



COORDINATION OF  
THE THIRD NATIONAL  
COMMUNICATION

TNC- CAR



2022



**THIRD NATIONAL COMMUNICATION OF  
THE CENTRAL AFRICAN REPUBLIC**

**Under the United Nations Framework Convention on Climate Change**



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<b>AFOLU</b>	Agriculture, Forestry and other Land Uses
<b>AGDRF</b>	Agency for Sustainable Management of Forest Resources
<b>ANDE</b>	National Agency for Livestock Development
<b>ANEA</b>	Agence Nationale de l'Eau et de l'Assainissement en milieu rural
<b>ARV</b>	Antiretrovirals
<b>ASECNA</b>	Agence de Sécurisation de la Navigation Aérienne en Afrique et à Madagascar
<b>BAD</b>	African Development Bank
<b>BCR</b>	Central Bureau of Census
<b>BIVAC RCA</b>	International Trade Agreement Verification Office in CAR
<b>BTP</b>	Buildings and Public Works
<b>BUR 1</b>	Biennial Update Report / Rapport Biennal actualisé
<b>CCNUCC</b>	United Nations Framework Convention on Climate Change
<b>CDN</b>	Nationally Determined Contributions
<b>CEMAC</b>	Economic and Monetary Community of Central African States
<b>CENTRAPALM</b>	La Centrafricaine des Palmiers
<b>CFA</b>	African Financial Community
<b>CNC</b>	National Climate Coordination
<b>CNI</b>	Initial National Communication
<b>COI</b>	Indian Ocean Commission
<b>COMIFAC</b>	Central African Forestry Commission
<b>CVCA</b>	Climate Change Vulnerability and Adaptive Capacity Analysis
<b>DDRR</b>	Disarmament, Demobilization, Reintegration and Repatriation
<b>DPEN</b>	National Energy Policy Document
<b>DSM</b>	Municipal Solid Waste
<b>DSRP</b>	Poverty Reduction Strategy Paper
<b>ECASEB</b>	Central African Survey for Monitoring and Evaluation of Welfare
<b>ENERCA</b>	Central African Energy

<b>EUFOR</b>	European Union Forces
<b>FAO</b>	World Food and Agriculture Organization
<b>FDF</b>	Forestry Development Fund
<b>FEM</b>	Global Environment Facility
<b>FIT</b>	Intertropical Front
<b>FMI</b>	International Monetary Fund
<b>FNE</b>	National Environment Fund
<b>GEF</b>	Global Environment Facility
<b>GPL</b>	Liquefied Petroleum Gas
<b>GES</b>	Greenhouse Gases
<b>GIC</b>	International Contact Group
<b>GIEC</b>	Intergovernmental Panel on Climate Change
<b>GPE</b>	Global Partnership for Education
<b>GWP</b>	Global Water Partnership
<b>HUSACA</b>	Central African Oil and Soap Factory
<b>ICA</b>	Central African Printing Company
<b>ICASEES</b>	Central African Institute of Statistics and Economic and Social Studies
<b>ICRA</b>	Central African Institute of Agronomic Research
<b>IDH</b>	Human Development Index
<b>IFB</b>	Forestry Industry
<b>IGES</b>	Greenhouse Gas Inventory
<b>INDC</b>	Intended Nationally Determined Contributions
<b>KM5</b>	Kilometre 5
<b>KtCO<sub>2</sub>éq</b>	Kilotonnes of CO <sub>2</sub> equivalent
<b>LACCEG</b>	Laboratory of Cartography, Climatology and Geographic Studies
<b>MEED</b>	Ministry of Environment and Sustainable Development
<b>MICS</b>	Multiple Indicator Cluster Surveys/ Enquête à Indicateurs multiples
<b>MINUSCA</b>	United Nations Multidimensional Integrated Stabilisation Mission in the Central African Republic
<b>MISCA</b>	Inter-African Stabilisation Mission in the Central African Republic

<b>MSF</b>	Médecins Sans Frontières
<b>Mtep</b>	Million tons of oil equivalent
<b>MW</b>	Megawatt
<b>MWA</b>	Megawatt Ampere
<b>NAMA</b>	Nationally Appropriate Mitigation Action
<b>OCHA</b>	Office for the Coordination of Humanitarian Affairs
<b>ODD</b>	Sustainable Development Goals
<b>OMD</b>	Millennium Development Goals
<b>ONG</b>	Non-Governmental Organisation
<b>ONI</b>	Office National de l'Informatique
<b>ONM</b>	Office National du Matériel
<b>PARPAF</b>	Project to Support the Implementation of Forest Management Plans
<b>PEA</b>	Exploitation and Management Permits
<b>PFNL</b>	Non-timber forest products
<b>PIB</b>	Gross Domestic Product
<b>PME</b>	World Education Programme
<b>PNAE</b>	National Environmental Action Plan
<b>PNB</b>	Gross National Product
<b>PNUD</b>	United Nations Development Programme
<b>PNUE</b>	United Nations Environment Programme
<b>PPTE</b>	Heavily Indebted Poor Country
<b>PTF</b>	Technical and Financial Partner
<b>PSO-CC</b>	Strategic and Operational Planning of Climate Change Responses
<b>PTME</b>	Prevention of Mother-to-Child Transmission of HIV
<b>PURD</b>	Emergency Reconstruction and Development Programme
<b>PURISU</b>	Emergency Rehabilitation and Urban Infrastructure and Services Project.
<b>RCA</b>	Central African Republic
<b>RCP</b>	Representative Concentration Pathway
<b>RCPCA</b>	Plan de Relèvement et de Consolidation de la Paix en Centrafrique
<b>RDC</b>	Democratic Republic of Congo

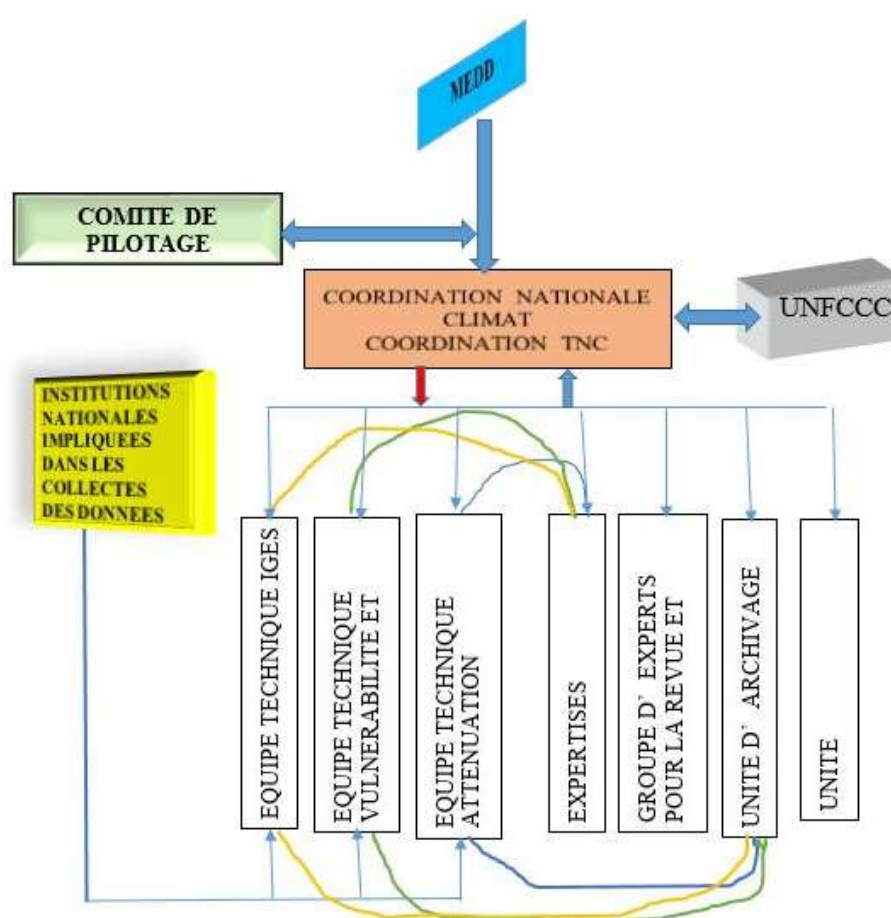
<b>RGPH</b>	Recensement Général de la Population et de l'Habitat
<b>SCAD</b>	Société Centrafricaine de Déroulage
<b>SCN</b>	Second National Communication
<b>SCT</b>	Traditional Knowledge and Skills
<b>SDRASA</b>	Strategy for Rural Development, Agriculture and Food Security
<b>SEDS</b>	Solid Waste Disposal Site
<b>SEFCA</b>	Société d'Exploitation Forestière Centrafricaine
<b>SIDA</b>	Acquired Immunodeficiency Syndrome
<b>SIE</b>	Energy Information System
<b>SOCACIG</b>	Central African Cigarette Company
<b>SOCAGI</b>	Central African Industrial Gas Company
<b>SOCASP</b>	Central African Petroleum Products Storage Company
<b>SOCATEL</b>	Central African Telecommunications Company
<b>SOCATRAF</b>	Central African River Transport Company
<b>SODECA</b>	Société de Distribution d'Eau en Centrafrique
<b>SUCAF</b>	Central African Sugar Company
<b>TCN</b>	Third National Communication
<b>Tep</b>	Tonne of oil equivalent
<b>THIMO</b>	Travaux à Haute Intensité de Main d'Oeuvre
<b>UNHCR</b>	United Nations High Commissioner for Refugees
<b>UNICEF</b>	United Nations Children's Fund
<b>USD</b>	United States Dollar/Dollar des Etats-Unis d'Amérique
<b>UTCAT</b>	Land Use and Land Use Change
<b>UTCATF</b>	Land Use, Land Use Change and Forestry
<b>VBG</b>	Gender Based Violence
<b>VIH</b>	Human Immunodeficiency Virus
<b>WRI</b>	World Institute Resources
<b>WWF</b>	World Wide Fund for Nature

