REPUBLIC OF CAMEROON

Peace – Work – Fatherland

MINISTRY OF ENVIRONMENT, PROTECTION OF NATURE AND SUSTAINABLE DEVELOPMENT

SECOND NATIONAL COMMUNICATION ON CLIMATE CHANGE

Fonds pour l'environnement mondial

UNFCCC

SEPTEMBER 2015

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PREFACE

Le Cameroun partie à la Convention Cadre des Nations Unies sur les Changements Climatique (ratification en 1994 et adhésion au Protocole de Kyoto en 2002) est résolument engagé, avec le reste de la communauté mondiale, dans la lutte contre le Changement Climatique. Cet engagement s'est traduit par la signature de toutes les conventions internationales relatives à l'Environnement et surtout par l'élaboration et la mise en œuvre de stratégies nationales et des programmes qui concourent à la stabilisation du climat.

Cette Seconde Communication Nationale sur les changements climatiques a été élaborée dans une approche participative et a impliquée les différentes parties prenantes nationales, notamment les administrations, le secteur privé et les Organisations de la Société Civile.

Ce document présente :

- les circonstances nationales ;
- l'inventaire national des émissions de Gaz à Effet de Serre (GES) secteurs par secteurs tel que le prescrivent les recommandations du GIEC ;
- la vulnérabilité du Cameroun aux effets néfastes des changements climatiques ;
- les actions d'adaptation mises en œuvre et à entreprendre pour faire face aux impacts négatifs des changements climatiques ;
- les mesures d'atténuation des émissions de gaz à effet de serre ;
- Pour les actions d'adaptation et d'atténuation, les types de technologies adéquates ainsi que les axes de renforcement de capacités utiles aux actions de développement de notre pays.

La mise en œuvre des actions identifiées requiert, certes, la contribution des uns et des autres. C'est à ce titre, que le développement et le renforcement du partenariat entre institutions publiques, privées, les ONG et les Partenaires Techniques et Financiers impliqués dans le processus de lutte contre les changements climatiques apparait comme une voie privilégiée de recours.

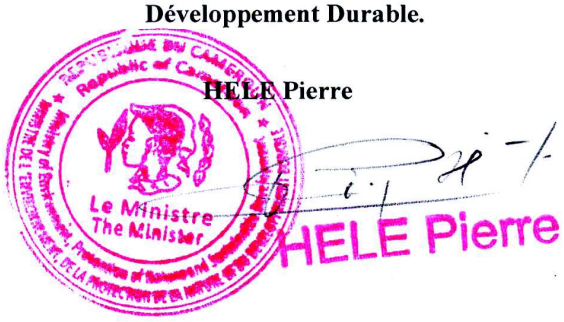
Je saisis l'opportunité qui m'est offerte pour remercier toutes celles et tous ceux qui ont contribué, à différents niveaux, à l'élaboration et à la publication de cette Seconde Communication Nationale du Cameroun sur les changements climatiques. Je pense tout particulièrement au Fonds pour l'Environnement Mondial (FEM) pour son appui financier, au Programme des Nations Unies pour l'Environnement (PNUE) en tant qu'organe d'exécution.

Je salue tout aussi le travail des experts nationaux qui, sous la supervision du Point Focal de la Convention Cadre des Nations Unies sur les Changements Climatiques, ont élaboré ce document.

Le Cameroun se lance ainsi un grand défi, celui de réaliser sa légitime « émergence socio-économique » à moyen terme dans un cadre écologiquement rationnel et "environnementalement" pertinent. Ce document relève l'engagement du Cameroun à contribuer à l'objectif global de stabilisation du climat.

Confiant que la communauté mondiale apportera sa juste contribution dans la réalisation de ce grand chantier, le Cameroun reste persuadé qu'avec l'appui et l'engagement soutenus de tous, ce document Seconde Communication Nationale sur les changements climatiques permettra de réaliser une percée significative dans le processus de lutte contre les effets néfastes des changements climatiques.

Le Ministre de l'Environnement, de la Protection de la Nature et du Développement Durable.



HELE Pierre

AVANT-PROPOS

La Commission Mondiale pour l'Environnement et le Développement (CMED) dans le cadre du Rapport Brundtland (1987) et du fameux Halte à la croissance du club de Rome (1972) avait clairement mis en évidence la dégradation de l'environnement tant au niveau mondial qu'au niveau régional en liaison avec les activités anthropiques, notamment l'activité économique. Cette prise de conscience s'est renforcée au Sommet de Rio encore dénommé « Sommet de la Terre » par l'acceptation du concept de Développement Durable par l'ensemble de la communauté internationale. Parmi les actes concrets de cette conférence figure en bonne place l'adoption de la Convention Cadre des Nations Unies sur les Changements Climatiques (CCNUCC), convention que le Cameroun a ratifiée en 1994.

La ratification de cette Convention ainsi que les efforts consentis pour se conformer à ses dispositions tels que décrits dans la présente Seconde Communication Nationale (SCN) démontrent la volonté du Cameroun à contribuer efficacement à l'effort mondial de lutte contre le réchauffement global de la planète dont il est très vulnérable eu égard à la fragilité de ses écosystèmes et de son économie fortement dépendante de secteurs sensibles aux vulnérabilités climatiques.

En effet, la preuve est aujourd'hui établie que le facteur prédominant du réchauffement mondial observé depuis les cinquante dernières années est d'origine anthropique et non naturelle. Les perturbations climatiques qui en découlent (sécheresses récurrentes, inondations fréquentes, vents violents, vagues de chaleur, glissements de terrains, montée du niveau de la mer, etc. .,) initialement prévues par les scientifiques pour la fin du 21ème siècle sévissent déjà et plus fréquemment dans plusieurs régions du monde en frappant de plus en plus de nombreuses populations. Somme toute, ce sont là des phénomènes incalculables : famines, maladies endémiques (paludisme, méningite, choléra), exode et pertes de milliers de vies humaines dont les pays les en développement ont du mal à y faire face.
Le Cameroun a connu, tout au long de son histoire, des sécheresses plus ou moins prononcées. Celle de 1972 et surtout celle de 1983-1984 ont été jugées parmi les plus sévères ayant affecté l'ensemble des zones agroécologiques du pays comme (voir PNACC, 2015).

La Communication Nationale initiale (CNI), préparée avec l'appui financier du « Stockholm Environment Institute » (SEI) et du Fonds pour l'Environnement Mondial (FEM) a été élaborée depuis 1999 et publiée en 2001.

La seconde communication bénéficiant de l'appui du FEM est élaborée au lendemain de la Quinzième Conférence des Parties à la CCNUCC qui s'est tenue à Copenhague au Danemark du 7 au 18 Décembre 2009, sur laquelle les pays sévis par les changements climatiques dont le Cameroun, attendaient impatiemment l'adoption du régime post-Kyoto plus contraignant et plus rassurant pour la survie de l'humanité. Elle est publiée à la veille de la Conférence de Paris de Décembre 2015, au moment où le Cameroun prépare sa **Contribution Prévue Déterminée au niveau National (ou INDC en anglais**) en vue de ladite conférence planétaire. En outre, cette Deuxième Communication Nationale fait suite au **Plan National d'Adaptation aux Changements Climatiques (PNACC**) publié en 2015.

Elle porte, en plus du Second Inventaire de Gaz à effet de Serre (2013), sur les mesures d'atténuation des émissions de gaz à effet de serre (2013), sur la vulnérabilité des populations aux changements climatiques (2013) et sur les mesures d'adaptation et d'atténuation que le Cameroun (2013) a déjà initiées et celles qui ne le sont pas encore, qui attendent des appuis

extérieurs pour leur mise en application ; le pays ayant d'autres défis auxquels il fait face pour son développement socio-économique en matière de santé, de sécurité alimentaire, de paix durable et d'éducation.
Ces études sectorielles justifient le retard que le Cameroun a pris dans l'élaboration de cette seconde communication nationale et constituent en même temps la contribution significative de notre pays à l'effort global de la communauté internationale dans le cadre de ladite convention.

Ces études sectorielles réalisées par des consultants nationaux, ont permis à une équipe d'experts sous la supervision du Coordonnateur national de l'élaboration des communications nationales sur le changement climatique du Ministère de l'Environnement de la Protection de la Nature et du développement Durable (MINEPDED) de rédiger la présente Seconde Communication Nationale (SCN) du Cameroun.
Une équipe pluridisciplinaire d'experts a ainsi été mobilisée tout au long du processus, rassemblant des spécialistes de l'environnement, du climat et des changements climatiques, de la vulnérabilité et des adaptations aux changements climatiques, des sciences humaines et sociales, de la santé publique, de la géographie physique et humaine, de la géomatique, de la démographie et de la gestion des ressources en eau.
C'est le lieu de remercier tous ceux qui ont contribué aux divers processus ayant conduit à l'élaboration du présent document :

Pour ce qui est des études sectorielles, trois consultants ont été requis :

- **Monsieur BIGNOM Blaise**, consultant, a réalisé avec son équipe, les inventaires des GES dans tous les secteurs recommandés par le GIEC ;
- **Monsieur BIGNOM Blaise** accompagné de **Dr HAMAN UNUSA** et de **Monsieur NGUEMADJI MOUSSA Jules Maxime**a mené des études d'atténuation ;
- **Pr BINDZI Isaac**, PhD (ENEF-MINESUP) a conduit les études sur les Besoins en Technologies ;
- **Pr TCHINJANG Mesmin** (Université de Yaoundé I-MINESUP), a conduit les études sur les risques climatiques, la vulnérabilité et les adaptations aux changements climatiques.

Les membres du comité de rédaction de la présente Seconde Communication Nationale sur les changements climatiques dont la grande disponibilité a permis de réaliser un tel travail, après des études sectorielles ; il s'agit de : **Pr AMOUGOU Joseph Armathée**, (PhD, UYI- MINEPDED), **Pr BINDZI Isaac**, (PhD, ENEF-MINESUP), **Monsieur BIGNOM Blaise** (ARSEL – MINEE) ; **Pr TCHINDJANG Mesmin** (HDR, UYI-MINESUP), **Monsieur MOUSSA NGUEMADJI Jules Maxime** (assistant technique du projet SCN) **Dr HAMAN Unusa**(Point Focal Geoss, MINEPDED) et **Monsieur KAGONBE Timothée** (Point Focal GIEC, MINEPDED).

