impact Studies (EIE) are being carried out since 2003 for mining.

Concerning the health sector , the organization of the system consists of three levels ,viz : central level which plays a designing role, the intermediate or regional level which plays a support role at the peripheral and operational level that plays a role of designing, programming and implementation of operations. .

In 1995, the Ministry of Health launched the elaboration of a Ten-Year Development Plan by adopting an approach referred to as "programme approach". That consists in having a global and integrated vision of health development. Thus, in June 1998, the Malian Government adopted the Ten-Year Health and Social Development Plan (PDDSS, 1998-2007)

Despite the expansion of life expectancy at birth and the development of public health systems, health conditions in Mali remain far below international standards. Infectious and parasitic diseases such as malaria, neonatal tetanus, meningitis, diarrhoeas continue to be endemic.

Children and child-bearing age women who are consequently experiencing the highest mortality and morbidity rates need to be further taken care of by the health system. The immunization coverage for children is still low despite the efforts undertaken these recent years by partners. The majority of the population has still no access to adequate medical cares.

V. UN FRAMEWORK CONVENTION ON CLIMATE CHANGE (UNCCC) AND THE KYOTO PROTOCOL

UNCCC and the Kyoto Protocol : Synthetic Recall

Context of the Convention

« The first World Conference on Climate Change held in 1979 considered that climate change is a serious threat to sustainable development with its unexpected unfavourable effects on human health, food security, economic activity, water resources, the other natural resources and physical infrastructure. It was followed by a number of Inter-Governmental conferences from 1980 to 1990. The Intergovernmental-Group on Climate Evolution (IGEC) was established in 1988 by the United Nations Environment Programme (UNEP) and the World Meteorological Organization (WMO) and its mandate was to evaluate the status of existing knowledge on the climate system and climate change, environmental, economic and social impacts of climate change as well as possible response strategies. The IGEC published its first evaluation report in 1990 and that gave the scientific evidence of climate change and enabled governments to base their political decisions on most updated information. That has a remarkable effect on both decision-makers and the general public, and served as a basis for negotiations on climate change. In 1990, the second World Conference on climate opted for a treaty-framework on climate change which was adopted on May 9, 1992 in New York. It entered into force on March 21, 1994. **Mali signed the UNCCC) on September 1992 and ratified it on December 28, 1994.**

Objective, principles and organs

The objective of UNCCC is to « stabilize, in accordance with relevant provisions of the Convention, glasshouse gas concentrations in the atmosphere at a level that prevents any dangerous anthropic disturbance of the climate system.

It would be desirable to reach this level in a reasonable time-limit so that the ecosystems can be naturally adapted to climate change and that food production is not endangered and that economic development can be pursued sustainably »

The Convention implementation is based on five (5) principles which are provided for in its article 3. Its supreme body is the Conference of Parties which is assisted by a Secretariat and two subsidiary organs, viz: the subsidiary organ of the scientific and technological council entrusted with providing scientific and technological advice, and the subsidiary implementation organ in charge of the enforcement of the provisions of the Convention.

Commitments /Obligations of Mali

By signing and ratifying UNCCC, Mali commits itself to comply with all the relevant commitments, the main ones being the following:

- To pay an annual contribution for the operational costs of the Convention Secretariat. ;
- To prepare and submit « national papers » containing information on inventories of glasshouse gas emissions per source and on their « national sinks » ;
- To implement national programmes and adapt oneself to their effects ;
- To sensitize the general public on climate changes and to their possible impacts.

The Kyoto Protocol

The UNCCC text states the general principles but does not contain mandatory clauses. Implementing the convention requires from industrialized countries great efforts for reducing their gas emissions That is why at the first Conference of Parties(C O P), in Berlin in 1995 ,a Special Group referred to as “Special Group on the Berlin Mandate “ was established for negotiating a Protocol to the Convention. It was adopted on December 1997 in Kyoto and was named the Kyoto Protocol. “

Mali signed the Kyoto Protocol on January 27, 1999 and ratified it on March 2002.

The Protocol entered into force on February 16, 2005.

Objective

The Protocol makes it mandatory for the Annex I countries to achieve a reduction of their glasshouse gas emissions by 5% at least, as compared to the 1990 level, between 2008 and 2012.

The Annex I countries are composed of developed countries and countries with a transition economy..

Developing countries are not concerned by objectives for reducing their glasshouse gas emissions. They, are also called Non-Annex I countries.

Cooperation mechanisms :

Under the Protocol, there exist three mechanisms, viz:

- Exchanges of emissions: **as defined in Article 17, the Kyoto Protocol allows the Annex I countries with emission reduction surpluses to sell them to other Annex I countries for enabling them to honour their commitments relating to the Protocol.**
- Joint implementation :
It allows the Annex I party-countries to honour their commitments through flexible and non-costly ways, with benefits for Annex I host countries, in terms of foreign investments and technology transfer

* CLEAN DEVELOPMENT MECHANISM (MDP):

The objective of the « Clean Development Mechanism is to assist the Parties not coming under Annex I in achieving a sustainable development as well as in contributing to the ultimate objective of the convention, and in assisting in helping the Annex I Parties achieve

of the convention, and in assisting the Annex I countries in fulfilling their figured commitments to limit and reduce their glasshouse gas emissions as provided in Article 3.

Concerning the Clean Development Mechanism (CDM), it was established by Article 12 of the Protocol, with the purpose of assisting the Annex I Parties in achieving a sustainable development as well as in contributing to the ultimate objective of the Convention, and in assisting the Annex i Parties in fulfilling their figured commitments to limit and reduce their glasshouse gas emissions. .

VI. Analysis of the effects of climate change on the sectors of socio-economic development

Agriculture and water resources

The increase in temperatures with a decrease in rainfalls will have an impact on the agriculture section and **consequently** on food security, by a decrease in cereal production which depends on rainfalls. The reduction in flood areas in the central delta (from 36,000 km² in 1969-70 to 8,500 km² in 1972-73) and the drying up of lowlands, ponds and lakes, caused a reduction in fish production. Fish captures shifted from 110, 000 tons in an average year (as 1966) to 54, 000 T in a dry year (as in 1984) i.e., a decrease of nearly 50% (SHENDAN D, 1985, Final Report on Adaptation Strategy, 2007).

By the year 2005, it will be virtually difficult to contemplate rice farming through controlled water submission as currently in the Rice Offices of Segou and Mopti as well as in San, without hydraulic structures. Concerning the full control of parameters, the available volumes of water for off-season farming will be limited given the weakness of the inputs of rivers, mainly during the period of low water in rivers (Report on the Adaptation Strategy, 2007).

The analysis also allows for showing and assessing the impact of climate change on two varieties of crops which are very important for Mali, namely: maize and cotton which are very water-demanding and which withstand very poorly water stress.

Therefore, the persistence of water deficit could have some logical consequences, the loss of crops and of human lives following when famine occurs. .