# EXECUTIVE SUMMARY

## 1. National circumstance

- Institutional arrangement and environmental governance

The Ministry of Environment and Sustainable Development of the Central African Republic has as its main missions, the design, development and implementation of the Government's policy on the Environment and Sustainable Development. As such, all the activities developed within the framework of this third national communication are under its responsibility. At the operational level, the National Climate Coordination, a structure under the supervision of the MEDD whose mission is the development and strategic orientation of the national policy on climate change and the Project Steering Committee have been involved.



- Geographical context

With a surface area of 628,000 km<sup>2</sup>, the Central African Republic is a country with a relief made up of mountain massifs, with the highest peak, Mount Ngaoui (1,410 m), covering 3% of the country, plateaus occupying almost three-quarters of the country's surface area, and plains covering 30% of the territory. In terms of hydrography, the country is the water tower of Central Africa, with its two river basins. The Ubangi basin and the Chari-Logone basin. In terms of

vegetation, the country can be divided into 5 domains running from south to north, according to a phytogeographical scale: dense rainforest; flooded forest; wooded savannah; shrub savannah and steppe. There is a diversity of soils in the Central African Republic. These vary according to climate, relief and vegetation. Ferralitic soils cover three-quarters of the country, as do tropical ferruginous soils, alluvial and hydromorphic soils and river valley soils. As far as the climate is concerned, there are two seasons: the dry season and the rainy season. Average annual temperatures range from 23°C in the south to 26°C in the north, and there are 5 main climate zones: the Guinean Forest zone; the Sudano-Obanguinean zone; the Sudano-Guinean zone; the Sudano-Sahelian zone; and the Sahelian zone.

- Socio-economic context

CAR remains a sparsely populated country. The 2016 population estimate based on the 2003 General Census of Population and Housing (RGPH03) gives a population of 5.3 million, 62% of whom live in rural areas. Contexte socioéconomique

Table 1: Demographic growth

RUBRIQUE	INDICATEURS
Population	5,3 millions habitants
Taux de Croissance	1,8%
Mortalité infantile	112 p/1000
Mortalité infantile de moins de 5 ans	173 p/1000 naissances
Mortalité Maternelle	980/100 000
Esperance de vie à la naissance	47,7 ans

CAR's economy is characterized by the predominance of agriculture, which is the main activity of over 80% of the population. It should be noted that this agriculture has low labor productivity due to rudimentary tools, slash-and-burn agriculture and the almost total absence of inputs and improved seeds. The CAR is rich in mining potential: diamonds, gold, uranium, iron, limestone and copper are all untapped, with the exception of gold and diamonds. With an almost non-existent secondary sector, the country is dependent on imports of manufacturing and other products, mainly from Europe, the USA and CEMAC countries. Political and military crises have had a considerable impact on the country's economy. The improvement in the country's revenue from exports of products such as diamonds, gold and timber has prevented it from meeting its sovereign expenditure, forcing it to rely on budgetary aid and other bi- and multilateral financing. The government has presented to the donor community the Recovery and Peace Consolidation Plan for the Central African Republic (RCPCA), the three pillars of which are : Supporting peace, security and reconciliation; Renewing the social contract between the State and the population; Ensuring economic recovery and relaunching the productive sector. The positive reception given to the RCPCA, the lifting of the diamond embargo, the consolidation of public finances resulting in improved tax and customs revenues, and the resumption of budgetary aid are encouraging signs for the future. The fight against insecurity, the promotion of reconciliation and the implementation of an effective economic policy should help to improve the standard of living of the population, most of whom live below the poverty line and suffer from high unemployment.

The health sector is faced with: (a) insufficient vaccination coverage, (b) one of the highest maternal and infant mortality rates in the world, (c) low prevalence of modern contraception, (d) a high teenage fertility rate, and (e) a high proportion of early marriages among girls aged 15-19. In response to these issues, a Health Sector Transition Plan 2015-2016 was drawn up and adopted in 2015. In addition to health issues, there is also the question of nutrition. The military-political crisis has eroded food reserves, reduced agricultural production and limited population movements, resulting in the development of severe acute malnutrition and moderate acute malnutrition.

With regard to HIV AIDS, there has been a decline in the prevalence rate among adults. In 2015, HIV prevalence was estimated at 4.1%, compared with 6.2% in 2006. This rate is the highest in the sub-region among people aged 15 to 49. The epidemic is therefore generalized. Seroprevalence is higher in urban areas (7.9%) than in rural areas (2.9%). This trend is observed among women (10.3% vs. 3.7%), men (4.8% vs. 1.9%) and young people (4.4% vs. 1.6%). Women are infected at a younger age than men. In 2014, it can be seen that significant percentages of health facilities dedicated to people living with HIV AIDS are not operational.

The rate of satisfaction of drinking water needs remains low (around 34%). This rate falls to 10% for sanitation. Generally speaking, when it comes to access to drinking water and sanitation services, urban populations are better off than those in rural areas.

Problems facing the education sector include access to education, a shortage of teachers, a shortage of classrooms and the quality of teaching. While indicators in this sector were improving significantly, there was a break in 2013 at the height of the military-political crisis. The government has therefore developed a transition plan which aims to: Facilitate the transition from emergency activities to normal teaching conditions; Ensure that the primary and secondary education system is able to reach the level of results achieved before the 2013 crisis in terms of school access and quality, and restore the capacity of education authorities to develop long-term education perspectives and sector strategies. Technical and financial partners such as UNICEF, the ADB and the World Bank have supported the country in improving this sector.

An examination of the country's gender profile reveals that there is still work to be done in the area of gender. It is worth highlighting the adoption and promulgation of the law on male/female parity in December 2016.

Unemployment affects 24% of the population, with a high rate in urban areas.

Faced with a series of shortcomings in the Housing and Construction sector, the government is planning to build decent housing for the population; make serviced plots of land available to the population; and, implement urbanization plans for towns. These programs are hampered by security concerns in the target localities.

- **Political context**

The organization and functioning of the Central African State are based on the Constitution of March 16, 2016. The presidential and legislative elections that followed the adoption of this law marked a return to constitutional order after years of exception. Political parties and associations are leading political life and enjoying the freedom of expression enshrined in the new constitution. Decentralization and regionalization, begun 25 years ago, are slow to take effect.