Le Cameroun va accroître des efforts pour s'y adapter. Toutefois, ces efforts nécessitent un appui financier et technique à même de permettre cette adaptation, c'est le grand défi de la coopération multilatérale. Aussi nous ne saurons terminer sans remercier ces partenaires multilatéraux, en l'occurrence le Fonds Mondial pour l'Environnement (FEM) et le Programme des Nations Unies pour le Développement (PNUD), dont l'appui multiforme a été déterminant dans la réalisation effective de la Seconde Communication Nationale.

Le Coordonnateur National

ABBREVIATIONS AND ACRONYMS

ADB:	African Development Bank
AEZ:	Agro-ecological Zone
AFD:	French Development Agency
AIWO-CAN:	African Indigenous Women's Organization - Central African Network
AMCOW:	African Ministerial Council on Water
ANCC:	National Academy on Climate Change
ANP-TER:	National Agency for the Promotion of Environmentally Sound Technologies
APF:	Adaptation Policy Framework
APIP:	Agricultural Productivity Improvement Project
BOD:	Biological Oxygen Demand
BP:	Before Present
BUCREP:	Central Bureau of the Census and Population Studies
C2D:	Debt Reduction and Development Contract
CAMAIR:	Cameroon Airlines
CAMAIR-CO:	Cameroon Airlines Company
CAM-ECO:	Cameroon Ecology
CAMRAIL:	Cameroon Railways
CAPAM:	Small Scale Mining Support *and Promotion* Framework *Unit*
CARE:	Cooperative for Assistance and Relief Everywhere
CBA:	Community-based Adaptation
CC:	Climate Change
CCT-TER:	Cluster de Compétences Technologiques pour les Technologies Écologiquement Rationnelles
CDC:	Cameroon Development Corporation
CDE:	Cameroon Water Company
CE-ET:	Centre of Excellence for Environmental Technologies
CEMAC:	Economic and Monetary Community of Central African States
CENAME:	National Essential Drugs *and* Consumables Supply Centre
CICAM:	Cameroon Industrial Cotton processor
CICOS:	International Commission of the Congo-Oubangui-Shangha (CICOS)
CIDA:	Canadian International Development Agency
CIG:	Common Initiative Group
CIPRE:	International Centre for Promotion and Recycling
CMA:	District Medical Centre
CNIC:	Cameroon Shipyard and Industrial Engineering
CNPS:	National Social Insurance Fund
CSO:	Civil Society Organisation
CSPH:	National Hydrocarbons Prices Stabilisation Fund
DCO:	Chemical Oxygen Demand
DHC:	District Health Committee
DSS:	Demographic and Statistical Surveys

ECAM: Cameroon Household Survey
ECCAS: Economic Community of Central African States
EDF: European Development Fund
EDSC: Cameroon Demographic and Health Survey
ESDP: Electricity Sector Development Plan
EST: Environmentally Sound Technology
ESTIS: Environmentally Sound Technologies Information System
EU: European Union
FAC: Fund for Aid and Cooperation
FAO: United Nations Food and Agricultural Organisation
FIMAC: Capital Investment in Community-based Micro-Agricultural Projects
FNC: First National Communication
FND-TER: National Environmentally Sound Technologies Development Fund
GCM: Global Circulation Model
GDP: Gross Domestic Product
GEF: Global Environment Facility
GESP: Growth and Employment Strategy Paper
GHG: Greenhouse gases
HEVECAM: Hévéa du Cameroun
HIPC: Highly Indebted Poor Countries
HIV/AIDS: Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome
HYSACAM: Hygiène et Salubrité du Cameroun
ICT: Information and Communication Technologies
IDWSD: International Drinking Water and Sanitation Decade
IFORD: Institute *for* Demographic Training and Research
IHC: Integrated Health Centre
IMPM: Institute *of* Medical Research *and* Study *of* Medicinal Plants
INADES: African Institute for Economic and Social Development
IPCC: Intergovernmental Panel on Climate Change
IRAD: Institute of Agricultural Research for Development
IRD: Institute for Research and Development
ISIC: International System for Industry Classification Code
IWRMP: Integrated Water Resources Management Plan
LCBC: Lake Chad Basin Commission
LDA: Local Decentralised Authorities
LUP: Land Use Plan
MAETUR: Mission d'Aménagement et d'Études des Terrains Urbains et Ruraux
MDG: Millennium Development Goals
MIDEPECAM: Maritime Artisanal *Fishing Development Mission*
MINADER: Ministry of Agriculture and Rural Development
MINAS: Ministry of Social Affairs
MINATD: Ministry of Territorial Administration and Decentralisation
MINEE: Ministry of Energy and Water Resources
MINEP: Ministry of Environment and Protection of Nature

MINEPAT: Ministry of the Economy, Planning and Regional Development
MINEPDED: Ministry of Environment, Protection of Nature and Sustainable Development
MINEPIA: Ministry of Livestock, Fisheries and Animal Industry
MINFOF: Minister of Forestry and Wildlife
MINIMIDT: Minister of Mines, Industries and Technological Development
MINRESI: Minister of Scientific Research and Innovation
MINSANTE: Minister of Public Health
MTCEO: Mount Cameroon Ecotourism Organization
NAEP: National Agricultural Extension Programme
NAPA: National Adaptation Programme of Action
NBA: Niger Basin Authority
DMN: Department of National Meteorology
NEB: North East Benue
NEPAD: New Partnership for Africa's Development
NIS: National Institute for Statistics
OAPI: African Intellectual Property Organisation
ORSTOM: Overseas Scientific and Technical Research Office
PACC: Climate Change Adaptation Plan
PAN/LCD: National Plan for the fight against Desertification
PHP: Plantations du Haut Penja
PIA: Participatory Impact Assessment
PIB: Public Investment Budget
PNDP: National Community-driven Development Programme
PPPLC: Pamol Plantations Plc
PRSP: Poverty Reduction Strategy Paper
R&D: Research and Development
RAMPAR: Support Network for Agricultural and Rural Micro-Projects
REDD: Reduction of Emissions from Deforestation and Forest Degradation
REGIFERCAM: Régie des Chemins de Fer du Cameroun
REPECC: Populations' Resilience to Climate Change Impacts
REVECC: Reduction of the Vulnerability of Livestock to Climate Change
RNI-TER: National Network of Information on Environmentally Sound Technologies
RUWDEC: Rural Women Development Centre
SCAC: Service of Cultural Action and Co-operation
SEB: South East Benoué
SEMME: Société des Eaux Minérales du Mont Etindé
SEMRY: Société d'Expansion et de Modernisation de la Riziculture à Yagoua (Corporation for the Expansion and Modernisation of Rice Cultivation at Yagoua)
SGP: Small Grants Program
SIC: Cameroon Real Estate Corporation
SIECAM: Cameroon's Energy Information System
SMDD: World Summit on Sustainable Development
SNEC: National Water Corporation
SNV: Stichting Nederlandse Vrijwilligers (Dutch Development Organisation)

SOCAPALM: Société Camerounaise de Palmeraies
SODECAO: Cocoa Development Corporation
SODECOTON: Cotton Development Corporation
SODERIM: Société de Développement des Rizières de la plaine des Mbos
SONARA: National Oil Refinery
SOSUCAM: Société Sucrière du Cameroun (Cameroon Sugar Company)
SOWEDA: South West Development Authority
SW: South West
TEP: Tonne of Oil Equivalent
TFR: Total Fertility Rate
TIZ: Technological Immersion Zone
UMP: Urban Master Plan
UNDP: United Nations Development Programme
UNEP: United Nations Environment Program
UNESCO: United Nations Educational, Scientific and Cultural Organisation
UNFCCC United Nations Framework Convention on Climate Change
USP: Urbanisation Summary Plan
VDC: Village Development Committee
VRE: Vulnerability Reduction Evaluation
WHO: World Health Organisation
WMO: World Meteorological Organization

LIST OF CHEMICAL SYMBOLS AND UNITS

CFC: chlorofluorocarbons
CH_4: Methane
CO: Carbon monoxide
CO_2: Carbon dioxide
NMVOC: Non-Methane Volatile Organic Compound
$CO_{2\text{-}Eq}$: Carbon Dioxide Equivalent
Gg: Gigagramme
HFC: Halocarbons
HCFC-22 Hydro chlorofluoro carbon 22
KPE: Kilogramme petroleum equivalent
N_2O: Nitrous Oxide
NO_x: Nitrous Oxides
SF6: Sulfur Hexafluoride
SiO: Silicon dioxide
$S0_2$: Sulfur dioxide
TEP: Tonne of Oil Equivalent

EXECUTIVE SUMMARY

1. Cameroon Specific Conditions

Located in the heart of the Gulf of Guinea between latitude 2° and 13° North, and longitude 8° 30' and 16° 10' East, Cameroon is at the junction between Central and West Africa. This geographical situation explains the variety in landscape, climate and population of the country, thus earning it the name of "Africa in miniature". With a surface area of 475,000 km², Cameroon is bounded by Nigeria to the North West (over 1,720 km), Chad to the North (1,122 km), to the East by Central African Republic (822 km), to the South by Congo (520 km), Gabon (298 km) and Equatorial Guinea (183 km). It opens to the Atlantic Ocean in the West with a total coastline of 400 km.

1.1. Relief and Catchment Areas

Sixty-three per cent of the country is made up of highlands. It has 5 main relief forms, namely:

- The North Cameroon lowlands and basins (200-300 m) extending up to Lake Chad.
- The Adamawa Plateau (1,000 to 1,500 m) which gently slopes down to the Sanaga Valley in the south and ends suddenly in the north, at the contact with the Benoué Plain.
- The South Cameroon Plateau is 650 to 900 m relief formation extending west - east from Yaounde to the Central African Republic and covering 1/3 of the country.
- The Western Highlands which are connected to the central plateau through an extensive area of extinct volcanoes.
- The coastal region (which hosts Mt. Cameroon), with an area of about 150 km.