The energy sector will be affected by the reduction in inputs to Selingué and an increase in evaporation, following an increase in temperature. Therefore, one should expect a decrease in energy production that will have an impact on the economy. The river transport sector will be also affected.

Natural Resources : waters, forests, biodiversity, soils

The nature of climatic zones created a variability of ecological conditions which determine, in their turn, a great diversity of ecosystems and biological resources. The country is therefore subject to climate conditions, and mainly the rainfall. Natural resources are naturally affected by the side effects of the variability and climate change. .

Water resources

Water courses, in the basins of which lives nearly the whole population of Mali, play a main role in the national economy. They constitute the engine for the socio-economic development of our country.

Though theoretically abundant, surface and underground water resources are seriously threatened by wastage and non-rational management of networks, sedimentation and sand silting of water-courses, lakes, and ponds, various pollutions, etc. This situation will be exacerbated by the effects of climate change..

The various climate-related problems in Mali with regard to water resources are, among others, the following:

- A regular decrease in rainfalls, and a great spatio-temporal variability ;
- Squall lines which are characteristic of the Sahel, focused from the North, often coming along with strong winds and heavy rains;;
- A very strong radiation all the year round ;
- an increase in temperatures from south-west to north ;
- High values off potential evapo-transpiration ;
- The persistence of droughts from the seventies (1970s) entailing considerable rainfall deficits ;
- Sand silting of water courses.

An analysis of the reduced abnormalities of 59 meteorological stations from 1961 to 2004, shows a downward trend of rainfalls for the recent three decades (National Directorate of Meteorology, 2006)

The decrease in rainfall is going to entail land conflicts because of the reduction in arable lands and rangelands, the migration of populations towards urban centers, with as consequences the increase in unemployment, insecurity, and in health problems .Access to water, mainly safe drinking water, is an objective of the Ten-Year Health Programme referred to as « PDS » adopted by the Government of Mali. This means that safe drinking water availability and the level of health are interrelated. Water is an element which is indispensable to life. Without water, no community can live and get developed economically.

In case of shortages or disruption of rural production systems, some activities that are traditionally considered secondary, such as wood cutting become very important. Thus, stakeholders whose productivity declined tend to carry out such activities. For some small basins such as Diola, Bougouni, and Selingué, wood-cutting will be favoured by the relative activity of major urban centers such as Bamako. That is valid for other supply basins close to urban centers. It will temporarily play the role of a source of income but only for a short period because the forest plateau of these zones will not withstand for long owing to an increased pressure exerted on it and especially that this pressure prevails during the dry period. Generally, the degradation of land cover will increase soil erosion and will favour a blocking up of the water courses of water retention lakes.

The frequency of floods, following an increase in rainfalls, will cause economic losses with current occupancy of its main water courses..

Owing to the decrease in rainfall, the safe drinking water supply for the population and livestock will be very difficult following the drying up of some wells or increase in their in-depth..

It is worth noting that the decrease in rainfall, the supplying of deep aquifers through infiltration has become very weak. In some regions, as in the Bani-Niger sub-basin, aquifers have experienced the **lowest** level in 1987 (National Directorate for Energy, 2006)

Forest resources

The forest sector plays a decisive role in the socio-economic and cultural life of Malian populations. It provides capital goods that no other sector can provide (93%) of energy requirements, food products, and pharmaceuticals, ecotourism, biodiversity conservation, improving the living environment, etc..

Natural formations underwent great changes, due especially to the aridity of the climate, successive droughts, and mainly anthropic activities.

Les études ont démontré que le bilan production- prélèvement de bois passerait de 2,7 millions tonnes en 1994 à 1,7 millions tonnes en 2005 et 0,8 millions de tonnes en 2010 pour l'ensemble du bassin d'approvisionnement de Bamako (Direction Nationale des Ressources Forestières Fauniques et Halieutiques, 1995).

Biological biodiversity

Rich and varied, Mali's biological resources heritage is unfortunately endangered. This loss of biodiversity is associated with a set of complex factors, mainly climate change, recurrent droughts, and anthropic action.

Frequent droughts, more than any other factor, contributed to fragilizing further the ecosystems, by making them more vulnerable to the least disruption and by accelerating the speed of degradation of biological resources. As for subsequent water deficits, they entailed a reduction of primary production, a modification of the structure of the plant cover, and a massive reduction of the wild fauna..

Energy sector

In the energy sector, an analysis of effects of climate change pointed out two very vulnerable sectors, namely: the hydro-electricity sub-sector and that of woody fuels..

The growth rate of electricity amounts, on average by year, to 12%, of which 15% for localities supplied by the interconnected network and 10% for isolated centers. This demand is essentially met for more than 80% from hydro-electricity. The growth rate of electricity demand is, on the average, 12% per year, of which 15% for localities supplied by the interconnected network and 10% for remote places. This demand is essentially met, for more than 880% from hydro-electricity the structures of which are water retention structures depending mainly on rainfall decrease in rainfall entails production shortages that will influence negatively the continuity of electric energy supply service..

According to an analysis by DNH, the electricity production of operational hydroelectricity structures is nearly 1007 GWH for the Manantali power plant and 200 GWH for the Selingué plant power.

On contrary, for years with low hydraulicity, the electricity production of major power plants decreases for more than 20% as compared to the average and is estimated at 660GWH .

Health

The organization of the health system consists of three three levels ,viz : the central level which plays a role of designing ,the intermediate level which plays a backup role at the peripheral level, and an operational level which plays a role of planning and implementation of operations..

A study on the relationships between health and the environment dealt with two diseases, viz: malaria and meningitis. These diseases seem to have close relationships with climate parameters.

Concerning malaria, an increase in temperatures would reduce the time of development of the parasite in its vector, which would increase the virtual capacity of the anopheles mosquito. Therefore, warning could increase the transmission level in a given place and allow for the transmission in regions where it was previously made impossible by low temperatures ranging from 16 to 18°C.

Climate scenarios forecasts for Mali a temperature increase higher than 2°C all over the territory for the 2005-2100.

As for meningitis, its expansion could be amplified in the future, following the modification of the extent of eco-climatic zones.

It is also worth noting that climate change can, through glasshouse gas emissions, cause respiratory diseases, especially in urban centers.

Infrastructures

Transport equipments

The national road system consists of 89,024 kilometers of roads. Only 3,387 kms of roads are tarred. Because of this situation, roads are very vulnerable to climate effects such as wind and water erosions, and sand-silting

Quant au réseau fluvial national, il sera beaucoup handicapé par le déficit pluviométrique et l'ensablement des cours des fleuves.

Dwellings and hydraulic structures (bridges, dams and dykes,etc)

Following rainfall deficits, the population has had the bad habit of building dwellings in the bed of water courses This situation resulted in floods with many human and material losses. Because of the **same** rainfall deficit, weaknesses **were observed** in the dimensioning of some hydraulic structures such as bridges, dams, and dykes.