The CAR has experienced decades of political crisis and instability, the most devastating of which was triggered by the disputed re-election of the former president in 2011. A coalition of rebel movements eventually seized power, and negotiations took place to set up transitional institutions that would lead to a return to constitutional order after the 2016 elections. Professor Faustin Archange TOUADERA, elected President of the Republic, and his government drew up an RCPCA (Plan de Relèvement et de la Consolidation Paix en Centrafrique) with the following objectives: Support peace, security and reconciliation; Renew the social contract between the State and the population; and Ensure economic recovery and the revival of productive sectors. Associated with the socio-economic challenges facing the government are security issues, with armed groups scouring a significant number of the country's towns and villages. Negotiations with armed groups and opposition political parties have led to the following agreements

- Environmental profile

CAR has abundant natural resources and a diversity of agro-ecological zones linked to its relief and rainfall. Its extensive hydrographic network and good availability of fresh water provide sufficient space for agriculture and livestock farming. Four agro-ecological zones are known, namely The forest or equatorial zone, known as the forest-coffee zone; the Guinean zone, known as the food-producing-livestock zone; the Sudano-Guinean zone, known as the cotton-production-livestock zone and the Sudano-Sahelian zone, known as the hunting and tourism zone.

Achievement of the MDGs was compromised by the country's military and political crises. Nevertheless, CAR has embarked on the implementation of the MDGs by pursuing and strengthening institutional and legal provisions and developing projects and programs that promote sustainable development.

CAR has signed and ratified the main Multilateral Environmental Agreements. Its legal arsenal also includes codes and laws designed to protect the environment.

Five sectors are considered to have the greatest impact on CAR's GHG emissions. These are: Energy, Agriculture, Transport, Industry, Mining and Waste. Also in terms of vulnerability to the effects of climate change, the following sectors are the most impacted: Water resources; Agriculture; Fishing; Forestry; Health and Tourism.

## ***2. National greenhouse gas inventory***

- National greenhouse gas inventory framework

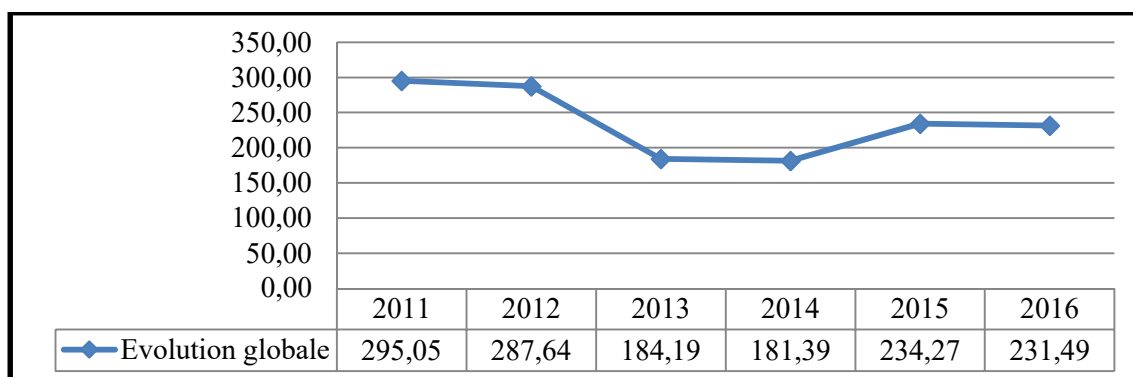
With the creation of the National Climate Coordination in 2017, CAR now has a structure dedicated exclusively to climate change issues. This structure, which is in charge of GHG inventories, is supposed to work with a team of experts and national institutions, including ICASSES, to produce periodic climate statistics for CAR, including GHG inventories. However, these activities are only developed if a project is financed.

- National anthropogenic emission registers and greenhouse gas inventories

Emissions from the energy sector come from fueling activities and fugitive hydrocarbon emissions. The fuels concerned are petroleum products (Super, Gasoil, Kerosene, Jet A1, Fuel

and LPG (Liquefied Petroleum Gas) and biomass consumed in Other sectors and the energy industry (for information).

Figure 7: Overall trend in GHG emissions from the Energy sector (in Gg)



The Industrial Processes and Product Use (IPUP) sector covers greenhouse gas emissions from industrial processes, solvent use and non-energy fossil fuel carbon emissions. The two main gases emitted in this sector are CO<sub>2</sub> and non-metallic volatile organic compounds (NMVOC).

Figure 12: CO<sub>2</sub> emissions from lubricant use and soda ash use

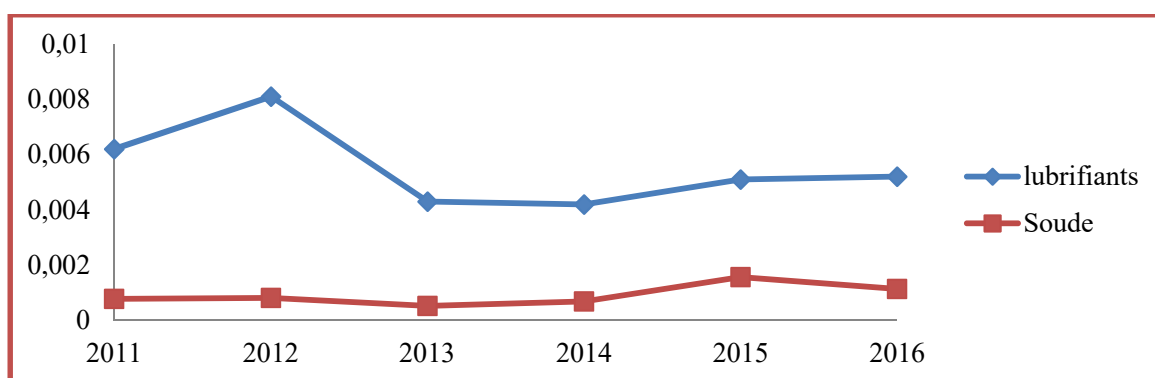


Figure 13: NMVOC emissions from asphalt uses, food and beverages

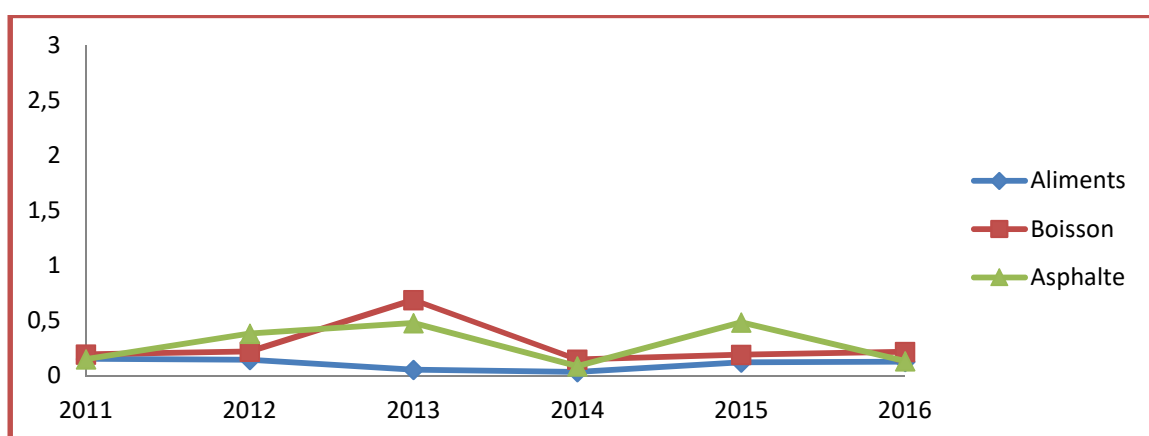
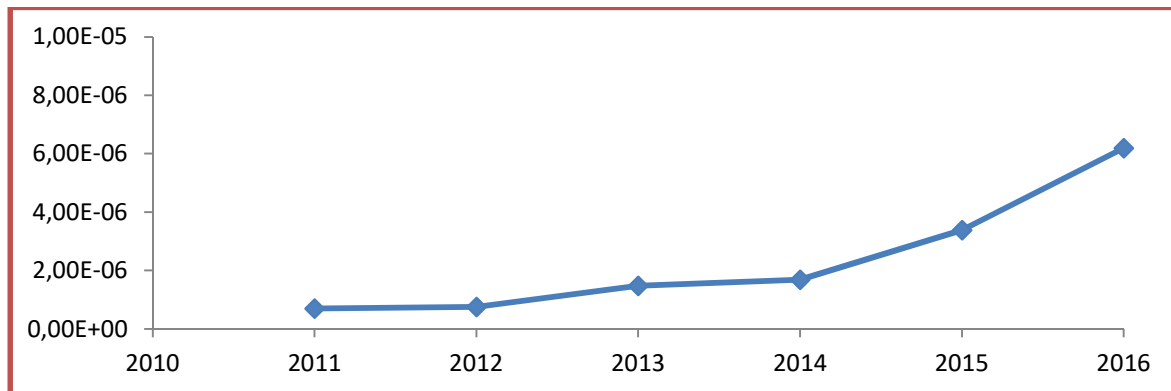
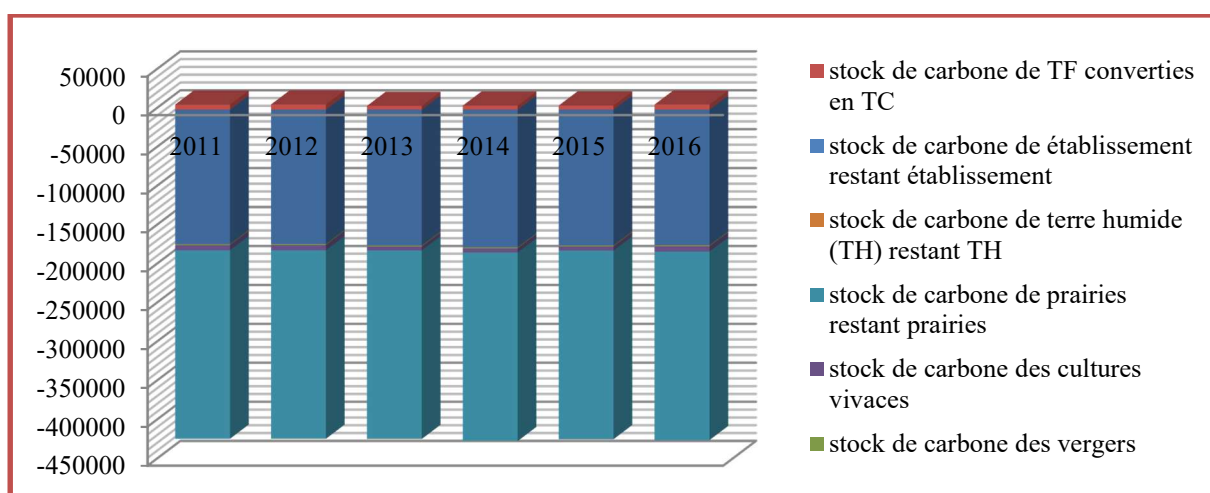