The hydrographic network is divided into 5 main basins: 1) The Sanaga Basin with the River Sanaga and its tributaries: Djerem, Noun, Mbam, Lom and Pangar; 2) The Coastal Basin with coastal rivers including: Cross River, Mungo, Wouri, Dibamba, Nyong, Lokoundje, Kienke, Lobe and Ntem; 3) The Congo Basin with rivers such as Sangha, Dja, Boumba&Ngoko and Kadei; 4) The Niger Basin with rivers such as Benoué, Katsina Ala, Donga, Faro, Kebbi, Menchum and Gordi, 5) The Lake Chad Basin with Rivers Logone and Chari and rivers Mbere and Vina.

1.2. Climate and Vegetation

Cameroon is located in the tropical zone with two main climate types, namely: the equatorial and tropical climates, influenced by altitude and the monsoon winds. Annual average temperatures vary from 20°C and 28°C and increase as one moves northwards. The country has a main rainy season. Rainfall varies with distance from the sea, altitude and latitude, dropping as one moves from the sea (7500mm) to the interior 2500 mm, and from the south (2000 mm) to the north (550 mm). Table 1 shows the rainfall and temperature distribution based on the altitude.

Table 1: Temperature and Rainfall Distribution Base on the Altitude in Cameroon

Regions	% of total surface area of country	Altitude in metres	Annual average temperatures in°	Annual average rainfall in mm
Northern lowlands and basins	21.53	300-900m	28	500-800
Adamawa Plateau	13.67	1200-1800	25	1200-1500
Western Highlands	6.69	800-3000	22-25	1300-2500
South Cameroon Plateau	48.31	650-900	24-26	1500-1800
Littoral and Coastal Plain	9.79	15-300	25-27	3000-9000
Mount Cameroon	0.01	800-4090	15-24	2000-3000

As a result of its geographical situation, Cameroon has a great diversity in ecosystems and climates. It is traditionally divided into 5 agro-ecological zones that broadly follow the cut-up of its natural regions:

1. The moist forest with monomodal rainfall or coastal plain with a coastal facade and a mountainous facade. It is characterized by the "Cameroonian" moist equatorial climate and witnesses the highest rainfall in the country.
2. Forests with bimodal rainfall or South Cameroon Plateau, South and East, a tropical rainforest environment with a very dense hydrographic network.
3. The High Plateau Zone; covering the North West and West Regions, it is an upland region with a monsoon equatorial climate. It is the country's 2nd *"water shed".*
4. The Guinean High Savannah in the Centre of the country with Sudano-Guinean vegetation on the Adamawa plateau, the country's 1st *"Catchment Area"* of the country: many major rivers take their rise from here.
5. The Sudano-sahelian zone in the North with savannah vegetation and semi-arid climate.

Cameroon is 5th among the richest African countries in terms of biodiversity. The country's forests host 40% of African animal species, representing 48 % of mammals, at least 54 % of bird species, 50 % of the continent's known amphibians, 30 to 75 % of reptiles, 42 % of identified African butterflies, and at least 21 % of its fishery resources.

Population: 22.3 million inhabitants and an annual population growth rate of 2.5%. This rate reaches 4.3% in urban areas.
Uncontrolled urbanisation is one of the most striking phenomena in recent years. This has lead to an urbanisation rate of 52% in the country in 2010. Fifty percent of the country's population lives in precarious and often illegal habitats.

Economy: Cameroon's economy is one of the most diversified in Africa. Although the secondary (22% of GDP) and tertiary (45%) sectors are well established, the economy still depends mostly on the production sectors: agriculture, livestock, fishing and aquaculture, forestry and sylviculture. Agriculture employs about 60% of the population and remains the predominant sector of the national economy, both in terms of contribution to GDP (23%) and in terms of the effect it has on other sectors. Main cash crops include cocoa, coffee, tobacco, cotton, banana and pepper.

The contribution of the mining sector to the GDP is still negligible, despite the huge identified potentials. According to CAPAM, Cameroon has at least 52 types of minerals and the strategy in this sector is to exploit at least 30% of these resources by 2015. Mining activities include exploration, exploitation and transformation. The industrial sector represents close to 1/3 of the GDP. Its output is essentially destined for the national market and it is generally subdivided into nine sub-sectors broken down into four domains.

Energy: Although firewood is the dominant fuel, it represents only 60% of energy consumption, a rate that is lower than in neighbouring countries. However, this figure rises to 94% in rural areas. In 2010, 49% of the population had access to electricity and this represents 14% of total national energy consumption. Electricity supply comes from three main Hydro-electricity plants: Edea, Song Loulou and Lagdo. However, the country's Hydro-electricity potential is largely underexploited. It should be noted that Cameroon equally has huge petroleum reserves.

Transport: The road network is the dominant transport mode with 12, 457 km of rural tracks and 18 national roads serving all the four corners of the country and ensuring liaison with neighbouring countries. The rail network covers 1,000 km of main tracks, with a rolling stock of 32 line

locomotives and a dozen shunting locomotives, passenger and cargo coaches. The country has three international airports in Douala, Yaounde and Garoua, in addition to a network of national airports with a total annual traffic of about a million passengers. Cameroon has a 400 km coastline to the Atlantic and the Douala Port Authority handles 95% of port traffic in the country. It is the main port in Central Africa.
Socio-economic activities generally depend on soil quality, temperatures and rainfall in the agro-ecological zones. As such, variations in the spatial and temporal distribution of rainfall and temperatures resulting from climate change often have a negative impact on the Cameroonian people's livelihood. The main sectors that are vulnerable to climate change include: agriculture and livestock, forestry, sylviculture and wildlife, water, sanitation and health, energy, mines and industries, fishing and aquaculture, urban development and public works and tourism.

At the institutional level, Cameroon has created a Ministry in charge of the environment in which there is a UNFCCC focal point. **The Department of Conservation and Management of Natural Resources (DCGRN)** was designated by this ministry as the structure that operationalizes projects relating to climate change.

At the level of policy and regulation, Cameroon has a framework law on the environment (1996) and a forestry law (1994). Also, the country has enacted a petroleum code, a mining code (2001, revised in 2010) and a gas code.

This Second National Communication of the country deals successively with GHG inventories, the country's ability to mitigate GHG emissions, vulnerability to climate variation and climate change, adaptation, State organisation in he are of climate change as well as requirements needed to address the negative impacts of climate change.

2. Greenhouse gas inventories

2.1. General presentation of GHGs in Cameroon

The greenhouse gas (GHG) inventory is important in that it helps the country to define options available to mitigate climate change or other environmental strategies such as the fight against air pollution. It equally serves as a basis for flexibility mechanisms; especially the Clean Development Mechanism (CDM) and emerging mechanisms such as REDD (Reduction of Emissions from Deforestation and Forest Degradation).

Gases taken into account in the IPCC Guidelines include direct greenhouse gases like carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O); as well as indirect greenhouse gases like carbon monoxide (CO), nitrogen oxides (NO_x), and non-methane volatile organic compounds (NMVOC), halocarbons (HFC, PFC), sulfur hexafluoride (SF_6), and sulfur dioxide (SO_2). Halogen compounds like chlorofluoride hydrocarbons (CFCs), hydrochlorofluorocarbon 22 (HCFC-22), halons, methyl chloroform and tetrachloride are not taken into account by signatories of the Montreal Protocol.

In this Second National Communication (SCN), GHGs inventories were done with 2000 as the reference year, in full respect of the Revised 1996 IPCC Guidelines, *Simplified Manual* as well as the *IPCC Reference Manual and Recommendations* on best practices in the management of uncertainty in national GHG inventories (RBP, 2000); as well as recommendations in the area of best practices in Land Use Change and Forestry sector (RBP 2003).

Information required for estimating GHGs emissions include data on emission activities, factors and other coefficients/parameters. This data was obtained through bibliographical research, data collection in administrative and para-public institutions, private companies and for some, by hypotheses and estimates discussed among professionals of the targeted sector. In its simplest form, the method used to estimate emission or absorption in a specific source is as follows:

Estimation of the emission = Data on the emission activities = Data on activities x Emission factor x Emission factor

- Data on activities Data on activities describe the annual national intensity of an activity (for example, the number of tonnes of carbon extracted at national level over a period of one year).
- The emission factor.The emission factor is the mass of greenhouse gases emitted by an activity (for example, Gg CH4 per tonne of coal extracted).

In several cases, available activity data did not really correspond to what was expected, considering the particular emission factor to be used. In such cases, activity data is converted by applying the "conversion factor" to the basic data which is here qualified as "indirect activity data". In such a situation, the emission estimation equation is as follows:

Emission estimation = [Indirect activity data x Factor(s) of conversion factor(s)] x Conversion emission factor] x Emission factor

Five (05) of the six (06) sectors indicated in IPCC Guidelines were covered. They include: Energy (1), Industrial Processes (3), Agriculture (4), Land Use & Land Use Change and Forestry (LULUCF) (5), and Waste (6).

The national balance of GHG emissions and absorptions in 2000 is presented in Table 2-3 below, in Gg. The result is that, in 2000, the GHG inventory was dominated by absorption as compared to emission. Absorption stood at 76,582 Gg CO_2 compared to an emission of 2,990 Gg CO_2 including

473 Gg of CH_4 and 54 Gg of N_2O as direct emissions, and, 4,824 Gg of CO, 192 Gg of NMVOC, 109 Gg of $NO_x$and 8 Gg of SO_x as indirect emissions.