This situation will be exacerbated with climate change.

VII. STATUS OF IMPLEMENTATION OF PROGRAMMES AND PROJECTS ON CLIMATE CHANGE

In seeking solutions to problems related to climate disruptions, Mali ,like the other Sahelian countries, with the support of its partners, took several measures for better responding to the consequences of climate change. These actions dealt with several projects, some of which have been already implemented, some others are being implemented, others are underway or being planned.

IMPLEMENTED PROJECTS

Mindful of the well-being of its population, Mali has already implemented a number of programmes and projects in the framework for the adaptation of the following to the effects of climate change:

- the National Self-Evaluation of capacities for the Global Environment Management (ANCR Project) ;
- the studies of the first and second phases of the Programme on Assistance to studies on climate change (NCAP, funded by The Netherlands).The latter dealt with the following themes :
- the study on the elaboration of climate change scenario in the Sankarni and Baoule Basins for Mali. ;
- the vulnerability and adaptation of water resources to climate changes in the Sankarani and Baoule Basins;
- ;
- the evaluation of costs of options for adaptation and of the socio-economic impacts of phase 1 ;
- the study on ultimate users of water resources and dialogue with the communities ;
- the identification and selection of appropriate technologies for water resources management ;
- the study on the elaboration of strategies for adaptation to climate changes;
- the study on the perception of risks of climate change by the most vulnerable social classes ;
- the National Programme for Adaptation to Climate Change (PANA).
- The Regional AGRHYMET Project « Support to Capacities for Adaptation to Climate Change in the Sahel » ;
- the Project for Early Warning System and Agricultural Production Forecasts (AP3A) ;
- the Project on Vulnerability Assessment in the Sahel « SVS » ;
- the Climate/CNRST Project- 2003, allowed for comparing occurrences of **maximum temperatures higher** than the maximum average of the 1961-1990 normal one, by the years 2050 and 2100. .

On-going Projets

For on-going programmes and projects for adaptation to climate change, one can retain the following:

- the National Climate Change Adaptation Programme (PANA funded by UNDP and GEF) in its phase of elaboration of the elements of the policy on climate change;
- the GEF small grants projects focused on climate change ;
- the preparation of the second National Communication of Mali on climate change ;
- Climate change adaptation from the bottom up : collaboration between Malian communities and scientific organisations to identify and implement responsive water management actions (ACCCA-UNITAR).

Planned Projects

In the framework of the elaboration of the climate change adaptation programme, eighteen (18) priority projects were elaborated and **validated**. **These projects were the following::**

- The popularization of improved varieties and suitable for the climatic conditions of the main crops (millet, sorghum, maize, and rice) ;
- The popularization of plant and animal species that are better adapted to climate conditions ;
- The promotion of income generating activities and development of mutual assistance funds ;
- Aquaculture development schemes in Mali ;
- the promotion of cereal banks ;
- the use of meteorological information for improving agricultural production and contributing to food security ;
- Lowlands development ;
- Construction of boreholes equipped with solar pumps or wind-powered pump;
- Energetic valorization of typha ;
- Harnessing run-off water and restoration of water-points ;
- Sensitization and organization of populations for preserving natural resources (elaboration of local conventions and agroforestry ;
- Bushfires management in Mali ;
- Development of CES/DRS farming actions and composting ;
- Development of fodder crops ;
- Elaboration of a technological package for training the population with regard to climate change ,and simple practices relating to climate change adaptation ;
- Promotion of food banks for livestock ;
- Promotion of jetropha oil
- Establishment of information risks of diseases associated with climate change.

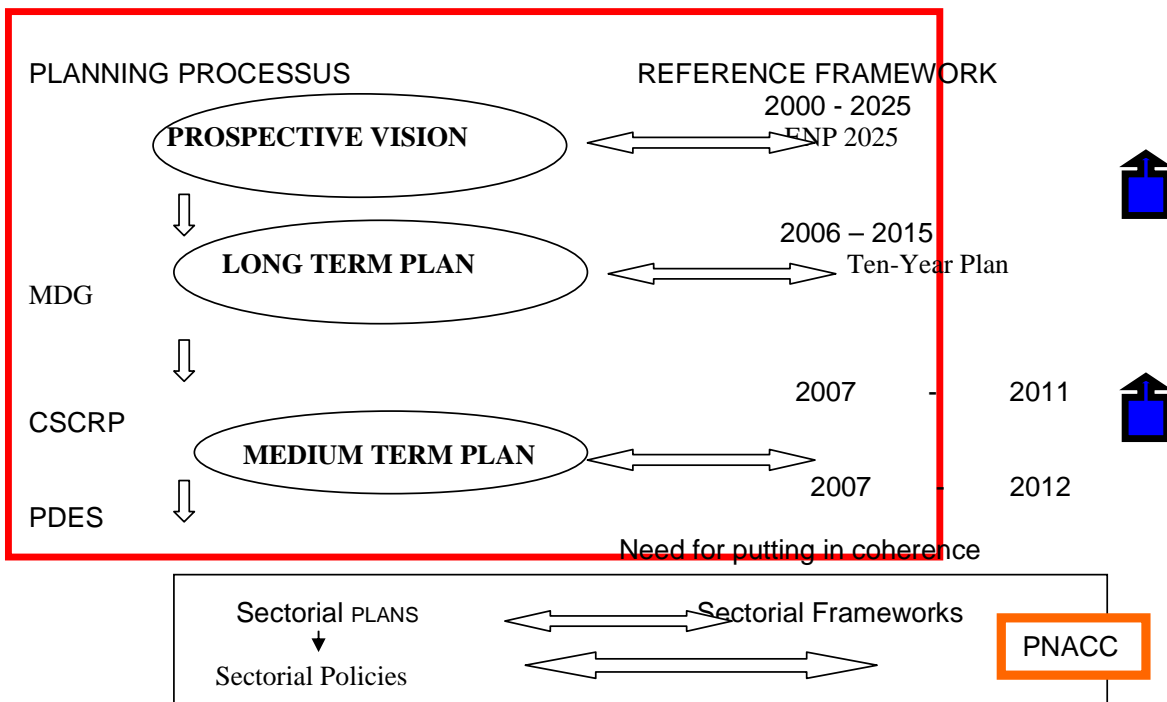
VIII. Analysis of national socio-economic development policies of Mali

The national climate change policy should be harmoniously inserted in the overall framework for the economic and social development planning development planning process. For this reason,(4) reference frameworks and two(2) national policies can be retained:

- The 2005 National Perspective Study (ENP 2025) : for vision ;
- The Millennium Development Goals (MDG) :long term planning
- The Strategic Framework for Growth and Poverty Reduction (CSCR) : medium term planning ;
- The Economic and Social Development Programme (PDES) medium term programming; ;
- The National Decentralization Policy (PND); and
- The National Environment Protection Policy (PNPE).