Figure 14: HFC emissions from the use of refrigerators and air conditioners

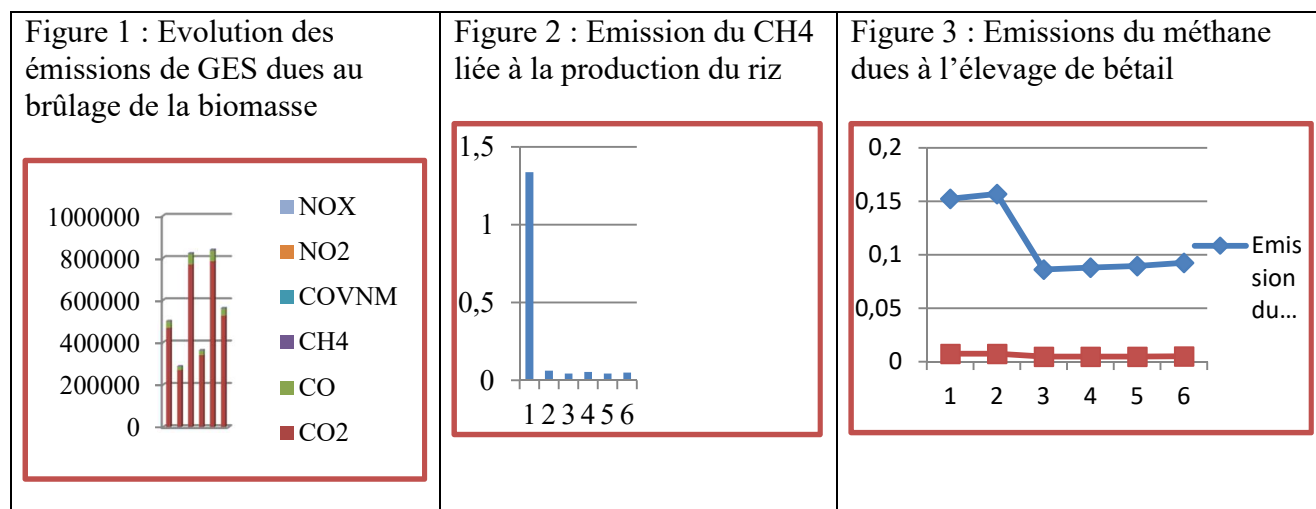


The Agriculture, Forestry and Land Use (AFAT) sector is a carbon sink. With the country's extensive vegetation cover, the rate of carbon sequestration by forest and cropland is just as high.

Figure 15: CO2 emissions due to land use



Biomass burning and agricultural practices (rice cultivation and livestock breeding) are also responsible for emissions.



Emissions from the waste sector come mainly from municipal solid waste and domestic and industrial wastewater, and concern CH4 and O2.

Figure 20: CH4 emissions from waste management (Gg)