Table 2: National Balance of GHG Emissions and Absorptions in 2000 (Gg)

Emission source/ sink category	CO_2 Emission	CO_2 Absorption	CH_4	N_2O	NO_X	CO	NMVOC	SO_X
National total emissions and absorptions	2990	- 7582	473	54	109	4824	192	8
1-Energy	2800	0	79	1	51	1501	177	6
A. Combustion of fuels (sectoral method)	2800		78	1	51	1501	175	4
1-Energy industries	229		0	0	1	8	0	1
2-Manufacturing and construction industries	296		1	0	4	105	2	0
3-Transport	1 777		0	0	4	106	20	3
4-Other sectors	498		76	1	18	1282	152	1
B. Fugitive emissions from fuels	0		0		27	0	2	1
1. Solid fuels			NO		NO	NO	NO	NO
2. Petroleum and natural gas			1		0	0	2	1
2. Industrial processes	190	0	0	0	0	13	16	2
A. Mineral products	45				0	0	10	0
B. Chemical industries	0		0	0	0	0	0	0
C. Production of metals	146		0	0	0	13	0	1
D. Other forms of production	0		0	0	0	0	1	0
E. HFC and SF_6 Production								
F. HFC and SF_6Consumption								
3. Use of solvents and other products	**NE**			**NE**	**NE**	**NE**	**NE**	
4. Agriculture			311	52	57	3299	0	0
A. Enteric fermentation			163					
B. Manure management			8	0			0	
C. Cultivation			11				0	
D. Agricultural land				50			0	
E. Controlled burning of grassland			125				0	
F. On the spot burning of agricultural residues			1				0	
5. **Land use, change of land use**	0	-76 582	1	0	0	11	0	0
A. Change of forests and other woody biomass stocks	20 763	0						
B. Conversion of forest to grassland	471	0	1	0	0	11		
C. Abandonment of cultivated lands		-107672						
D. Emission and absorption	9836	0						
E. Others	0	0	0	0	0	0		
6. **Waste**			82	1	0	0	0	0
A. Disposal of solid waste in landfills			68		0		0	
B. Effluent water treatment			14	1	0	0	0	
C. Incineration of wastes					0	0	0	0
D. Others			0	0	0	0	0	0
For the record								
International Bunkers	203		0	0	2	1	0	0
Air	119		0	0	1	0	0	0
Maritime	85		0	0	2	1	0	0
CO_2 emissions from biomass	14 886							

Note: NO: Non Occurrent NE: Non Estimated

Source: MINEPDED, Calculations by ENERGECO Consulting/National Experts

It follows that nitrous oxide (N_2O) is the main GHG emitted in 2000 with a 56% contribution to total emissions expressed in CO_2, Eq. corresponding to about 16,672 Gg Eq. of $_{CO}2$. It is followed by methane CH_4 with 34% of the total expressed in CO2 Eq. and CO2 which represents 10% of its equivalent.

By applying the GWP for each GHG, that is, 1 for CO_2. 21 for CH_4 and 310 for N_2O. These emissions and absorptions are converted into CO_2 Equivalent (CO_2 Eq.). Table 3 below is a summary of direct GHG absorptions in $CO_{2\ Eq.}$

Table 3: National Aggregated Balance of GHG Emissions and Absorptions in CO2 Eq.

Emission source/sink category	CO2 Emission	CO2 Absorption	CH4	N2O	Total
National total emissions and absorptions including LULUCF	2990	-76 582	9934	16674	-46983
National total emissions and absorptions excluding LULUCF	2990	0	9909	16672	29571
1-Energy	2800		1661	348	4809
2-Industrial processes	190		0	0	190
3-Use of solvents and other products				NE	NE
4. Agriculture			6523	15998	22521
5. Land use, change of land use and forestry (LULUCF)	0	-76 582	26	3	-76554
6. Waste			1724	326	2051
For the record					
International Bunkers	203		0	1	204
Air	119		0	1	120
Maritime	85		0	0	85
CO2 Emissions	14886				14886

Source: MINEPDEP *Calculations by: ENERGECO Consulting/National Experts*

The results in Tables 2 and 3 show that Cameroon is generally a GHG sink with an absorption capacity of 46,983 Gg CO_2EQ 2000. In fact, GHG emissions (excluding LULUCF) are estimated at 29,571 GgEq CO_2. Inclusion of the LULUCF sector will raise emissions to 29,599 GgCO_2Eq and absorptions to 76,582 Gg CO_2Eq (-76,582 Gg CO_2) Eq, which corresponds to a net absorption of 46,983 Gg CO_2Eq (-46,983 Gg CO_2Eq).

As such, GHGs from the agricultural sector are mostly made up of gases including N_20, which constitutes 71% of emissions in this sector and CH_4 (21%). Inversely, three direct GHGs are present in the energy sector with CO_2, which is responsible for 58% of total emissions in the energy sector, followed by CH_4 which represents 35% of emissions in this sector and NO_2 which is third with 7%. As for the industrial procedures sector, direct GHG emissions are made 100% of CO_2. Lastly, direct emissions from the wastes sector are made up of CH4 (84%) and N20 (16%).

2.2. Summary per sector

Agriculture: It follows that GHG emissions in the Agriculture and Fishery sector are modest, amounting to about 60 Gg of CO_2 emitted in 2000, the other gases being very marginal.

Generally speaking, it is the agricultural land category that is responsible for CO2 Eq. emissions in the agricultural sector with 69% of emissions, followed by enteric fermentation with 15% and grassland bushfires, 14%.

After emission of CO, which is highest ranking in terms of quantity emitted, the CH4 comes in the second position with 311 Gg emitted in 2000, followed by NOx with 57 Gg emitted and lastly, N2O with 52 Gg emitted.

While agricultural soils constitute almost the only source of N2O emissions in the agriculture sector, CH4 emissions result from almost all categories. Thus, 53% of CH4 emissions result from enteric fermentation, 40% from savannah bushfires, 4% from rice cultivation and 3% from waste management.

Energy: Combustion of fuels causes 2800 Gg of the CO2 emitted in 2000 including 32% from transport, 12% from households, 10% from manufacturing and construction industries and 8% from the energy production industry.

Industrial processes: As such, a single greenhouse gas, CO2, is emitted in Cameroon's industrial processes. It is the most important GHG in industrial processes with 190 Gg of CO2 emitted in 2000. The other GHGs can be attributed to Cameroonian industrial processes: NMVOC (16.0 Gg), CO (13.1 Gg), SO2 (1.7 Gg), NOx (0.2 Gg) and PFCs (0.2 Gg). The results of the industrial process GHG emissions inventory show that they essentially come from aluminium production, followed by cement production. Emissions from glass production and drink and food processing are minimal. The diagram below illustrates this situation.

Waste: In terms of type of gas emitted, CH4 is the main gas emitted with 84.26% of total emissions as against 15.74% for nitrous oxides. In terms of methane emission source (CH 4), as shown in the following diagram, municipal waste is the highest with 82.51%, followed by 11.31% from industrial effluents and 6.18% from household effluents.

Land use, change of land use and forestry: The main data used in estimation of CO2 emissions and absorptions in this sub sector are surfaces covered by volunteer plants over a 20-year period and surfaces of land abandoned for over 20 years. The indicated surfaces are obtained with the use of Landsat TM and ETM+ combined with documentary sources. Processing this data helped obtain a volume of 107,672.06 Gg of absorbed CO_2.

Total emissions amount to 40,985.43 Gg of CO 2 as compared to an absorption of 107,672.06 Gg. The inventory thus shows that GHG emission (excluding LULUCF) stands at 29,571 Gg of CO2 Eq. Inclusion of the LULUCF sector will raise these emissions to 29,599 Gg CO2 Eq. and absorptions of about 76,582 Gg CO2 Eq. (-76 582 Gg Eq. CO2), amounting to a net absorption of 46,983 Gg CO2 Eq. (- 46 983 Gg CO2 Eq.). Generally speaking, Cameroon is therefore a GHG sink with a capacity to absorb 46,983 Gg CO2 Eq. 2000.

3. Vulnerability to climate change

Climate change vulnerability and adaptation studies carried out as part of this National Communication in Cameroon include national relevant proposals from the initial studies (**agriculture; livestock; fishing and aquaculture; forestry, sylviculture and wildlife; water and sanitation; health; energy; mines; industries; public works; urban development; tourism**). Like other Sub-Saharan African countries, Cameroon is vulnerable to climate change which constitutes a serious threat to its natural resources which is in turn the source of livelihood for the majority of its population.

Before dealing with climate change risks and associated vulnerability, experts started by studying natural risks in each agro-ecological zone and made a cartographic comparison between natural risks and climate change risks. Besides past climates and their impact on the population and natural resources, climate projections were made within vulnerability studies and within the NPAACC. This shows that the northern sahelian zone is the most variable, followed by the coastal zone.

A specificity to note in the precipitations simulated is the rather significant deficit in rainfall recorded in all the time horizons retained. Also, temperatures shall increase over the entire national territory for the three horizons 2030, 2060 and 2090.

3.1. Climate trends

Precipitation and temperature in Cameroon are characterized by high geographical variability. Table 4a shows the present average rainfall and temperature trends per AEZ over a period of 1961 to 2010. Available data covers a period of 50 years in all AEZ and the number of stations spreads from 4 to 15. Generally, a drop in average annual rainfall is noted at the national scale. However, a rising trend is noted in some specific stations. On the contrary, temperatures are on the rise almost anywhere.

Table 4a : Average Rainfall and Temperature Trends in Cameroon's AEZ

N°	Station	Relief characteristics	Average rainfall trend	Average temperature trend
Monomodal rainfall AEZ or coastal zone				
1	Douala	Littoral, maritime	↓	↑
2	Tiko	Littoral, maritime	↓	↑
3	Kribi	Littoral, maritime	→	↑
4	Edea (SAFACAM)	Humid littoral	→	↑
5	Nkongsamba	Mixed humid littoral and mountain	↓	↑
Bimodal rainfall AEZ or forest or South Cameroon plateau				
6	Yaounde	Humid South Cameroon plateau	↓	↑
7	Ebolowa	Humid South Cameroon plateau	↓	↑
8	Bafia	Semi-dry South Cameroon plateau	↓	↑
9	Bertoua	Humid South Cameroon plateau	↓	↑
10	Akonolinga	Humid South Cameroon plateau	↑	↑
High plateau AEZ				
11	Bafoussam	Humid mountain	→	↑
12	Bamenda	Humid mountain	↓	↑
13	Koundja	Semi-dry mountain	↓	↑
14	Foumbot	Semi-dry mountain	↑	↑
15	Dschang	Humid mountain	↑	↑
Guinea high savannah AEZ or Adamawa plateau				
16	Ngaoundere	Mountain, ecotone	↓	↑
17	Meiganga	Mountain, ecotone	↓	↑
18	Tibati	Mountain, ecotone	→	↑
Sudano-sahelian AEZ				
19	Maroua	Mixed Sahelian (plain and mountain)	↓	↑
20	Garoua	Lowland Sudanian	↓	↑
21	Kousseri	Dry Sahelian	↑	↑
22	Yagoua	Dry Sahelian	↑	↑
23	Kaele	Dry Sahelian	↑	↑
24	Mokolo	Dry Sahelian	↑	↑

Source: Tchindjang et al. 2012, modified.