The figure 3 below illustrates the need for ensuring an overall coherence of PNAC with the national economic and social development planning process.

Figure 3 : Processus de planification



National Prospective : VISION 2025 (ENP)

The Mali 2005 National Perspective Study (NPS) carried out from 1997 TO 1999 and adopted by the Government in 2002 is the logical continuation of Segou1. This study identified Malians' long term vision which is « a united nation on a diversified and rehabilitated cultural bedrock, a democratic political and institutional organization which is the guarantor for development, and social peace, a strong ,diversified, and open economy, a decrease in poverty and social progress occurring in all the regions and among all the social classes of the population”

Four long term objectives were retained by the National Perspective Study (cf Table 1)

- Consolidation national unity and cohesion, based on the wisdom conferred upon the Malian society owing to its cultural diversity;
- A political and institutional organization which guarantor for development and social peace;
- A Strong, Diversified, and Open Economy;
- An improved environmental setting.

It is easy to observe that the environmental aspect is taken into account with three sub—objectives

Table 1: Strategic long term objective n°4: An improved environmental setting

Sub-Objectives	Strategic Orientations
To preserve the fragile equilibrium of rural ecosystems	<ul style="list-style-type: none"> - To ensure a rational and concerted management of natural resources , - To support actions implemented by partners (Community Organisations, NGOs., development partners) by defining a cooperation framework focused on the participation of the population.
To improve life quality in towns and in rural areas	<ul style="list-style-type: none"> - To design and implement development schemes that take account of local specificities , - To strengthen sensitization and training of the population and the various stakeholders in the field of the protection of their environment , - To implement policies for controlling industrial development –related pollution and nuisance, mainly those associated with glasshouse gas , - To see to a proper enforcement of the legislative texts and provisions for the involvement and management of industries and manufacturing plants - To strengthen the management capacity of urban and rural communes in the field of hygiene and sanitation. .
To control desertification and the other transnational harmful climate effects.	<ul style="list-style-type: none"> - To support all on-going actions aimed at reducing the effects of negative eco-climatic effects . . - To ratify and implement the various conventions and other bilateral, multilateral, and regional agreements since these ones enjoy no waiver vis-à-vis Mali's legislative environment (Agenda 21, Sahel 21, PNAE/CID, Bamako Convention on hazardous wastes, etc.)

MDGs.

In September 2000, at the UN 55th General Assembly commonly referred to as the « Millennium Summit », the Leaders of the whole world and the senior Officials of the United Nations System Agencies agreed on a set of measurable objectives and targets by the year 2005 for controlling poverty, hunger, disease, illiteracy, environmental degradation, and discrimination against women (Millennium Declaration attached as Annex).. Being placed at the heart of the world agenda

,these objectives are nowadays referred to as the Millennium Development .They are six in number, viz: :

1. To reduce by half extreme poverty and hunger ;
2. To ensure primary education for all ;
3. To promote gender equality and women empowerment ;
4. To reduce infant mortality by two- thirds ;
5. To reduce mother mortality by three-fourths(3/4) ;
6. To control VHI/AIDS, malaria, and tuberculosis ;
7. To re-ensure a sustainable environment ;
8. To establish a global partnership for development.

These objectives were spelled out in eighteen (18) targets or quantified objectives. Discussions made at international level allowed for defining a total of forty-eight (48) consensual indicators allowing for measuring the progress made by the various countries in implementing these objectives.

However,in Mali and for the purpose of adapting MDGs to national realities and preoccupations, eight (8) objectives, nineteen (19) targets and sixty-one (61) indicators were retained in December 2003.

Strategic framework for poverty control

The 1st generation of CSLP came to an end in 2005.The 2nd generation referred to as « Strategic Framework for Growth and Poverty reduction (CSCRП)» relies on the achievements and lessons learned from the accomplishments of the 1st generation.

The CSCRП document which was adopted by the Mali Government on **December20, 2006 included five main parts,viz :**

- The presentation of poverty situation in Mali and the results of the first CLSP from 2002 to 2006 ;
- The major objectives and the overall framework in which this new CLSP is going to be implemented. : the macro-economic framework and the budget framework from 2007 to 2011. ;
- The strategies and policies through the strategic orientations, the priority axes, and the details of sectorial policies ;
- The accelerated growth strategy including cross-cutting issues (population, gender, land development) ;
- The coordination and monitoring –evaluation mechanisms ,with the monitoring-evaluation indicators, the implementation of the Paris Declaration, the Funding Plan and the Logical framework of the CSLP second generation

The overall objective of CSCRП is to promote a re-distributive growth and a reduction of poverty, through the relaunch of the productive sectors and the consolidation of the public sector reforms .It has two (2) main specific objectives,viz :

- To accelerate the +7% growth per year over the 2007-2011
- To improve the well-being of Malian populations..

For attaining its overall objective and its specific objectives, CLSPII proposes three strategic orientations expected to strengthen one another for attaining the central objective of strong, sustainable, and poverty-reducing growth,viz:

- . Infrastructures and productive sectors development (SO1;
- . The continuation and consolidation of structural reforms (SO2) ;
- . Strengthening the social sector (SO3).

SO1: Infrastructures and productive sectors development

The point is to improve the productive environment for a better productivity of production factors allowing for increasing economic growth. .

SO2: Continuation and consolidation of structural reforms

Institutional reforms are conducted by the Institutional Development Programme (PDI) for ensuring a proper management of public affairs, peace, and social stability.

In addition to the consolidation of the decentralization process, three basic aspects will be given great consideration,viz :the strengthening of the rule of law and the improvement of the system and of the judicial organization, building the capacities of the civil society, and poverty alleviation.

SO3 : Strengthening the social sector

Emphasis is placed on a better providing of the main basic social services, especially Education, Health, , Safe drinking water ,and Sanitation and Settlement

The three strategic actions are explained in Fourteen priority intervention areas which are the following : (1)food security and development,(2) development of small and medium size entreprizes, (3)environment management, natural resources conservation and management(4) consolidation of public administrations reform,(5)The continuation of the business environment reform,(6)The financial sector development,(7) infrastructures development,(8) The promotion of democratic governance and of public liberties;(9) Building the capacities of the civil societies,(10) Strengthening regional and sub-regional integration initiatives,(12)Developing access to basic social services,(13) HIV/AIDS Control ,(14)Integration in the Multilateral Trade System .

Concerning the monitoring of CSCRP, a series of restricted indicators give an account of its implementation, among which «reafforested areas » as an indicator associated with environmental aspects.

The environment is taken into account by the 3rd area of intervention, viz: « Environment management and conservation and natural resources sustainable management »

The Project for the economic and social development of Mali (PDES)

PDS is the first reference framework for the whole governmental action during the five years to come (20072012).

The ambition of PDS is to make »the Malian state a model of good governance: A strong state, a professionally and morally improved justice, and strengthened local communities.