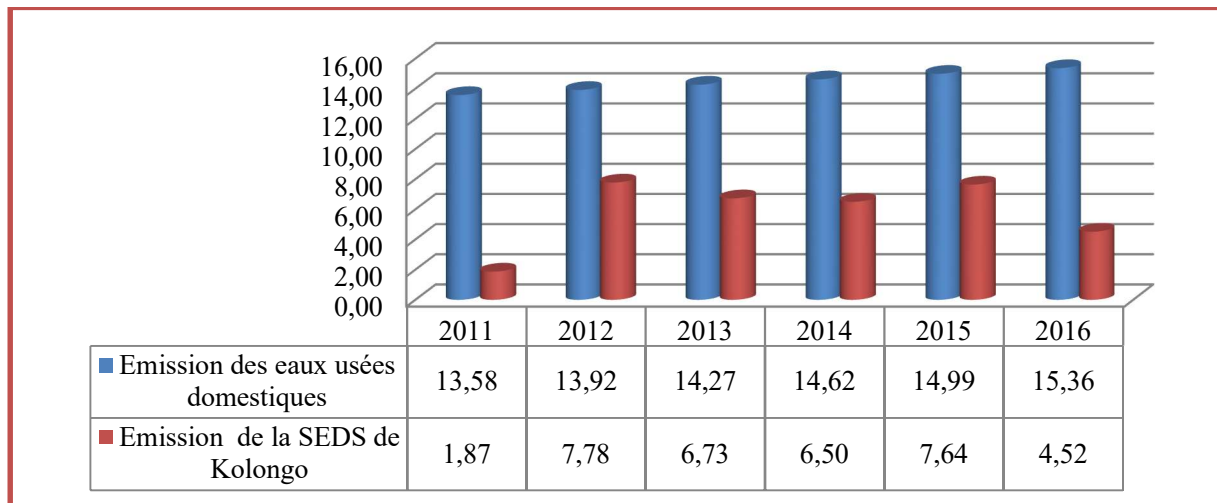


Figure 21: Carbon dioxide (Gg) emissions from open-air combustion

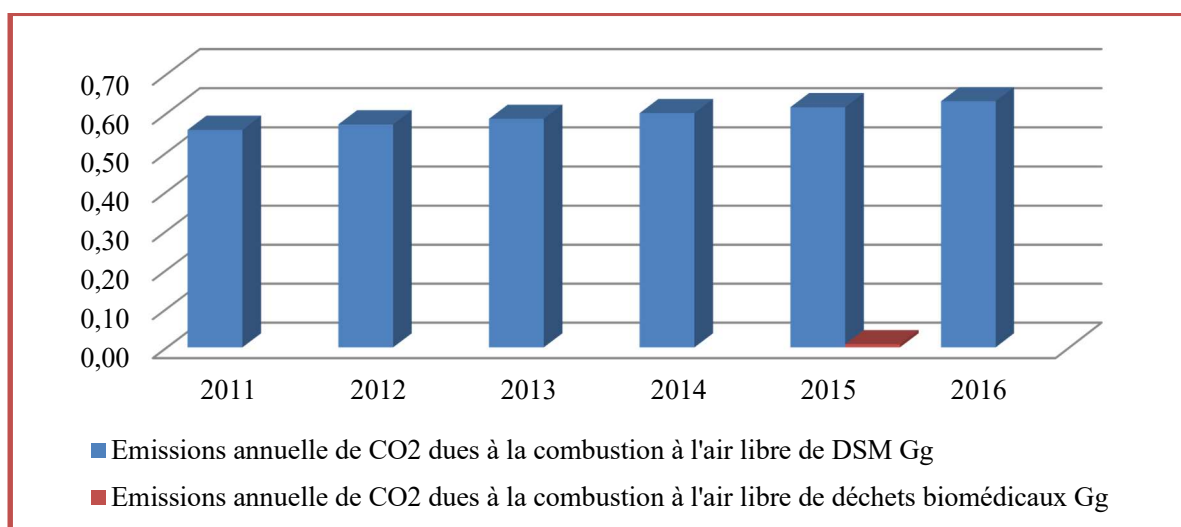
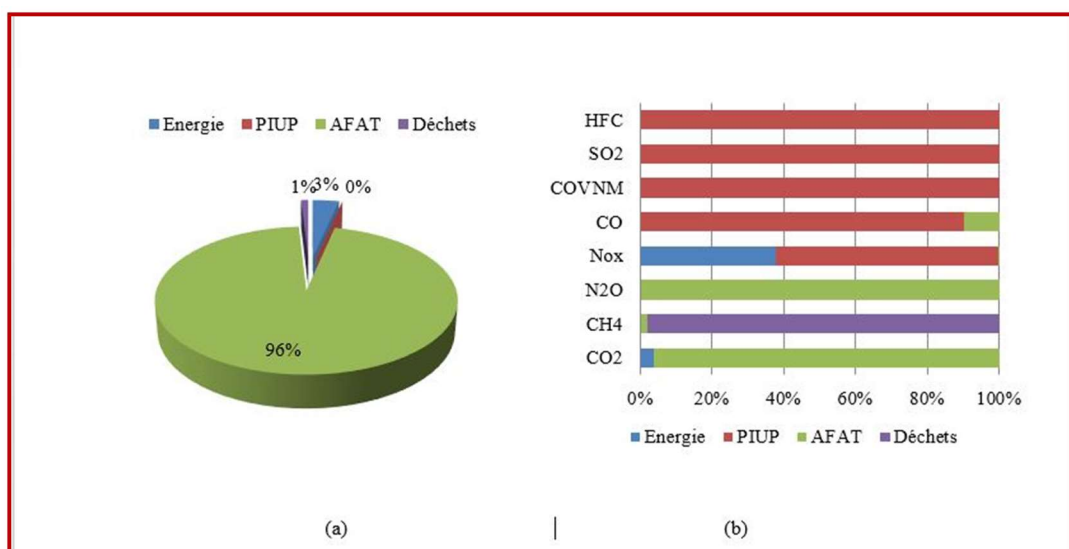


Figure 22 Sectoral contributions (a) to total anthropogenic emissions and (b) to individual greenhouse gases



### 3. Policies and measures to mitigate climate change

The methodological approach adopted for the adoption of policies and measures aimed at mitigating climate change consisted in carrying out preliminary investigations into the scope of benefits, defining the projection horizon, identifying the various partners relevant to the feasibility of the projects identified, and monitoring and evaluating mitigation measures. Deforestation drivers and the impact of population growth were analyzed. Emissions have also been quantified in relation to the previously established reference scenario. The proposed measures are not only in line with the country's target SDGs, but also take into account the RCPCA, ongoing programs and key documents that reflect the country's commitment to combating climate change.

The table below summarizes the projects recommended in each sector examined.

Table 23: Sectoral mitigation projects

N°	Secteur	Mesures d'Atténuation	Impacts
1	Forestry, Spatial Planning and Energy	Restoration of Bangui's urban and peri-urban forest landscapes	reducing emissions from the forestry sector in Bangui and the surrounding area.
2	Land and forest use	Reducing Emissions from Deforestation and Forest Degradation (REDD+) in CAR	This measure will make it possible to avoid greenhouse gas (GHG) emissions due to deforestation and forest degradation, and at the same time facilitate carbon sequestration.
3	Energy	Dimoli hydroelectric scheme (Sosso-Nakombo sub-prefecture) in the Central African Republic	<ul style="list-style-type: none"> <li>- Reducing greenhouse gas (GHG) emissions</li> <li>- Promote low-cost technology</li> <li>- Electrification of three prefectures (Mambéré Kadéi, Nana Mambéré and Sangha-Mbaéré)</li> </ul>
4	Energy	Renewable energy production and energy efficiency in CAR	production of renewable energy technologies (biofuel, biogas, solar energy, etc.)
5	Energy	Promoting solar energy in rural CAR	Greenhouse gas (GHG) reduction Promotion of low-cost technology Electrification of 100 CAR communes

6	Agriculture	Implementing sustainable agriculture in CAR	Contribute to improving the multifunctionality of systems by providing climate change mitigation and adaptation benefits.
7	Forestry	reforestation of degraded ecosystems ;	By 2035, 224,000 ha of wasteland will be reforested (7.12%), based on endogenous knowledge and the needs expressed by local communities.
8	Forestry	protecting wooded ecosystems ;	The mitigation scenario involves protecting 5.2% of forest land area (124,250 ha). Under this condition, carbon stocks will gradually increase as the various anthropogenic pressures on biomass are reduced.
9	AFAT	protecting wooded ecosystems ;	Various projects, notably REDD+, CAFI, PGRN, PRESIBALT, PDRSO and Chinko, are working to promote agroforestry as a potential carbon sink. Based on this hypothesis, the promotion of practices linked to the formalization of agroforestry and community forestry will contribute by 2040 to the mitigation of GHG emissions.

- **Greenhouse gas emission projections 2011 - 2040**

To make the projection of greenhouse gas emissions from 2011 to 2040, it was necessary to use a combination of tools (IPCC 2006 methodology for the energy, PIUP and waste sectors; FAO Ex-Ant Carbon-balance Tool (EX-ACT) for the AFAT sector and LEAP for the analysis of the domestic energy sub-sector) for the analysis of mitigation, population growth and economic evolution. Taking into account the various plausible scenarios, we can estimate CAR's GHG emissions by 2040 in the table below.

## 2.2. Evolution des émissions de GES de la RCA (GgégCO2)

	2011	2015	2020	2025	2030	2035	2040
<b>Emission</b>	11 364,07	7 599,73	13212,69	14141,71	17 644,02	21 146,33	24 648,64
<b>Séquestration</b>	- 754 535,70	-755 077,46	- 757 173,56	- 758 221,61	- 759 269,66	- 760 317,71	- 761 365,76
<b>Net sequestration</b>	- 743 171,63	-743 024,12	-745 439,48	-750 235,63	- 47 477,72	- 745 787,83	- 736 652,99

### 4. Vulnerability and adaptation

In-depth studies have been carried out on the sectors most vulnerable to the effects of climate change in CAR. For each sector considered, the current and future impact of climate hazards was examined. Adaptive capacity was also examined, taking into account political and economic, environmental, social and societal, and governance factors, and coefficients were assigned to help prioritize actions to reduce vulnerability. After analysis and assessment, the table below shows the level of vulnerability by sector.

Sectors	Sensitivity to CC	Exposure to CC	Adaptive capacity	Vulnerability level
<b>Agriculture and food safety</b>	Strong	Strong	Low	Strong
<b>Water Resources and Sanitation</b>	Strong	Strong	Low	Strong
<b>Forests</b>	Medium to high	Strong	Low	Medium to high
<b>Energy</b>	Medium to high	Moyen	Low	Medium to high
<b>Infrastructure and habitats</b>	Strong	Strong	Low	Strong

### 5. Needs for capacity building, technology transfer and project financing of projects

To better contribute to global efforts to reduce GHG emissions and combat the effects of climate change, CAR has a great need for capacity building in several areas. Firstly, there is the need for capacity building in terms of integrating climate change into sectoral policies. Secondly, there is a need for technology transfer to enable proper management of sectors that are vulnerable to the effects of climate change. And finally, there is a need for capacity-building in the field of systemic research and observation. Indeed, teaching, research and data and information production structures are needed to enable the right decisions to be taken.