Average annual temperatures have risen by 0.7°C since 1960, which corresponds to an increase of 0.15°C per decade (UNDP, 2008). Generally, the fastest increase is registered in the months of March, April and May (MAM), with 0.19° per decade. However, in the *Sudano-Sahehian*, the fastest warming rates were observed in the months of December, January, February (DJF) and September, October and November (SON) with rates of 0.2 to 0.4° per decade (UNDP, 2008).

Average annual rainfall in Cameroon have fallen by **approximately** 2.2% per decade (that is 2.9 mm per month) since 1960. Months during which this regression is pronounced are March, April and May (MAM), followed by June, July and August. By 2060, these months are expected to have witnessed a reverse in the decrease in rainfall as shown in Table 4b.

Table 4b: Observed and Projected Temperatures in Cameroon

	Observed median 1970-1990	Trends observed 1960-2006	Projected median trend		
			2030	2060	2090
Temperatures °C					
	T°C	Evolution per decade °C	Evolution in °C	Evolution in °C	Evolution in °C
Annual average	24.1	0.15	1.1-1.4	1.8-2.5	2.2 – 4.2
DJF	23.9	0.13	1.2 – 1.3	1.8 – 2.5	2.2 – 4.2
MAM	25.7	0.19	1.0 – 1.5	1.8 – 2.6	2.2 – 4.3
JJA	23.3	0.14	1.4 – 1.5	1.6 – 2.6	2.1 – 3.9
SON	23.5	0.15	1.1 – 1.4	1.7 – 2.4	2.1 – 4.0
Rainfall in mm					
	mm/month	**% evolution in a decade**	**% evolution**	**% evolution**	**% evolution**
Annual average	129.7	-2.2	0	-1 – 3	0 – 2
DJF	22	-1.4	-2 – 0	-1 – 1	2 – 4
MAM	125.2	-3.4	0 – 1	1 – 3	-2 – 4
JJA	196.1	-2.4	0 – 1	0 – 2	-2 – 2
SON	175.6	-0.9	1 – 3	2 – 4	4 – 6

Source: UNDP 2008

Briefly, future climate change in the country can be summarized as follows:

- **Moist forests with monomodal rainfall zone:** whatever the scenario, temperatures tend to rise relative to the reference period, reaching a maximum around 2028. Rainfall, shall increase relative to the reference scenario, but will witness a drop around 2021.
- **Forest with bimodal rainfall zone**: temperatures are on the increase relative to the reference period with a drop in 2018 and 2021 in A2 emission. Rainfall, which is on the rise, will witness a drop as from 2030.
- **High plateau zone**: the temperature trend will be on a rise till around 2035 according to the worst case scenario while a fall will be observed as from 2022 for the second scenario. Precipitation will increase relative to the reference scenario witnessing a fall, however, between 2021 and 2027.
- **Guinea high savannah zone**: temperatures will fall between 2013 and 2019 without however, reaching their level at the onset of reference period. They shall rise again after 2019. Generally, rainfall will increase, albeit with a dry phase in 2018 and 2024 for all scenarios.
- **Sudano-sahelian zone**: temperatures, which have generally been on the increase since the start of the reference period, will continue to rise and precipitation will generally increase following the HadCM3 Model. According to the A2 emission scenario, temperatures and precipitation will fluctuate around the normal, but with more years recording a deficit. This also indicates the importance of heavy rains in the annual and inter-annual rainfall balance.

To understand the effects of climate change in Cameroon, several studies were carried out in the country within the framework of the RESAKO or those of the IRD (paleo-environnements on the banks of the Nyong or Sanaga). These works testify to climate change at several levels. The different challenges involved in climate change include deforestation, increase in the erosive potential of rivers and increased rainfall which initiates new landscape dynamics with the acceleration of geomorphological processes.

Climate change manifestations in the form of harmful impacts of extreme climatic phenomena constitute a major handicap to the country's development. Climate variability and change are responsible for several perturbations in Cameroon's biophysical milieu.The analysis of results from participatory field investigation can edify us on the population's perception of climate change vulnerability and real impacts in their close environment.

Given the high population growth rate in the different natural regions subjected to water stress, the availability of water per inhabitant reduces. Water usage increases with increased needs resulting from an increased population. During the last twenty years, the population has doubled or even tripled but water availability has not kept up with this growth.

3.2. Vulnerability to climate change

Vulnerability varies with natural region, a more suitable term than agro-ecological zone because these natural regions better reflect the climate and biophysical processes going on in the different milieus. They integrate the notion of agro-ecological zone which is rather limiting, reducing the notion of climate to agriculture and ecology, omitting physical characteristics which pose natural risks that can be magnified by climate change risks.

The climate change risk evaluation method involved two approaches: a participatory process (*Bottomup)* based on specific studies of the population, administration and main development sectors. The aim of this study was to enable participants to express their perception of climate change. The results obtained were analysed in comparison with the proposals (open or closed questions) by experts. The second approach consisted in analysis and interpretation of meteorological and satellite data. Climate projections were obtained by rotating the regional RegCM model. The evolution of climate trends was the result of various statistical methods, with adjustments linked to the work at hand.

Impact evaluation, vulnerability analysis as well as development of adaptation measures all result from a combination of perception and analysis of meteorological data. Parameters that helped characterize the real impact and potential include the nature of the impact, the duration of the perturbation, its geographical span and intensity, without forgetting the degree to which the population are exposed. Vulnerability analysis was based on the IPCC framework (2001) which stipulates that a simple is ever the more vulnerable if it is exposed and sensitive to a risk and has a low adaptation capacity. Climate change adaptation consists in adjusting practices, procedures or structures to announced changes in climate.

The main climate change risks were evaluated for each natural region. The northern region is characterized by drought, violent winds, floods and land slides and slips, to which erosion can be included. In the Adamawa, a region naturally exposed to seismic and volcanic risks, landslides caused by heavy rains and the existing relief energy (gravity) constitute the most recurrent risk. To this can be added the risk of erosion caused by over grazing. The Western highlands for their part are characterized in literature by the risk of gas emissions from lakes, Monoun and Nyos, due to heavy rainfall and the sheer seriousness of the same climate risks as those in the Adamawa plateau. The South Cameroon plateau, on the contrary, will witness heat waves resulting from global warming. These shall be added to flooding, landslides and erosion. Lastly, in the coastal region, intense and abundant rainfall will cause recurrent flooding, mass movements and erosion.
Based on all the information collected and analysed, the northern part of Cameroon seems to be the most climate change vulnerable region in the country, followed by the coast and the Western highlands.. The South Cameroon plateau appears to be the least affected, but care must still be taken because of deforestation, forestry and mining which jeopardises conservation and can

accelerate the above mentioned threats.

The agricultural sector in Cameroon, due to its high sensitivity to the availability of water, erosion and flooding, shall be the most affected by climate change in Cameroon. Similarly, energy production is entirely dependent on the hydrological system and, considering the influence of the availability of energy resources on the other development sectors, the vulnerability of the main rivers' regimes will have a major impact on the development of the country as a whole.

As concerns human groups, the main vulnerability factor is poverty in peri-urban areas, in addition to mass exodus from rural areas to urban areas which already face a huge demographic pressure from youths and vulnerable classes, seeking better living conditions.

Two types of adaptation measures were proposed. Endogenous methods come from the population facing the climate change risk, where their vulnerability to such a risk is confirmed and other measures from the various administrative sectors and personal notes from experts. Measures vary with natural region and type of activity in each region. The use of improved breeds, modification of the agricultural calendar, the fight against bush fires, dispersal of livestock, construction of dykes, transhumance, planting of trees, improvement of seed conservation, diversification of activities, reduction of food rations, construction on piles, recycling of wastes, creation of community forests are the main adaptation measures proposed by the population in the different natural regions. Regarding institutions, adaptation options involve the mastery of water, diversification of crops, reactivation of reforestation programmes, vulgarization of fodder banks, construction of soil protection and restoration structures, climate risk management, domestication of some wild species, etc. The cost of adaptation measures cannot be estimated at this stage.

4. Mitigation measures and strategies

Mitigation measures should enable the country achieve sustainable socio-economic development while offering it opportunities for economic, social and ecological development. Activities sectors considered in this section are those studied in the GHG inventory, namely: (i) energy, (ii) industrial processes, (iii) agriculture, (iv) land use, land use change and forestry (LULUCF), (v) and waste.

4.1. Energy sector

To ensure sustainable supply and varied supply in energy on the one hand, and reduce GHG emissions on the other, a given number of technological options have been identified, from the demand as well as supply perspective.

- **As regards energy demand**

The objective is to improve energy efficiency. By creating a technical change dynamic such that efficient materials and equipment will progressively take over growing market sectors.

- ***Vulgarization of low consumption bulbs:*** This concerns the replacement of 60W incandescent bulbs with more efficient 11 to 13 W bulbs. Although the latter are more costly in terms of purchase price, they enable energy savings of more than 30W as well as offer the advantage of a longer lifespan.
- ***Passing of rules and regulations on labelling of energy performances*** Labelling is a means used to inform consumers on the energy performances of household appliances. The aim is to distinguish appliances according to their energy efficiency and enable the consumer make the best choice. For the consumer, a label allocated by an independent organisation is a guarantee of quality, which distinguishes highly efficient products from ordinary ones. Regulatory labelling, on the other hand, is a procedure imposed for all products, including less efficient ones, such as to enable comparison.
- ***Passing of rules and regulations on industrial energy performance:*** The installation of minimum performance norms ushers in a new dynamics and improvement of energy efficiency. As an alternative to this regulatory procedure, voluntary sectorial agreements can be negotiated by industries and public authorities. The two parties jointly determine target values for each sector. This measure will have a significant impact, considering the high number of cement and aluminium factories to go operational by 2025.
- Regarding biomass***consumption***, the promotion of improved fireplaces and other efficient carbonisation technologies aimed at improving carbonisation rates by 18% to 25% as against the traditional millstone will have a significant effect on wood saving.