PDS is grounded on six priority axes of intervention:

- To better organize public action for supporting effectively the other components of the Programme ;
- To improve primary production and ensure food security ;
- To set up an environment propitious to the emergence and development of the private sector ;
- To insert women and children in productive channels ;
- To develop social sectors.
- To make indispensable societal reforms

It deals with eleven areas of intervention among which one can retain the following..

- ***Democracy and Governance : The Renewal of Public Action***

The point is to make the Malian state a model of good governance, strong and provided with an effective administration, a professionally and morally improved justice and strengthened local communities .The broad lines of actions are : the consolidation of democracy and human rights ,the restoration of credit and the authority of the State;a new mindset, the choice of men and women; fight against corruption..

- ***A stronger economic growth***

The ambition is to reach at least 7% per year from 2007 to 2012 through a proper maintaining of the economy and the requirement for a stronger economic growth .of time.

- ***A strategy for Agricultural :Towards food sovereignty***

It is a matter of making agriculture the leverage of the growth of the economy and a source of wealth for the populations, in the framework of Mali as an exporter of agro-food products, processed and labelled. This requires: the imperious change of agricultural production systems, the funding of the intensification of agricultural production systems, the strengthening of food security.

The vision of the future is to trigger off a new green revolution based mainly on the generalization of efficient farming implements, the massive use of inputs, and including also water control, with special emphasis on « Office du Niger ».

The political will is to boost Malian agriculture so as to reach a cereal production of ten(10) million tons per year by the year 2012.

- ***Strengthening the Programme on Infrastructures Expansion***

The main areas of intervention are : interna land external opening up of the country,energetic infrastructure,safe driniking water,communications infrastructures and information technologies development, settlement and urban infrastructures..

Decentralization policy

Decentralization is one of the most illustrative cases of the weakness of taking account of the environmental dimension in development programmes and plans despite the existence of basic texts..

Decentralization process in Mali marked a decisive step with the administratively territorial structuring that took place in 1998 and the setting up of the elected organs of territorial communities in 1999. Today, Mali consists of 761 Territorial Communities, including 703 communes, of which 684 are rural communes.

In 2005, the holding of a sectorial consultation meeting on decentralization led to the adoption of a National Policy Decentralization Framework Document/DCPN (2005-2014) which is articulated around four (4) major axes, viz :

- Building the capacities of territorial communities ;
- Improvement of the deconcentration of the State's services ;
- Development of citizenship ;
- Development of the provision of services by individuals or private structures at local level

The ultimate aim of the decentralization policy is to strengthen the process of democratization of the society, adapt the State's missions and organization to the requirement for the promotion of local initiatives .It aims at instituting a framework for the development and organization of the space that is compatible with the powers transferred to territorial communities in the field of the designing, programming, and implementation of economic, social and cultural development actions of regional and local interest.

The guidelines lines of the decentralization process are articulated around five (5) major requirements, viz:

- The need to engage a reform process based on pragmatic regulations serving as the strategic orientation framework This framework defines the general principles and the implementation strategies, without being a rigid and static and not tallying with the field realities;
- The need to achieve an expanded consensus of all the stakeholders on the content of the decentralization policy and its modalities of practical application (mainly the transfer of powers);
- the need to re-model the administrative restructuring and ensuring the integral communal coverage of the national territory ;
- the need for adopting a bottom up approach in the conduct of the process of construction of the new administrative architecture with a view to guaranteeing the participation of the populations in the implementation of decentralization. ;
- the need for strengthening the institutional capacities of decentralized territorial communities for enabling them to boost and take care of the economic and social development at local level .l.

The decentralization policy aims at the following major objectives :

- the furthering of the democratic process ,adapt the administration, and more generally the institutional framework to the objectives and requirements of political pluralism by allowing for a local democracy ;
- the promotion of local and regional development by facilitating the emergence of initiatives at the level of the various stakeholders and the establishment of a new development framework from the preoccupations ,the resources and the know-how of the populations ;.
- the decentralization implementation strategy is based on two (2) fundamental major principles :
- participation : it is organized through a citizen-oriented communication/mobilization policy with fora of concertations around decentralization instruments ;
- progressiveness: it is a principle of the Malian State that is implemented in the framework of a dialogue. This principle prevailed at the creation of the various levels of territorial communities and also as regards the transfer of the State's powers and resources to territorial communities. .

The decentralization policy forecasts the transfer of expanded powers to decentralized territorial communities in the field of environmental protection and natural resources management .Thus, in accordance with the provisions of the Territorial Communities Code(Law No 95-034(of16/10/1996) relating to the principle for the establishment and management of the territorial communities and modalities for organizing the activities to be carried there, territorial communities are responsible for the management, development, conservation, and safeguard of ecological equilibrium of their territories.

..

The operational framework for the implementation of decentralization is spelled out by the Draft Land Development Scheme (ESAT, 1995) and the regional preliminary draft land development and economic development schemes (AP-SRAD, 1997). These tools are mainly aimed at conferring upon economic development planning a territorial dimension, in the framework of an organization of space that takes account of the requirements stemming from decentralization.

The strategic orientations identified in ESAT are articulated around four main axes viz ::

- the re-balancing of the urban development process through the promotion of secondary support back-up centers likely to entail the expansion of major towns;;
- the concentration of industrial activities in a limited number of urban centers with a view to favouring a better mastery of pollution phenomena;
- the strengthening of the regional integration process through the establishment of liaison infrastructures and through the interconnection of urban and regional systems ;
- the safeguard of the natural environment and endangered ecosystems.

According to the planning process defined, environmental protection actions should integrate local development plans

The National Environment Protection Policy (PNPE)

The national environmental protection policy that was adopted in August 1998 is aimed at contributing to the sustainable economic and social development of the country and search for food security, the control of any form of pollution and nuisance, the control of the natural resources degradation process and desertification. Its overall objectives are the following:

- To ensure food security and the supply of other products in sufficient quantity and quality through a sustainable management of renewable natural resources ;
- To preserve/ protect and improve the living environment of all the citizens, mainly by controlling any form of pollution and nuisance ;
- To develop national capacities (technical and financial) of intervention at various levels (national, regional et local) and promote the participation of all the components of the Malian society in the environmental protection work ;
- To promote the creation of alternative jobs in the area of environmental protection ;
- To contribute actively to the development of sub-regional and international cooperation in the field of environmental protection

The specific objectives of the national Environmental Protection Policy (PNPE) were defined by area:

- ***In the area of natural resources management and environmental protection in rural area***

- To develop and support the implementation of a decentralized and participatory management of renewable natural resources ;
- To support the various territorial communities ,producers Organizations and Associations (O P, Socio-professional Organizations, Economic Interests referred to as « GIE »,etc) and other partners such as NGOs, so that they can play fully their role in natural resources management and environmental protection Group;
- To promote sustainable agricultural production systems and environment friendly mining methods;
- To elaborate and support the implementation of participatory programmes on natural resources management through regional land development schemes and village lands development and management schemes with a view to reducing the effects of degradation ,desertification and/or drought

- ***In the area of environmental protection in urban area***

- To strengthen the control of any form of nuisance and pollution ,mainly through the creation of purifying plants or plants for depolluting liquid ,solid and gaseous wastes of industrial and artisanal units and of major towns. ;
- To encourage local initiatives (GIE, NGOs ,and other members of civil society) in the field of household collection and processing, and sanitation ;
- To elaborate and/or strengthen the implementation of a sanitation policy through the implementation and setting up of sanitation infrastructures forecast in the framework at the level of SDAUs elaborated for urban centers with more than of 5,000 inhabitants;
- To master interactions between rural area and urban area.