### 6. Difficulties and shortcomings

Producing the Third National Communication is a tedious exercise, limited by legal, regulatory, institutional, technical and above all financial difficulties. These difficulties are manifested, among other things, in the low technical and team capacities of the institutions responsible for carrying out the studies; the low capacity of observation and research centers; the lack of

availability of reliable, up-to-date data; and the inadequacy of financial resources for carrying out missions and studies, which do not allow the experts to give their best.

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# PREFACE



The issue of climate change has become a major concern for all people today and is a challenge for decision makers. The latter need effective tools to enable them to better take this issue into account in national planning.

Since the Initial National Communication (INC), the Central African Republic has progressively improved the content of its communications through the use of good quality data, more accurate analysis tools and more and better trained experts.

The studies carried out in the framework of the Third National Communication (TCN) on climate change allowed to measure the notable progress and weaknesses of the country in the implementation of the United Nations Framework Convention on Climate Change (UNFCCC). This communication was the occasion to initiate the institutionalization process that covered the Greenhouse Gas Inventory (GIES) and mitigation studies.

The Third National Communication follows the submission by CAR in June 2015 of its Nationally Determined Contribution "INDC" and will be followed by the submission before the end of January 2019 of the first Biennial Update Report "BUR1". This process will be crowned by the elaboration of a National Strategy for Carbon Neutral Development and a National Plan for Adaptation to Climate Change.

With the implementation of all these projects, the Central African Republic will have fulfilled all of its commitments to the UNFCCC and the various decisions of the Conferences of the Parties.

The preparation of this communication benefited from the technical and financial support of the Global Environment Facility (GEF) and the United Nations Environment Programme (UNEP), which is the implementing agency.

The Central African Government, through me, expresses its gratitude to the GEF and UNEP for their support. I would like to take this opportunity to invite our development partners to continue to support the implementation of the actions identified in the TCN in terms of adaptation, mitigation, technology transfer and capacity building to enable the country to contribute more to the global fight against climate change.

I would also like to congratulate and thank the national experts for their mobilization and dedication with which they conducted the various studies.

The CAR will do its utmost to meet its commitments to the UNFCCC. It will mobilize more technical, financial and human resources to continue the implementation of the Convention, in partnership with all national and international development actors.

Le Ministre Chargé de l'Environnement  
et du Développement Durable

LE MINISTRE  
**Thierry KAMACH**

# FOREWORD

In accordance with its obligations as a country party to the United Nations Framework Convention on Climate Change (UNFCCC), the Central African Republic, which ratified this instrument in 1996, after having prepared and submitted the report of its initial communication and that of its second, has set about preparing the Third Communication report, which centralizes all the data and information relating to climate change recorded on its territory.

This report therefore provides an account of the efforts made by the country as well as the measures taken for the implementation of the Convention, specifying the vulnerability of the main development sectors and the socio-economic impact of climate change on these sectors and the environment.

The preparation of the Third National Communication aims to fill the gaps, update and improve the data and knowledge of the first two reports in the field of climate change in CAR. This exercise also allowed for the deepening of the studies carried out on the Greenhouse Gas Inventory (IGES), the Vulnerability and Adaptation Assessment (V&A), and the study of mitigation measures in order to communicate to all stakeholders, the country's efforts in the fight against climate change.

This report is organized into the following six (6) chapters:

Chapter 1: National circumstances

Chapter 2: Inventory of greenhouse gases

Chapter 3: Greenhouse Gas Emissions Projections & Mitigation Measures

Chapter 4: Vulnerability, Impacts & Adaptation Measures

Chapter 5: Technology Transfer, Research & Systematic Observation and Education, training and awareness

Chapter 6: Difficulties, gaps and Integration of climate change concerns into CAR's sustainable development programs.

**Le Coordonnateur de la Troisième  
Communication Nationale**



**Igor Gildas TOLA KOGADOU**



**CHAPITRE I**  
**NATIONAL**  
**CIRCUMSTANCE**

# 1. NATIONAL CIRCUMSTANCE

This chapter essentially aims to present the general context of the Central African Republic and the framework for the development of the Third National Communication under the United Nations Framework Convention on Climate Change (UNFCCC).

It addresses issues specific to the country based on the physical and human environment, the political and socio-economic context. As well as, the profile and determinants of poverty, human and natural capital. Particular emphasis is placed on essential basic social services, including education, health and nutrition, water and sanitation, and housing and infrastructure issues. Finally, this chapter recalls the main challenges to be met by the country in order to achieve the SDGs by 2030.

This information forms the basis of analysis for the various sectoral studies, particularly the greenhouse gas (GHG) inventories, vulnerability and adaptation studies, and mitigation studies carried out under the United Nations Framework Convention on Climate Change (UNFCCC).

## 1.1. Institutional arrangement and environmental governance

This national communication was produced under the coordination of the Ministry of Environment and Sustainable Development and covers the period between 2013 and 2018. The impacts of climate change are very perceptible throughout the country, particularly through the persistence of high heat, violent rains, land degradation, the extension of the duration of the dry season, the increase of drought sequences during the rainy seasons, floods and the recrudescence of certain pathologies.

### 1.2.1. Coordination bodies in relation to climate policy

The Ministry of Environment and Sustainable Development (MEDD) ensures the coherence of the State's action in the field of environment and sustainable development. Given the current political form of the country with 16 prefectures and 20 in the coming years, management competence is ensured both at the central level by the specialized services of the Cabinet of the Ministry in charge of the Environment and by the prefectural inspectors in charge of the issue.

### 1.2.2. Institutional framework for implementation of the UNFCCC

The institutional mechanism for the implementation of the UNFCCC includes the following main bodies: (i) the Ministry of the Environment and Sustainable Development; (ii) the Directorate General of the Environment; and (iii) the National Climate Coordination (CN-Climat), the national agency for the implementation of the UNFCCC.

The National Climate Coordination (CN-Climat), a governmental body for international negotiations, ensures the coordination of climate change-related actions in CAR. It has a central role to play in the implementation of the climate policy. Its projects and activities are prepared and executed, under the supervision of the department in charge of the Environment and Sustainable Development, by different project coordination units and working groups, which depend on the Steering Committee of the National Environment Policy and in which representatives of various ministries, universities, research centers and civil society sit.

### 1.2.3. Links with development policies

#### ❖ The National Recovery and Peace building Plan

Developed in 2016 for a period from 2017 to 2021, this plan is primarily aimed at helping the Central African Republic recover and develop after a long socio-political crisis with significant negative impacts. The plan is structured around three priority pillars and six priority cross-cutting objectives, including ensuring environmental sustainability and the sustainable use of natural resources. The effective implementation of this plan relies on a combination of different financing modalities and instruments. Although climate finance is not clearly identified in this document, in general terms, these modalities are as follows

- The national budget (including direct budget support), which will need to serve as the primary funding channel to ensure the sustainability of recovery efforts over time and to cover the recurrent costs associated with restoring public capacity and services;
- Grants and subsidies earmarked for specific programmatic areas under the special programs of donors and international financial institutions, such as the AfDB, IMF and World Bank;
- Loan instruments, the volume of which remains limited in CAR;
- Private sector financing and instruments: foreign direct investment is essential to stimulate economic recovery and lay the foundations for sustainable development and long-term stability.

#### ❖ **Nationally Determined Contributions (revised NDC)**

The revision of the Nationally Determined Contribution (NDC) builds on the achievements of the first generation of NDCs and improves it significantly from a methodological perspective.

It is based on the probable consequences of climate variations and changes projected to 2030, the evolution to date of greenhouse gas emissions and absorptions, the existing and potential impacts and vulnerabilities, in order to :

- Describe a trend scenario (or Business as Usual Scenario-BAU) of greenhouse gas emissions over the 2010-2030 cycle in the most emitting sectors: Energy; Agriculture, forestry and other land uses (AFAT); Industrial processes; Waste;
- Propose mitigation measures likely to bend the trend curve according to an unconditional scenario (investments made by the State) and a conditional scenario (additional investment needs required from the international community)
- Identify, according to a conditional scenario and an unconditional scenario, adaptation measures in the most vulnerable sectors (Agriculture, Energy, Forestry, Water Resources, Health, Land use, Infrastructure and Housing), in coherence with the objectives pursued by the sectoral planning.