- **As regards energy supply**

The management of energy supply includes all activities likely to optimise energy supply systems, with emphasis laid on: hydro-electricity, reforestation and renewable energies.

- **Reforestation:** This operation was chosen to sustain existing natural resources by making an additional contribution to the growth of natural formations. This can help reduce pressure on natural formations which constitute real carbon sinks. This option consists in creating 3,000 to 4,000 ha of forests each year up to 2035 essentially for the purpose of providing firewood. This option has in the past, witnessed a success rate of 10%.
- **Hydro-electricity:** With the opening of the sector to competition in 2001, and privatisation of SONEL, the installed thermal capacity rose from 12% to 28% between 2001 and 2010. However, the country has set up a huge hydro-electricity infrastructure development programme to meet demand by 2035. These include Memve'ele (201MW), Mekin (15 MW), Nachtigal, Bini à Warak, Ndjok, etc.

- A vast ***solar electrification*** programme (500 MW) is planned, together with the vulgarisation of biogas which is gaining momentum. The State, with the technical support of the Dutch Development Organisation (SNV), has undertaken a biogas vulgarisation campaign. The programme consists in constructing 3,000 bio-digesters in the up-coming five years.

4.2. Industrial processes sector

o Summary of greenhouse gas emission from the cement industry

Cement is obtained following the transformation of limestone (CaCO3), into quicklime (CaO3) and carbon dioxide (CO_2) through heating. More than 60% of CO_2 emitted during cement production comes from this "decarbonisation". To reduce this CO_2 emission, the cement industry has instituted a given number of measures over the past few years, including:

- incorporation of certain decarbonated or limestone free materials in the raw materials before kilning;
- incorporation of constituents (fly ash, blast furnace slag) with an equivalent reduction in the quantity of clinker, the end product of the kilning process and basic constituent of cement;
- use of waste as fuel. If they are not burnt in the cement foundry, these wastes will still have to be eliminated by traditional incineration methods. Corresponding CO_2 emissions are thus added to emissions from cement manufacturing and the ultimate waste would have been landfilled without being put to use, sometimes further producing methane, a greenhouse gas. This mode of CO_2 reduction is counted under energy production emissions.

o Summary of actions to reduce greenhouse gas emissions from the aluminium industry

Primary aluminium or primary smelting aluminium has 3 steps:

1. Bauxite extraction (bauxite mines);
2. Refining of bauxite into alumina through the Bayer (alumina refinery);
3. Electrolytic reduction of alumina into aluminium through the Hall-Héroult process (aluminium foundries).

Three types of pollution are caused by aluminium production:

- waste matter from bauxite during alumina production, termed red muds, stored in dykes, these muds are caustic (soda) and contain various metals;
- fluoridated pollution during transformation of alumina into aluminium;
- gas emissions over reduction cells, needing to be captured.

In the case of gas emissions, environmentally conscious companies burn carbon monoxide (CO) or recycle it as a source of carbon, and fluorides are returned into the electrolytic bath. Other measures are envisaged, including:

- Reduction of electrode spacing;
- Improvement of kiln combustion capacities;
- Improvement of temperature control during electrolysis.

As regards legislation, agreements can be signed between the Administration and industrial sectors (voluntary agreements) to limit emissions. The content of each specific agreement between the Administration and the industries shall essentially deal with setting targets and objectives. These shall be established through mutual agreement between the parties.

4.3. Wastes sector

The present state of sanitation in Cameroon results from several development constraints, the sustainability of infrastructure and institutional, technical or financial services. Technically speaking, collective sanitation remains highly limited, existing only in a few towns. It is often

dysfunctional. On its part, semi-collective sanitation is still in its embryonic stage. From the institutional perspective, a series of laws and regulatory texts specifically targeting the sanitation and waste sector exist. The definition of responsibilities is still imperfect. Functions and the specific tasks associated to them are not defined and cause a lot of confusion and practical difficulties. The main actors in the effluent water and waste treatment sector are communities, the private sector and NGOs.

Clarification of the institutional framework requires a specific importance, this situation is characteristic of several countries in the sub-region. The Growth and Employment Strategy Paper drafted by the country in 2009 provides for the realisation of its objectives through the reinforcement of the institutional framework notably, by the "reinforcement of the institutional framework, planning-programming-budgeting-monitoring, development of normalisation and quality, development of the private sector and lastly, development of human resources".

- **Chronology of some texts/laws/decrees likely to contribute to GHG mitigation in the wastes sector**

Analysis of the different texts on the issue of waste shows that there are three main periods of institutional evolution in Cameroon. The main laws on water management and waste water treatment date from the 2000s. All these texts can be grouped around several degrees outlining responsibilities.

- **Law** n° 98/005 of 14 April 1998 to lay down regulations governing water resources;
- **Collection of texts on decentralisation**:
  - Law n°2004/017 of 22 July 2004 to determine the orientation of decentralisation
  - Law n°2004/018 of 22 July 2004 to lay down laws on councils
  - Law n°2004/018 of 22 July 2004 to lay down rules applicable to regions
  - Law No.2004/003 of 21/04/2004 regulating town planning in Cameroon
- **Decrees**
  - Decree No. 2001/161/PM of 8 May 2001 to lay down attributions, the organisation and functioning of the National Water Committee
  - Decree n° 2001/162/PM of 8 May 2001 to define the conditions for designating sworn agents to monitor and control water quality
  - Decree n° 2001/164/PM of 8 May 2001 to specify the modalities and conditions for collecting surface run-offs or underground water for industrial or commercial purposes
  - Decree n° 2001/164/PM of 8 May 2001 to specify the modalities and conditions for collecting surface run-offs or underground water for industrial or commercial purposes
  - Decree No. 2001/216 of 2 August 2001 on the establishment of a special account to finance sustainable development projects for drinking water and sanitation
  - Decree No.2007/117 of 24/4/2007 to create councils
  - Decree No.2008/0737 of 23 April 2008 to lay down safety, hygiene and sanitation in construction
  - Decree of January 2008 to create 12 city councils
  - Decrees (total of 9) of 26 January 2010 to transfer competences from ministries to decentralised local authorities
  - Decree No. 2012/431 of 01 October 2012 to organise the Ministry of Environment, Protection of Nature and Sustainable Development (MINEPDED)
- **Orders**
  - Order No.003 of 28 March to organise the commission on eligibility to social housing
  - Order No. 009 of 21 August 2008 to lay down social housing norms
- **Strategy papers**
  - National policy on potable water supply and sanitation in rural areas, MINEE 2008
  - Growth and Employment Strategy Paper.

It is First National Communication (FNC) which presents an inventory of the different greenhouse gases in the several sectors, especially the waste sector, Cameroon's climate change response strategy was written, showing the country's main orientation on climate change mitigation and adaptation with the support of the international community.

In view of transforming the handicap of climate change into an economic opportunity through the CDM (Clean Development Mechanism), in January 2006, Cameroon created a National Committee on the Clean Development Mechanism (NC-CDM) with the mission of promoting CDM projects in various sectors, including the waste sector. In this light, some ten project identification notes have been written by Cameroonian companies, two of which specifically deal with waste.

4.4. Agricultural sector

The agriculture sector has a series of agricultural greenhouse gas emission mitigation options. Several interesting possibilities for the mitigation of agricultural emissions are proposed, including:

- Using of new agricultural land management techniques by adopting the following solutions:
    - avoiding empty fallows: completely empty fallows are prone to erosion and leaching, in addition to sequestrating less carbon than it would have done, were it under a vegetation cover;
    - reducing dependence on fertilisers by adopting other agricultural operation methods, for example, by practicing crop rotation with legumes;
- bury rather than incinerate waste and harvest residues on the farm;
- modifying pasture management will like offer some prospects for mitigation. We can, for example, reduce the intensity of pasture exploitation or restrain the frequency or intensity of forest fires through active fire management. These measures typically result in improvement of forest and shrub land covers, with the accompanying CO_2sinking, both in the soil and biomass.
- promote the production and use of improved manures through composting and compost;
- rehabilitate and restore degraded lands in order to improve the carbon sink;
- improve rice cultivation by reducing submersion to the maximum;
- practice agro-forestry which will enable significant mitigation of GHG emissions.

Current cultivation methods in Cameroon cause environmental problems which can be solved by adoption of agricultural practices that enable the creation of huge carbon sinks. Numerous solutions involve the possibility of climate change mitigation, including:

- better management of crops (by preventing empty fallows, through more judicious
- application of fertilisers, for example);
- better management of pastures;
- restoration of organic soils and carbon sinks.

Besides, agriculture offers several possibilities for mitigating climate change. Although it is presently ranked among the highest emitters of GHGs, it could emit far less, or even be transformed into a carbon sink. An entire series of options are available for attenuating the impact of agricultural practices on climate change. As has been noted above, the evolution of livestock and agriculture in Cameroon takes place within a context of a significant increase in greenhouse gas emissions from all sources (cattle, rice cultivation, cultivated land, burning of harvest residues, etc).

Use of livestock by-products like biogas (in Maroua) shall be envisaged for community use (production of energy to reduce the use of firewood). It is however, necessary to manage the risk of competition likely to occur between biogas and organic manure use for agriculture. It should be noted that livestock can be a viable alternative for diversifying the activities of households in the

forest and coastal regions. For this, it will be necessary to carry out sensitization and vulgarisation to this effect.

Consequently, the greenhouse gas emission reduction strategy needs to rest essentially on the improvement of certain aspects of livestock, especially better use of manure and for agriculture, change in fertilization modes, in particular, diminishing the use of mineral fertilizers.

4.5. Land use sector

The land use and land use change sector is a sink. Notwithstanding this status quo, mitigation measures will still need to be taken to reinforce the sequestration capacity of the sector. Given the technical, social, strategic, financial, economic, institutional and cultural requirements, it will be necessary to take a series of measures which must necessarily act in conjunction for any sustainable restoration of forests can be guaranteed. Table 5 Summarizes strategic options per agro-ecological zone.