- ***In the area of institutional and legislative measures***

- To set up an appropriate institutional framework with a view to ensuring the coordination, the control, and the monitoring of the implementation of the National Environmental Protection Programme. ;
- To build the capacities of the various categories of stakeholders;
- To harmonize the laws and regulations in force and elaborate the necessary legal and regulatory texts (enforcement decisions of various existing law texts, Environment Code,..) and define environment standards, including waste standards ;
- To make environmental impact studies (EIS) compulsory as planned in the Investments Code prior to the setting up of new industrial exploitation units.;

- ***In the area of international cooperation (at the sub-regional and international level)***

- To see to the respect and implementation of the various Conventions, International Agreements and Treaties signed and ratified by Mali in the area of environmental protection.
- To develop sub-regional and international cooperation programmes, and more particularly around shared resources (rivers, transboundary parks, etc...)
- The strategic axes are the following :
 - to preserve and strengthen the technical and methodological achievements;
 - To promote a holistic and multi-sectorial approach;
 - to prevent any new resources degradation
 - to promote the restoration and rehabilitation of degraded zones and sites;
 - to set up coordination and concertation frameworks;
 - to strengthen national capacities in the field of environmental protection,;
 - to set up a system for the control ,monitoring and continued surveillance of the environment .

The National Environment Protection Policy (PNPE) was translated into various national programmes (NAP) regional action programmes (RAP), and local action programmes the ultimate goal of which is to contribute to solving the major environmental problems identified and set up the mechanisms required for the concerted management of the resources of the environment. They constitute an orientation and coherence framework within which the various actions with a direct or indirect link with the environment management. should fit compulsorily.

National action programmes (NAP) are characterized by their cross-cutting_ and multilateral nature. They constitute themselves a reference framework for regional and local programmes (RAP/LAP).

National action programmes identified are nine in number, viz:

- Land development programme ;
- Natural resources programme;
- Water resources control programme
- Programme on improving the living framework ;
- Programme on the development of new and renewable energy resources;
- Programme on environmental information management ;
- Programme on environment information, education, and communication ;
- Programme on the implementation of de suivi de la mise en œuvre des conventions;
- Research programme on desertification control and environmental protection

As it can be observed, Mali's climate is of sahelian type and is characterized by a great inter-annual variability of rainfall which is translated by years of recurrent droughts that have become increasingly frequent from 1988. These harmful effects of extreme climate phenomena constitute a great handicap for the economic development of the country. In fact, in view of such a situation, it turns out as necessary to define an adaptation policy in order to ensure a harmonious and sustainable development.

Therefore, the objective of the present study is to define the elements of an adaptation policy that takes account of the various already existing policies defined by the government.

IX. ELEMENTS OF THE NATIONAL POLICY ON CLIMATE CHANGE

Justification of the national policy on climate change (PNACC)

The elaboration and implementation of the national policy for adaptation to climate change are justified by the relevant provisions of the United Nations Framework Convention on Climate Change (UNFCCC) and the results of studies and analyses carried out in the framework of the initial Communication of the national ,the strategy on CC, the NCAP project, and PANA.

Concerning the UNFCCC, principle N0. 3 provides” that it is up to the Parties to take precautionary measures for predicting, preventing or mitigating the causes of climate change and reduce its harmful effects, given that policies and measures aroused by climate change require a good cost-effectiveness ratio... For attaining this this purpose, it would be desirable that these policies and measures take account of the diversity of socio-economic contexts, and they should be holistic as well as extended to all the sources and to all the appropriate sinks and glasshouse gas reservoirs ,should include adaptation measures and be applicable to all the economic sectors”

In addition, as provided in Article 4(f) of the UNFCCC,party-countries(including Mali) commit themselves to take « into account, as much as possible, climate change – related considerations in the social, economic and ecological policies and actions and the use of appropriate methods (...) of projects or measures they undertake with a view to mitigating climate change or for getting adjusted to it. related to climate change

Vision and Objectives of the NAPCC

The national policy for adaptation to climate change should be based on a long term vision and should have overall, strategic and specific objectives.

The vision of the NAPCC is to define a sustainable socio-economic development in order to improve the well-being of the populations.

It is articulated around the following major objectives

- To secure agricultural production and productivity through a total control of surface and ground waters in order to cope with food security and poverty alleviation.
- To promote sustainable development through the exploitation and sustainable management of natural resources(water ,forests, soils, fauna ,and fish resources) ;
- To ensure energetic security and sovereignty through he implementation of the Household Energy strategy and the construction of hydro-electric structures ;
- To set up a system for monitoring diseases associated with climate change ;
- To develop environment friendly infrastructures which are adapted to climate change .

These major objectives are translated into the following strategic axes:

- To promote actions aimed at securing agricultural production and productivity through a full control of surface and ground waters in order to cope with food security and poverty control ;
- To promote a sustainable development through the exploitation and sustainable management of natural resources (water, forests, soils, and fish resources.);
- To promote actions for attaining energetic security and sovereignty through the implementation of the Household Energy and the construction of hydroelectric structures ;
- To define a framework for controlling the consequences of climate change on human health and animal health ;
- To set up a system for monitoring diseases associated with climate change ;
- To promote the actions of development infrastructures that are environmentally friendly and adapted to climate change ;
- To promote subregional, regional ,and international cooperation in the field of adaptation to climate change ;
- To improve and disseminate knowledge on adaptation to climate change ;
- To improve the institutional and legislative framework for a better adaptation to climate.

In addition to these axes, there are three other cross-cutting ones, viz: :

- the management of information at all levels ; sensitization ;
- research- studies and the long term support decision observation ;
- the development and /or strengthening of skills and capacities.