Thus, according to the trend scenario, the evolution of greenhouse gas emissions is from 10,040 GgeCO<sub>2</sub> in 2010 to 14,141 GgeqCO<sub>2</sub> in 2025 and 17,644 GgeqCO<sub>2</sub> in 2030. The sequestration capacity over the same time frame is 730,714 GgCO<sub>2</sub> and 733,607 GgCO<sub>2</sub> respectively.

The mitigation measures taken will generate, according to the unconditional scenario, a reduction in greenhouse gas emissions of 9.03% and 11.82% respectively by 2025 and 2030 compared to the baseline situation; and according to the conditional scenario 14.64% and 24.28% by 2025 and 2030 compared to the baseline situation

## ❖ **Strategic and operational planning document for climate change**

Validated during a workshop in late August 2017, in Bangui, this document aims to provide the government, under the coordination of the Ministry of Environment, Sustainable Development, Water, Forestry, Hunting and Fishing, with the necessary means for its climate change policy for the period 2017-2020 and with concrete proposals for climate finance.

To ensure the financing of the Strategic Operational Planning (POS-CC), it is proposed to design a financing strategy based on the priorities and the budget of the State; the integration of international financial mechanisms on climate change likely to be put to contribution and the enlargement to all stakeholders other than the State (civil society, private sector, community of donors).

## ❖ **The National Recovery and Peacebuilding Plan (RCPCA)**

In May 2016, the Government of CAR requested support from the European Union, the United Nations and the World Bank Group to carry out the Recovery and Peacebuilding Needs Assessment (RCPCA). This enabled the Government to have a five-year plan 2017-2021 which is structured around three (3) priority pillars and 11 strategic objectives. The six cross-cutting objectives of the RCPCA include: mitigating regional imbalances, promoting gender equality, strengthening transparency and accountability at all levels, increasing national capacity (civil service and civil society); promoting youth inclusion, ensuring environmental sustainability and sustainable exploitation of natural resources.

The first pillar aims to restore peace, security and reconciliation, which are fundamental factors for recovery and normalization. It includes four strategic axes: Supporting the reduction of violence through the disarmament and reintegration of ex-combatants and children associated with armed groups; Promoting stability through security sector reform; Reforming the judiciary and promoting the fin of impunity; Facilitating reconciliation and social cohesion; and Putting in place conditions for the return of refugees and durable solutions for displaced persons.

The second pillar aims to renew the social contract between the state and the population, by strengthening its presence and developing its ability to provide basic social services such as education, health, water and sanitation. It covers four strategic axes: Redeploying the administration throughout the country and establishing inclusive local governance; Providing basic services to the population throughout the country, particularly in the areas of education, health and water, by gradually transferring capacities and means to national structures; Ensuring food security and resilience; Strengthening good governance (macroeconomic stability, management and control of public finances, fiscal revenues, fight against corruption).

The third pillar aims to promote economic recovery and revive the productive sectors, in order to rapidly provide the population with income-generating activities and employment opportunities in the major productive sectors, as well as to make investments that will further stimulate the business and investment climate. It has three strategic thrusts: Reviving and developing the productive sectors (agriculture and livestock, mining and forestry); Rehabilitating and building infrastructure (especially transport, electricity and communication networks); and Ensuring conditions conducive to private sector development and employment (improved business support and financial services, vocational training, entrepreneurship and employment).

## ❖ **Policy documents for the forestry sector**

### *(i) The national forest policy document*

After many years without a defined forestry policy, the Government wished to equip itself with a national forestry policy, in accordance with the axes set out in the RCPCA and the commitments made by the CAR via international agreements. This document must guide and determine present and future decisions and actions. This will was carried out within a framework of consultation and reflection between the actors, conducted between 2015 and 2018. For the elaboration of the national forestry policy, the MEFCP requested FAO expertise through the implementation of the

TCP/CAF/3402 project: "Support to the formulation of the Forestry Policy in CAR". The mission resulted in a semi-finalized version in November 2018 and a final version in 2020 of the National Forest Policy Document, valid for the period 2018-2035.

The forest policy document has 6 strategic axes and 7 cross-cutting axes. The strategic axes include: forest monitoring, sustainable management and development of forests, reforestation, conservation of biological diversity and development of wildlife resources and protected areas, development of fisheries and aquaculture, adaptation and mitigation of climate change while the crosscutting axes include: forest governance, training and capacity building, forest research, communication, awareness raising, information and education, cooperation and partnership, monitoring and evaluation of forest policy and sustainable forest financing.

## **(ii) The VPA/FLEGT process**

The negotiation of the Voluntary Partnership Agreement (VPA) between CAR and the European Union in the framework of Forest Law Enforcement, Governance and Trade in Timber and Timber Products (FLEGT) started in October 2009 and led to the initialling of the agreement on December 21, 2010 in Bangui and its entry into force on July 1, 2012. Aware of the importance of the principle of sustainable forest management, CAR, through the VPA, intends to fight against illegal logging and the associated timber trade. The aim is to improve forest governance and to ensure that timber exported to the European Union, or to other markets outside the EU, is of legal origin, thereby promoting access for Central African timber to the European market.

The VPA allows CAR to

- Improve its sustainable forest management so that all production forest areas have a management plan;
- Contribute to economic growth and the fight against poverty through tax revenues, part of which is retroceded to the communes and communities;
- To create jobs in the wood sector;
- To set up community forests directly managed by the communities;
- To improve governance of the forestry sector by clarifying and simplifying management rules, increasing transparency, using public information and respecting the rights of indigenous and local peoples over resources.

### **❖ Policy documents for the environment sector**

#### ***(i) Strategic and Operational Planning for Climate Change (SOP-CC)***

The PSO-CC document outlines the overall plan for government interventions to increase the resilience of Central African society to climate change. It defines the strategic orientations and governmental priorities to address the main climate risks faced by the different components of society as well as the main economic sectors.

The vision formulated by the CAR in the PSO-CC document covering the period 2017-2020, is that "by 2030, the CAR will be part of a dynamic of sustained, equitable and sustainable socio-economic development because it will integrate the challenges of climate change in all social and productive sectors, which will allow for an improvement in the general well-being of its population" (CNC, 2017). This vision is articulated around 8 policy directions, namely:

- The establishment of anticipatory climate change governance ;
- Public awareness, education, training and capacity building on climate change;

- The promotion of the integration of climate change concepts in all national policy documents and sectoral strategies concerning development planning;
- The strengthening of adaptation actions to the impacts of climate change;
- The promotion of actions to mitigate greenhouse gas emissions (GHG);
- Prevention and management of risks and natural disasters;
- Strengthening research for development, extension and technology transfer, and the generation of appropriate information and data;
- Promotion and strengthening of sub-regional and international cooperation.

The Government's climate change policy, contained in the PSO-CC, targets priority sectors such as: Agriculture and Livestock, Water Resources, Natural Resources (forests, soils and wildlife), Energy, Health and Sanitation, Transport, Land Use Planning, Education, Industries, and Mining and Petroleum.

### ***(ii) The National Action Program for Adaptation to Climate Change***

The NAPA is a set of priority activities defined within the Least Developed Countries that will enable them to cope with climate change. Vulnerability/adaptation studies undertaken throughout the 7 regions of CAR have allowed us to clearly identify sectoral vulnerability throughout the country. These studies have made it possible to highlight that in the Central African Republic, regardless of the region, there are vulnerable sectors that require urgent options to be implemented through appropriate priority activities. Thus, it was highlighted through the public consultations that all regions of CAR are vulnerable to CC. The key sectors vulnerable to climate risks in CAR are: Agriculture and Food Security, Forestry and Agroforestry, Water Resources, Health, Energy and Natural Disasters. The study of sectoral vulnerabilities has made it possible to select priority options that have been translated into priority projects. Thus, a dozen project sheets were developed for urgent implementation in order to adapt the vulnerable populations of the CAR to the adverse effects of climate change.

### ***(iii) The National Biodiversity Strategy and Action Plan***

The CAR developed its National Strategy and Action Plan for Biodiversity (SNPAB) in 2000 for the period 2000 to 2015. The update of the first Biodiversity Conservation Strategy has allowed for the definition of national biodiversity objectives, taking into account the 2011-2020 Aichi Strategic Plan and the main issues for the conservation, sustainable use and fair and equitable sharing of benefits related to the exploitation of biodiversity components, as well as multiple emerging issues such as the REDD+ and FLEGT mechanisms. The vision of the Central African Republic is to act globally, i.e.: "By 2050, biological diversity is known, valued, conserved, restored and wisely used, ensuring the maintenance of ecosystem services, keeping the planet healthy and providing essential benefits to all people. To achieve this, CAR has selected 5 strategic goals for the sustainable management of biological diversity; these goals are broken down into 20 national objectives.