Table 5: Summary of strategic options per agro-ecological zone

	Forest with bimodal rainfall zone	Moist forests with monomodal rainfall zone	High plateaus zone	Guinea high savannah zone	Sudano-Sahelian zone
Competitive agriculture that respects the forests and natural resources shall be promoted					
• green agriculture (agro-forestry, composting, etc.)	+++		+++		++
• integration of arable cultivation/livestock	+	++	+++	+++	+++
• accompanying measures (microcredit, training, etc.)	+	++	+	+	+++
Energy sources are diversified to reduce pressure on wood					
• Improved stoves/ovens	+	++	+++	+++	+++
• planting for purposes of energy supply		+	+	+++	+++
• alternative energies	+	++	++	++	+++
The growth in the carbon stock shall be favoured through sustainable forestry					
• RIL	+++	++			
• Improvement of performance	+++	+++			
• Reinforcement of protected area management	++	+	+	+++	++
• Afforestation, reforestation	+	++	+++	++	+++
• Forest monitoring	+++	++	+	+	++

+ to +++: from least to most important.

4.6. Cameroon REDD+ Strategy

Cameroon considers the REDD+ process as an opportunity to implement a socio-economic development which is sustained participatory, coherent, legitimate and sustainable and which respects the social, economic and environmental requirements specific in each of the five (5) agro-ecological zones of the country.

Proposals of strategic options take into consideration all needs in all agro-ecological zones without giving any priority to the proposed strategic options. However, they evolve and take the country's development strategy documents into consideration.

Cameroon supports the initiative to reduce emissions from deforestation and forest degradation and wishes that forest conservation and sustainable management efforts be taken into account. To

this effect, an adjustment factor should have to be defined and taken into consideration in the calculation and reduction of carbon emissions. Cameroon opts for the implementation of a market mechanism where all efforts at reduction can be evaluated in terms of carbon credit that can be traded on the carbon market.

5. Clean Technology Transfer

On its road to emergence, Cameroon should be able to "cope" with climate change, which will impose relatively formidable challenges on the country. The first challenge shall be that of respecting its international commitments regarding minimisation of its "contribution" to Greenhouse Gas emissions, in order to participate in the global effort to reverse the forecasted climate change trend (with its associated adverse effects on the global "community"). The second challenge is that of achieving its legitimate ambition of emergence, even in the event of the "disaster scenario" coming to pass; the challenge being that of having alternative strategies to guarantee attainment of the development objectives in the "worse case" climate.

The two challenges above have a strong technical component, technology being, from time immemorial, called to contribute each time that nature's laws seem to have constituted obstacles to the goals of any human society. Cameroon is thus obliged to meet the technological challenge imposed by climate change, by implementing policies and strategies to first Master, then Appropriate and finally, Domesticate the appropriate technologies required to manage its development actions. In its quest for "technological development", as a "foundation" of its socio-economic development, particular accent should be placed on "climate change adaptation" technologies, in their capacity as technologies that are able to help reduce Cameroon's vulnerability to climate change and thus, help circumvent the threat posed by climate change to its development.

Indeed, the country aspires to become an Emerging Economy by 2035. The state of emerging economy requires that Cameroon achieves a high degree of autonomy in the production of "resources" necessary for the execution of its development strategy. As such, it should be a question of instituting its relative independence in the management of its development problems within a global context characterized by exacerbated economic competition among nations.

This legitimate ambition of the country should be possible in a global context in which economic competition imposes additional constraints on "developing countries", in their implementation of various plans and programmes, constraints which evolve around the requirement of sustainability in development. The question of "ecological and environmental" appropriateness of the development options arise on the road to development in developing countries like new barriers in the process of transforming their abundant natural resources into economic wealth.

Ecological/environmental issues have become a global issue since the first "Earth Summit" of Rio in 1992, and they introduce new norms in the implementation of development strategies in low "development" countries. It is actually a question of each country demonstrating to the "global community" that its development choices have an "ecologically viable" character. Climate change, which is considered as an imminent threat face by all humanity, in this regard constitutes a global challenge and development models and actions are thus bound to consider alternatives that will minimise the "carbon print" of the country, taken in terms of overall emission of greenhouse gases (GHGs).

Economically speaking, Cameroon's strategic development options are centred on the Agricultural sector (food security), Energy (energy security to ensure industrial and social development), and Industry (local valorisation of the large available amount of natural resources). As concerns climate change, these three sectors also constitute the main sources of greenhouse gas (GHG) emissions, and thus make it imperative to adopt ecologically viable development alternatives, in order to minimise future levels of national GHG emissions.

Climate change thus seems to constitute a major obstacle to the country's mid-term development objectives because, i) development strategies in the above priority sectors need to be implemented in keeping with "ecologically friendly", so as to ensure that the Cameroonian economy's "carbon footprint" remains "reasonable" (implementation of a greenhouse gas (GHG) emission mitigation strategy in the priority socio-economic sectors), and ii) climate change can skew the hypotheses used in justifying the modalities chosen for implementing the development strategies due to the projected negative effects of climate change on these economic sectors, and thus make it imperative to change the said development plans (have a climate change adaptation plan, and therefore alternative development strategies).

In this "knowledge era", technology, understood to mean a "system" of knowledge, knowhow and techniques to enable optimum implementation (economic efficiency which, since the beginning of the third millennium, is combined to "environmental efficiency") of development actions, occupies a key position in Nations' development strategy.

As regards climate change, in fact, several countries have developed "clean" or "environmentally sound" or "green" or "environmentally friendly" technologies over the past two decades; these are technologies which are believed to demonstrate a high capacity of "carbon print" reduction in the high GHG emission capacity economic sectors (agriculture, energy and industries above all) or help minimise the harmful effects of climate change in certain sectors (agriculture, water and health, above all). Clean technologies are a domain in which technological innovation is witnessing a full "boom" in "developed" countries which have a considerable lead over other countries in this domain.

As such, clean technologies are a global stake, and since climate change is a "global" problem, all countries are required to implement clean technologies in their main GHG emitting economic sectors; in this light, there are plans to enable and facilitate the "transfer" of clean technologies from "technologically" advanced countries to countries with a technological "deficit". Table 6 Shows Some Technologies in Use in Cameroon in Various Domains

Table 6: List of Technologies and Know-how used in Cameroon

Energy	Waste	LULUCF	Agriculture	Livestock
Hydro-electricity, micro hydro-electricity plant	Incinerator	Reforestation	Irrigation	Rational pasture management
Thermal plant (oil)	Methanisation	Reforestation	Organic manure	Transhumance
Power generators	Waste recycling	Protected area	Water reservoir	Animal vaccination and health monitoring
Solar	Composting	Resting	Terrace cultivation	Crossbreeding
Fuel wood	Waste sorting	Bushfires control	Hedges	Use of agricultural residues as animal feed
Biomass	Effluent water treatment	Rational pasture management	Improved fallowing with legumes	Use of industrial residues as animal feed
Butane gas	Filtration of industrial effluent waters	Forest management units	Mineral fertilisers	
Biogas	Purification plants	Forest cartography and zoning	Biotechnology	
Improved fireplaces		Community forest	Fight against erosion	
Fossil fuel		Community forest	Contour ploughing	
Thermal plant (gas)		Agroforestry	Multicropping and related forms	

While the problem of "technology transfer" has not yet been properly conceptualised by a "technology deficient country" like Cameroon, there is a serious risk of reproducing the

development model that has prevailed over the past two centuries, a model that considers the world as subdivided into "industrialised countries" (countries with the ability to make the best use of the natural resources of the world, and therefore, which are thus responsible for developing the required technologies) and "non-industrialised or developing countries" (which are natural resource rich, but provide these resources in the form of raw materials to industrialised countries because the former countries do not have any effective industrial infrastructure and thus, lack the mastery of the appropriate technologies. Clean technology transfer, for "under industrialised countries", should not be transformed into the institution of a mere consumption market of clean technologies developed in other countries. The problem of climate change, by making it necessary to implement clean technologies in priority economic development sectors in these countries, should serve as a golden opportunity for these countries to fully integrate the knowledge economy by developing a full "technology industry". For Cameroon, just like other "under industrialised countries", it will be a question of ensuring optimum autonomy in the supply of (environmentally appropriate) technological solutions to optimise its performance.

The textbook paradigm considers technology "transfer" as a process of "importation" of a given technology by a "technology deficient" country seeking to domesticate the said technology, and not as a process of "exportation" of a given technology by a "technologically advanced" country, for use in a "technologically deficient country". As such, technology transfer is a strategic action carried out by a "developing" country, and for this country, constitutes a technology "ASPIRATION" process aimed at absorbing its development deficit. Economic and technological development are intricately linked with technological development constituting an important precondition for the "sustainability" of economic development.