Eléments of the sectorial policy

9.3.1. Agriculture sector

In the area of agriculture, the elements are translated through:

- the implementation of the Agricultural Orientation Law I ;
- the modernization of agriculture by equipments adapted to the evolution of climate ;
- sensitization and training of farmers in the use of agro-meteorological information and counselling ;
- training in surface waters control and management techniques ;
- training in natural resources management techniques (forests,rangelands, soils,) ;
- plant cover restoration ;
- the development of water and soil conservation techniques ;
- the recharging of ground water-beds ;

- the strengthening of research in the field of improved seeds adapted to drought ;
- the use of crop varieties adapted to climate change (valorization of local genetic resources, mainly their adaptability to changes in farming conditions, viz : photosensitiveness/ photo period sensitiveness) ;
- the training of producers in water and soil conservation techniques ;
- the diversification of agricultural productions ;
- the strengthening of the early warning system and cereal banks for food security ;
- the use of non-perennial surface waters and ground waters for irrigation
- the development and intensification of agricultural production systems (agriculture, livestock) ;

9.3.2. Water resources sector

In the area of water resources, the NAPCC elements are the following :

- Full water control through irrigation or bore-holing ;deepening of wells and ponds) ;
- Construction of dams for regulating the water flow of permanent water courses ;
- the practice of farming techniques ensuring a better saving of water in the soil ;
- the setting up of an operational system for elaborating and disseminating agrometeorological information and counselling in the rural world ;
- the setting up , at the national level , of a rain water harvesting system wherever possible ;
- development of the banks of water courses ;
- the construction of gutters for evacuating run-off waters in sensitive areas ;
- the elaboration of a water evacuation plan in each and every risk zone .

9.3.3. Natural resources sector (forests, soils, fauna)

In the natural resources area, the elements are the following::

- the strengthening of the decentralized management of Natural Resources ;
- the designing and implementation of land development schemes that take account of local specificities ;
- the strengthening of sensitization and training of the population and the various economic stakeholders in the protection of their environment ;
- the support to all actions relating to the reduction of negative eco-climatic effects ;
- building the capacities of human resources in the field of sensitization/ training and research on protected areas (gazetted forests, national parks, arboretum, research stations,etc) ;
- the reduction of the share of wood in meeting the household energy requirements :it shifted from 96% down to 50% in ten years. I

- the valorization of non-woody products (exploitation rate from 25% to 50%);
- the strengthening of research on the productivity of ecosystems and the resistance of plants to drought.

9.3.4. Energy sector

The energy sector is expected to meet the needs of a rather rural economy, based on a little mechanized agriculture, on an embryonic industry, as well as on the demand from a poor population, which is weakly urbanized and very little equipped with household electrical appliances and using mainly wood and charcoal as fuels ..

9.3.4.1. Hydroelectricity

Climate change will have a great impact on hydroelectricity production owing to the decrease in the level of water in water courses and consequently because of dams. .

In this area, the policy should be focused on the following elements:

- The protection and good management of watershed areas ;
- The construction ,upstream, of the hydroelectric structures of water catchments in order to better regulate water courses and avoid the discharge of water surpluses ;
- The strict management of water for both agricultural and industrial production, as well as for consumption ;
- The construction, wherever possible, of hydro-electric micro-dams.
- The strengthening of the production fleet of the interconnected production system ;
- The use of electric energy saving equipment (low consumption lamp,etc.) for mitigating pressure on electric production ;
- The exploitation of ground water for reducing pressure on surface waters..

9.3.4.2 Household energy

90 to 93% of the household energy consumed in Mali come from woods from natural forests. .

In this area, the policy is translated through the following elements:

- meeting 50% of energy wood requirements from artificial forests in a ten- year- time limit ; ;
- the evaluation of afforestation policies in order to find an appropriate approach ;
- the innovation and promotion of energy saving technologies ; ;
- the substitution of woody fuels of agricultural residues and bio-gas ;
- the increase in the offer in a ten year perspective starting from 2009 through artificial plantations whilst reducing pressure on natural forests ;
- the restoration of degraded natural forests ;
- building the capacities of stakeholders for a rational management and a better control of the tapping of the resource ;
- improving charcoal producing equipments ;
- capacity building for the availability of technologies and the improvement of techniques ;
- diffusion of the butane gas ;
- the use of substitute fuels for energy wood (densified and carbonized agricultural residues) ;
- the use of energy saving equipments (furnaces and improved stoves) ;
- the use of solar equipments in households ;
- the promotion of solar energy through establishing solar equipment manufacturing enterprises, mainly solar plates..

9.3.5. Health sector

For the purpose of adaptation to climate change and climate variability, the policy should be focused on three main elements:

- Strengthening training, information, and communication on the harmful effects of climate change on the health and well-being of the population. ;
- building capacities for the prevention of and response to diseases with endemic and lethal potential having linkages with the climate ;
- the elaboration of plans for warning about extreme meteorological conditions with a view to preventing against their effects on the population.

9.3.6. Infrastructure sector

In the field of infrastructure, the adaptation policy is articulated around the following six elements :

- the strengthening of exchanges in the country and in the subregion ;
- the strengthening of interurban connection networks ;
- the articulation with decentralization ;

- the elaboration of land development schemes for dwelling areas ;
- the construction of dwelling areas outside the areas liable to flooding ;
- the compliance of security standards during the dimensioning and the construction of hydraulic structures .
- the strengthening of the « town-countryside » linkage in order to allow for the transport of and outlets for goods in the country as well as at the regional and international level ;
- the improvement of the quality of the interurban road network..

9.3.7. National, regional and sub-regional Cooperation

In the field of cooperation, the following is retained:

- The United Nations System ;
- The African Union, mainly the New Partnership for Africa's Development I ;
- Sub-regional Organizations, viz: ECOWAS, WAEMU,, CILSS,NBA,OMVS,LIPTAKO-GOURMA ,etc.
- Cooperation in the framework of Integrated Water Resources Management (IWRM) I.

CONCLUSIONS

Climate change should not be considered a punctual factor but rather a permanent one in development policies and strategies.

The elements of the national policy for adaptation to climate change fit in the various socio-economic development policies, strategies and programmes of Mali. They are integrated around the following major objectives:

- ◆ to secure agricultural production and productivity through full control of surface and ground waters in order to achieve food security and poverty alleviation. ;
- ◆ to promote a sustainable development through sustainable natural resources exploitation and management (water, forests, soils, fauna, and fish resources) ;
- ◆ to ensure energetic security and sovereignty through the implementation of the strategy for Household Energy and the construction of hydroelectric structures ;
- ◆ to set up a system for monitoring diseases associated with climate change ;
- ◆ to develop environmentally friendly infrastructures and adapted to climate change .

RECOMMENDATIONS

The success of national policy on climate change will depend on the following elements:

- ☞ the setting up of a national policy at all levels of the country ;
- ☞ le renforcement des capacités dans le domaine de la recherche sur les changements climatiques ;

- ☞ the availability of information on the climate change phenomenon ;

- ☞ the setting up of a system for monitoring the process ;

- ☞ the promotion and strengthening of national, sub-regional and international cooperation. ;

- ☞ the mobilization of national and international financial resources for attaining the objectives ;

- ☞ the promotion of the mechanism for clean development and make it a tool for attracting foreign public and private investments.