Based on the evaluation of GHG emission problems in the economic sectors considered as priorities in Cameroon's mid-term development strategy, the analysis of strategic options for the transfer of technologies is centred on:

- Identification of priority clean technologies in order to reduce the "carbon footprint" of the priority economic sectors;
- Proposals for applying these (priority) clean technologies at local level;
- Proposal of a methodology for integrating (priority) clean technologies in the national economy;
- Proposal of the architecture of a national information system on clean technologies which will be based on the national clean technology information system;
- Identification of other Data Bases, information networks and organisation dealing with clean technologies;
- And, above all, proposal of a Development Strategy and Plan of Action for a clean technologies "sector" in Cameroon. Such a structure should be based on the proposal of a model and infrastructure for "Aspiration - Domestication" of clean technologies;
- The technology aspiration model is based on the concepts of "duplicative imitation" and "creative imitation" of technologies. The implementation of this model should enable an effective creation of upstream and downstream subsectors in the "technological chain" (from technology development to its implementation in goods and services production system) associated to each clean technology involved in the "transfer" action.
- The clean technologies "aspiration-domestication" infrastructure is centred on:
    - A Climate Change Academy (NCCA) serving as a scientific and technical Hub for clean technology development (and/or domestication);
    - A National Agency for the Promotion of Environmentally Sound Technologies (ANP-TER), serving as a public planning structure for the development of the clean technologies "sector";

- A National Environmentally Sound Technologies Development Fund (FND-TER), serving as a public structure supporting funding of development (or domestication) and dissemination of clean technologies;
- Environmentally Sound Technologies Excellence Centres (CET-TER), serving as operational units of the NCCA in the implementation of clean technology development-domestication/transfer strategies. Priority clean technologies chosen were, in this light, classified into 06 "technological poles", and each CET-TER shall be dedicated to a given technological pole (06 CET-TER are proposed),
- Environmentally Sound Technological Competence (Clusters (CCT-TER), serving as "economic networks" dedicated to the development of clean technologies. The CCT-TER are centred around the CET-TER to constitute a vertically integrated economic system (all links in the technological chain are present) and horizontally (variety in the types of economic entities in the same technological chain);
- Technological Immersion Zones (ZIT) of the CCT-TER, as specific priority areas for each CCT-TER, from which clean technologies that make up the technological pole diffuse;

As regards the Climate Change Action Plan

Cameroon has taken the strategic development option of clean technology industry in its management of climate change. The implementation of the strategy is based on actions including the architecture of a **National Programme for the Development of the Clean Energies Sector**. Priority actions concern:

- **Setting up of support infrastructure for the development of a specific clean technologies sector**(ANP-TER, NCCA, FND-TER): Feasibility studies, organic law and effective implementation;
- **Creation of the necessary international partnerships** for the infrastructural entities: partner search missions, signing of institutional partnership agreements (ANP-TER, FND-TER) and scientific and technical partnership agreements (NCCA);
- **Putting into place of the CET-TER for all technological poles**: Constitution of a critical mass of national specialists in each technological pole (fill the gap in human skills), design of clean technology development-appropriation programmes for each pole, feasibility studies for the implementation of each CET-TER, putting into place of scientific and technical partnerships (national and international) for each CET-TER, putting into place of CET-TER for each technological pole;
- **Effective setting up of the CCT-TER**: feasibility studies for the CCT-TER (coherent with the clean technology development-appropriation programme of each CET-TER), creation of industrial and institutional partnerships (national and international) for each CCT-TER, launching of calls for industrial and commercial integration projects for the CCT-TER for each production sector, implementation of the CCT-TER;

This plan of action, covering a 5 (five) year period **has been estimated to cost 46,875,000,000 (forty-six billion, eight hundred and seventy-five million) CFAF (that is, US$ 93.75 million)**.

Conclusion

On its road to emergence, Cameroon should be able to "cope" with climate change, which will impose relatively formidable challenges on the country. The first challenge shall be that of respecting its international commitments regarding minimisation of its "contribution" to Greenhouse Gas emissions, in order to participate in the global effort to reverse the forecasted climate change trend (with its associated harmful effects on the global "community"). The second challenge is that of achieving its legitimate ambition of emergence, even in the event of the "disaster scenario" coming to pass; the challenge being that of having alternative strategies to guarantee attainment of the development objectives in the "worse case" climate.

The two challenges above have a strong technical component, technology being, from time immemorial, called upon to contribute each time that nature's laws have constituted obstacles to the goals of any human society. Cameroon is thus obliged to meet the technological challenge imposed by climate change, by implementing policies and strategies to first Master, then Appropriate and finally, Domesticate the appropriate technologies required for managing its development actions. In its quest for "technological development", as a "foundation" of its socio-economic development, particular accent should be placed on "climate change adaptation" technologies, in their capacity as technologies that are able to help reduce Cameroon's vulnerability to climate change and thus, help circumvent the threat posed by climate change to its development.

This National Communication of the country is the opportunity to develop a greenhouse gas emission mitigation response and climate change adaptation strategy. The strategy of Cameroon is thus based on technological development, technology being considered as the epicentre of the climate change "management" system.

Cameroon is therefore undertaking an enormous challenge, that of achieving its legitimate emergence in the medium term, within an environmentally sound and relevant framework. The textbook paradigm considers technology "transfer" as a process of "importation" of a given technology by a "technology deficient" country seeking to domesticate the said technology, and not as a process of "exportation" of a given technology by a "technologically advanced" country, for use in a "technologically deficient country". As such, technology transfer is a strategic action carried out by a "developing" country, and for this country, constitutes a technology "ASPIRATION" process aimed at absorbing its development deficit. Economic and technological development are intricately linked with technological development constituting an important precondition for the "sustainability" of economic development.

Cameroon aims to guarantee its relative technological autonomy in the implementation of development strategies, in view of realising its ambition of "emergence" in the medium term. Its ambition of socio-economic development is, in this regard, consubstantial to its ambition of creating a "clean technologies industry" which will be strongly supported by the public authorities in its implementation phase.

Research and Systematic Observation

Cameroon has a Ministry of Research and a Department of National Meteorology. Since 2011, MINEPED has rehabilitated about twenty meteorological stations to facilitate the collection of climate data. A national climate change observatory has been set up in the ministry. The main stakeholders in the area of systematic observation and research on climate change in Cameroon include: the Agence pour la Sécurité de la Navigation Aérienne en Afrique et à Madagascar

(ASECNA); the Department of National Meteorology (DMN); ONACC, MINRESI, and Cameroon's universities.

Research in Cameroon is appreciable but only a handful of institutions have an activity scope that more or less deals with climate change outside CIFOR, ICRAF, IRD and CIRAD. To these can be added institutions focusing on systematic research and observation with variation: IRAD, NIC, IRC, the Pole for Regional and Applied Research aimed at the Sustainable Development of the Savannahs in Central Africa (PRASAC).

National capacity building in the area of education, training and public awareness.
The implementation of this convention is a global responsibility but it is differentiated according to the category of actors at national level. Capacity building and the setting up of information channels that provide communication tools for dialogue on best practices have enabled the following results:
From the present state of environmental policies, it can be observed that, in line with the planetary mobilisation in favour of sound management of the environment, Cameroon has kept pace with the general awareness on environmental issues. This awareness is reflected by the adoption of environmental protection and sustainable management policies and strategies.
From the present state of the main stakeholders and their activities, we can note the desire for harmonious management and that of taking into account the various effects of climate change. This favours concrete integration in the field through programmes and projects (REPECC, REVECC, etc.). The activities identified are those of the main stakeholders at national level including support institutions, the private sector, civil society, educational actors, and communication actors, technical and financial partners.

The inventory and analysis of communication tools focused on the regional, national and local levels. The analysis of existing communication tools was carried out through the following channels: institutional channel, media channel, socio-traditional channel and participatory communication channel.
The current situation and information, education and public awareness needs analysis were carried out on the basis of the major constraints raised at national and local level. Information needs were analysed for each actor, depending on the desired changes. Needs analysis at national level was done through support institutions, the private sector, civil society, educational actors, and communication actors, technical and financial partners.

Constraints and shortcomings observed
Major constraints and shortcomings noted following studies and assessments carried out within the framework of the Second National Communication include:
- lack of specific data on temperatures, precipitation in certain localities, shortages in available data;
- technical expertise on key topics related to national communications is relatively limited;
- the limited national expertise capacity resulting from the lack of appropriate equipment, the lack of mid and long term sectoral planning, the absence of adequate data bases, etc, have had a bit of an influence on the level of analysis done;
- capacity building actions however, prove to be indispensible in the national expertise plan, institutional development, research, systematic observation and technological development;
- however, significant progress has been achieved as compared to the First National Communication, both in terms of the number of themes addressed as well as in terms of the methodological approach used.

Project Ideas Identified within the Framework of the Second National Communication

Enormous difficulties plagued the data collection activities undertaken in designing Cameroon's second national communication. Project ideas reflect these worries, questions and uncertainties which are of various types, technological, political and administrative, and which require systematic and coherent solutions. Project ideas essentially deal with the weakest spots that represent threats and risks in the implementation of the United Nations Framework Convention on Climate Change: capacity building, greenhouse gas inventories and mitigation measures, and, vulnerability analysis and adaptation.

The basic preoccupation pervading these project ideas is sustainability of the process and results on stable, differentiated and reinforced institutional bases. Project ideas constitute an urgent call for the sustained mobilisation of additional resources to enable Cameroon, a vulnerable developing country seeking emergence by 2035, due to the natural circumstances that are most sensitive to extreme variations in climate, protection against irreversible degradation of its population or natural ecosystems. It should be noted that the prospects afforded by the country's resources make the problem of Technology Transfer a crucial one, especially in the energy sector.

Cameroon's projects are identified within the framework of the NPACC whose preparation and realisation coincided with those of the second national communication on climate change. The NPACC has four strategic lines of action covering 12 sectors and can be broken down into 5 cross-cutting projects costing a total of 29 million Euros and 15 sectoral projects costing a total of 89 million Euros. These actions will take place in stages over the entire duration of the plan, from 2015 to 2020. The vast majority of the actions will be undertaken during the first three years. There is no possibility of making any evaluation of the financial cost for all the measures, but funding the 20 priority projects identified should enable the achievement of the results. It is important to note that REDD projects are an integral part of this.

Capacity building, research and systematic observation, as well as information, sensitization, education and training needs have also been formulated and presented in the NPACC, in the form of projects which for the most part, have a cost estimate.

Shortcomings and Constraints Observed

Several shortcomings can prevent or slow down the implementation of the UNFCCC. Regarding law and regulations, there are difficulties in the operationalisation of ONACC (National Climate Change Observatory). At the institutional level, the national structure in charge of implementing the Convention has not yet been given an adequate financial and material capacity to fulfil its UNFCCC mission. It should also be noted that awareness on the developmental stakes of climate change is insufficient and because of this, the "climate change" dimension has not yet been taken into account in some national development policies and strategies (GESP, PRSP). From the technical perspective, the lack of sufficient and dependable data and qualitative and quantitative shortage of national technical expertise, and the insufficient nature of financial contributions should be noted. All the same, MINEPDED has financed the restoration of some twenty climate stations in the national network; other state owned stations are waiting funding.

Financial, Technical and Human Resource Needs

Identified needs include:

- funding for the implementation of priority projects;
- operational capacity building for institutions and experts;
- information and education of the public.