BIBLIOGRAPHICAL REFERENCES

1. Programmes National d'adaptation aux changements climatiques, 2007 (PANA) ;(National Programmes on Climate change)(PANA)
2. CNRST/projet GEFMLI/G32, 2000 : Communication Initiale du Mali pour la CCNUCC, CNRST, Bamako, 2000 ;(Initial Communication of Mali for UNCCC, CNRST,BAMAKO ,2000)
3. CNRST/Projet Climat, 2003 : Résumé Projet NSCAP ;(CNRST/ Climate Project, 2003 : Summary NSCAP Project)
4. Ministère des Mines, de l'Energie et de l'Eau : Politique Nationale de l'Eau ; DNE, 2002 : Aperçu sur le secteur de l'énergie, 2002 ; (Ministry of Mining, Energy and Water : DNE : Overall on the energy sector ; 2002)
5. CCL/SED ,1998 : Evolution de la demande de bois énergie au Mali, Bamako, 1998. ; / (Evolution of the demand of energy wood in Mali, Bamako,1988)
6. Ministère de l'Environnement, 2000 : Politique Nationale de Protection de l'Environnement./ (Ministry of Environmental Protection Policy)
7. Ministère de l'Environnement et de l'Assainissement, 2006 : Rapport sur l'état de l'environnement 2005 (Mali) ;/ (Ministry for Environment and Sanitation,2 000 : Report on the status of the Environment)
8. CSLP, 2006: Cadre Stratégique de Lutte Contre la Pauvreté (CSLP), 2^{ème} génération 2007 - 2011 ;/ CSLP,2 008 : Strategic Framework for Poverty Alleviation (CSLP) ; 2nd Generation 2007)
9. République du Mali, 2005 : (Rapport de mise en œuvre du CSLP, Années 2003- 2004 ; / (Republic of Mali : Report on CSLP Implementation, Years 2003-2004)
10. CNRST/GEF : Stratégies d'adaptation dans les domaines de l'agriculture, des ressources en eau et de la santé, décembre 1998 ;/ (CNRST/ GEF :Adaptation strategy in the areas of agriculture,water resources and health,December,1998)
11. Etude Nationale Prospective ENP « Mali 2005 », Koulouba, Bamako, mai 1997 ;/ (National Prospective Study ENP « Mali 2005 », Koulouba,Bamako,May 1997 ;
12. Inter coopération : Contexte du Mali et Changements Climatiques, décembre, 2007 ; / (Inter –cooperation : Context of Mali and Climate Change : December 2007)
13. Le Programme de Développement Economique et Social (PDES) : programmation à moyen terme; / (Economic and Social Development Programme (PDS))
14. Les objectifs du millénaire pour un développement durable (OMD);/ (Millenium Development Goals (MDGs))
15. New Partnership for Africa's Development Nouveau partenariat pour le développement de l'Afrique NEPAD ; (New Partnership for Africa's Development)
16. Première Communication du Burkina Faso, 1998 ;(First Communication of Burkina Faso)

17. Première Communication du Sénégal, 1998 ;/ First Communication of
Sénégal)

18. Programme de pluies provoquées au Mali

19. Convention cadre des Nations Unies sur les Changements Climatiques

20. Protocole de Kyoto

- 17- Artificial Rains Programme
- 18- United Nations Framework Convention
- 19- The Kyoto Protocol

Formatted: Bullets and
Numbering

ANNEX

INSERT N°1

DEFINITION RELATIVE TO UNFCCC (SOURCE: TEXT OF THE CONVENTION)

:For the purpose of the Convention

1. The term « harmful effects of climate change » means changes of the climate change of the physical environment or biotes due to climate changes and which exercise significant noxious effects on the composition ,the resistance or the productivity of natural and developed ecosystems, on the functioning of socio-economic systems or on the health or well-being of human being. .

2. The term « climate change » means changes of climate which are directly or indirectly a humane activity altering the composition of the global atmosphere and which are added to the natural variability of the climate observed during comparable periods. On entend par «changements climatiques» des changements de climat qui .

3. The term « climate change » means a whole system encompassing the atmosphere, the hydrosphere, and the geosphere, as well as interactions. .

4. The term »emissions » means the release of **glasshouse gas or releasers** of such gases into the atmosphere above a zone and during a given period.

5. The term « glasshouse gas » means the gaseous constituents of the atmosphere, both natural and anthropic, which absorb and emit infra-red radiation. .

6. The term « reservoir » means one or several constituents of the climate system which retain a glasshouse gas or a glasshouse **gas releaser (précurseur)**. .

7. The term « sink » means<any process or activity or any mechanism, be it natural or artificial, which suppresses from the atmosphere a glasshouse gas,an oerosol or glashouse gas **releasers/precursors** .

8. The term « source » means any process or activity which releases into the atmosphere a glasshouse gas, an aerosol or a glasshouse **presursor**.

INSERT N°2

ARTICLE 3

UNFCCC PRINCIPLES (source : Convention text)

In the measures they take for attaining the objective of the Convention and implement the provisions thereof, the Parties will be guided, inter alia ,the following t:

1. It is up to the Parties to preserve the climate system in the interest of current and future generations, on the basis of equity and according to their common responsibilities but differentiated and their respective capacities. Consequently, it is up to developed country-Parties to be on the front line of the fight against climate change and the related harmful effects.

2. It would be desirable to take fully account of the specific needs and the special situation of developing country-Parties, mainly of those which are particularly vulnerable to the harmful effects as well as of Parties, mainly developing country-Parties, on which the Convention will impose a disproportioned or abnormal burden.

3. It is up to Parties to take precautionary measures for forecasting, preventing or mitigating the causes of climate change and for limiting their harmful effects. When there risks of serious or irreversible disruptions, the absence of absolute scientific certainty should not serve as an excuse for postponing the adoption of such measures, given that policies and measures implied by climate change require a good cost-effectiveness ratio in a way to guarantee the overall advantages the lowest possible cost. For attaining this goal, it would be desirable that these policies and measures take account of the diversity of socio-economic sectors, and be holistic whilst expanding to all sectors and to all glasshouse gas sinks and reservoirs, and be applicable to all the socio-economic sectors. Initiatives aimed at coping with climate change can be subject to a concerted action of interested Parties.

4. Parties have the right to work towards a sustainable development and should take action towards this end. It would be desirable that policies and measures meant for protecting the climate system against climate change caused by anthropic action, be adapted to the specific situation of each Party and integrated in national development programmes, economic development being indispensable for adopting measures meant for coping with climate change.

5. It is up to Parties to work in liaison with an international economic system that is promising and open, and which leads to a sustainable economic growth and a sustainable development of all Parties, especially for developing Parties, for enabling them to better address problems posed by climatic change. It would be desirable to avoid that measures taken for controlling climate change, including unilateral measures, be a means of imposing arbitrary and unjustifiable measures at the level of international trade, or disguised impediments to trade.