#### **❖ Policy documents for the agriculture/livestock sector**

### **(i) The Rural Development, Agriculture and Food Security Strategy (SDRASA)**

The sectoral strategies developed before the return to constitutional order in 2016 are considered reference documents for CAR. These are the Rural Development, Agriculture and Food Security Strategy (SDRASA, 2011-2015), supplemented by a National Agricultural, Food Security and Nutritional Investment Program (PNIASAN, 2013-2018). The SDRASA's vision is "a productive, profitable, environmentally friendly Central African agriculture, based on local initiatives and the gender concept, creating wealth, conditions for the emergence of a dynamic

agricultural private sector, employment and contributing to poverty reduction and the achievement of food security" (Ministry of Rural Development, 2011).

## **(ii) The National Agricultural Investment, Food Security and Nutrition Program (PNIASAN)**

The development of PNIASAN is part of the overall country process of implementing the Comprehensive Africa Agriculture Development Program (Maputo Declaration of 2003), which is a framework for stimulating/facilitating African countries to achieve 6% annual agricultural growth by 2015, with a commitment by Heads of State to allocate 10% of their national budget to agriculture in order to achieve the MDGs. The PNIASAN has made it possible to (i) translate into operational terms the areas of intervention defined in the SDRASA and PRSP 2; (ii) define and specify the priority investment programs and activities for the agro-sylvo-pastoral and fisheries sector for the next five years; and (iii) link the Government's policy choices in the agricultural sector to the orientations of the Heads of State of the African Union through the CAADP. It takes up the vision of the SDRASA by emphasizing the promotion of agricultural exports (mainly cotton, coffee and palm oil).

The priorities set out in the SDRASA and the PNIASAN remain valid, namely

- The importance of strengthening the agricultural technical services of the MADR (and MESA) at both the central and deconcentrated levels, which also includes improving the information system for the sector;
- Support for food production, including marketing channels and the development of sustainable agricultural practices;
- Support for the revival of agricultural sectors for export, mainly cotton, coffee and palm oil;
- Structuring the professional agricultural sector, particularly through the establishment of cooperatives;
- The World Bank is currently supporting the government in the formulation of a new "Agricultural Policy Document", the first version of which has not yet been presented.

### **1.2.4. Institutional framework for the preparation of the Third National Communication (TCN)**

The process of preparing the TCN benefited from the institutional framework put in place for the preparation of the second national communication. This institutional mechanism is made up of the steering committee and the multidisciplinary team of experts set up for the preparation of the CSS, but which has been revitalized for the preparation of the TCN.

The project coordination unit consists of a National Coordinator and an Administrative and Financial Assistant. This team ensures the daily management of the project. The technical working group is composed of: a GHG Inventory working group in charge of carrying out national inventories of greenhouse gas emissions, in accordance with the obligations of the United Nations Framework Convention on Climate Change, the guidelines and recommendations of the IPCC on greenhouse gas emission inventories. It is composed of multidisciplinary experts from all the specialized administrations and technical institutions. Its main mission is to participate in the preparation of reports and recommendations. It also organizes consultations with the various actors concerned by the IGES. Under the responsibility of a senior national consultant, this group carries out the methodological work related to the progressive and daily estimation of emissions, including the harmonization of methodologies.

The Non-forestry and AFOLU GHG Inventory Working Group is the main working group for the coordination of the estimates of the Energy, Industrial Processes and Other Solvents, Waste,

Agriculture, Livestock and Other Land Use and Forestry sectors. This working group is also responsible for compiling results from all sectors, including LULUCF. Other permanent working groups have been established to support the preparation of the National Communication on specific issues, such as mitigation, vulnerability and adaptation, and gender.

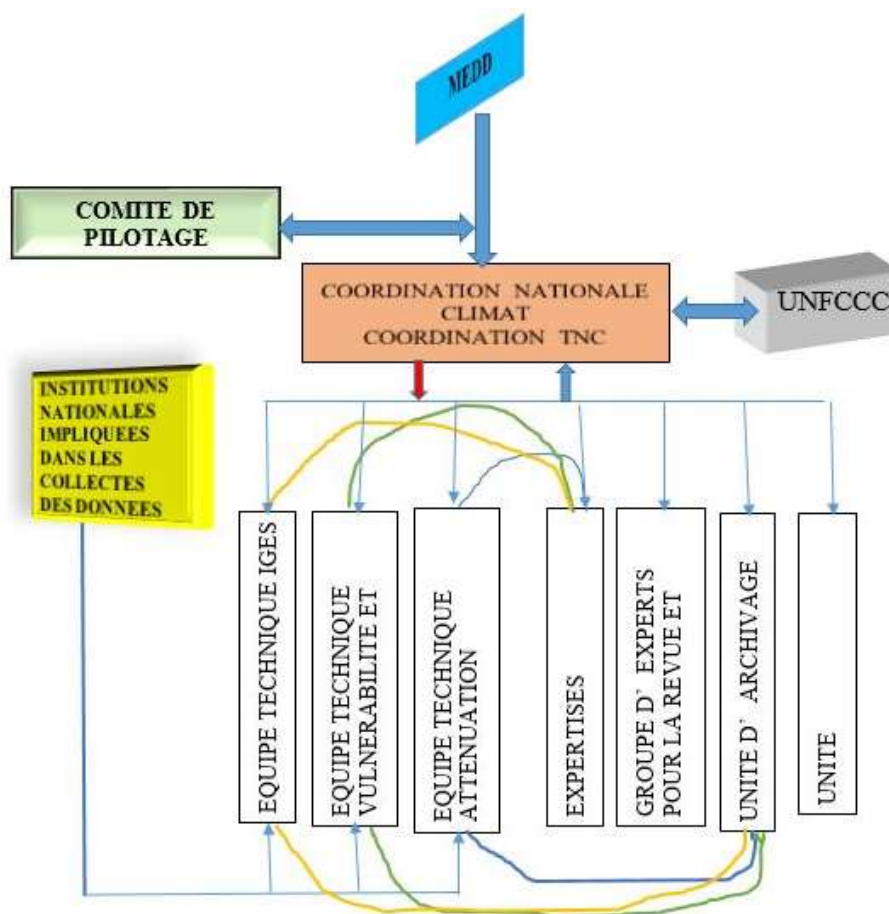


Figure 1: Institutional arrangement

## 1.2. Geographic Context

Located in the heart of the African continent, the Central African Republic (CAR) is a landlocked country in Central Africa with a total area of 622,984 km<sup>2</sup>. It shares 5,203 km of borders with six countries, namely Chad (1,197 km) to the north, Sudan (175 km) and South Sudan (990 km) to the east, Congo (467 km) and the Democratic Republic of Congo (1,577 km) to the south and Cameroon (797 km) to the west.

Administratively, the country is divided into seven regions, sixteen prefectures, 71 sub-prefectures, 175 communes, two administrative control posts and 9,500 villages/neighborhoods. Since 1994, CAR has been engaged in a process of decentralization, with the gradual transfer of decision-making powers to locally elected autonomous bodies such as regional assemblies, prefecture and sub-prefecture councils, and municipal councils. Unfortunately, not all of these bodies have yet been set up due to the misfortunes of this process, linked to recurrent military-political crises and a lack of political will.

Based on the 2003 General Census of Population and Housing (RGPH03), it has a population of 5.3 million in 2016. The country is sparsely populated and the population is unevenly distributed: the population density at the national level is 8.3 inhabitants per square kilometer; it varies from 1 inhabitant per square kilometer in Region 5 (Haute-Kotto, Bamingui-Bangoran and Vakaga) to 1,218 inhabitants per square kilometer in Region 7 (Bangui).

With rich agricultural land and enormous renewable and non-renewable natural resources (immense physical potential, climatic conditions favorable to agriculture) that are under-exploited, CAR is characterized by a subsistence economy with very poor performance, despite the development programs, recovery plans and reform policies for economic stabilization undertaken by the various governments for over two decades.

## 1.2.5. Physical Framework

### 1.2.1.1. Relief and hydrography

#### 1.2.1.1.1. Relief

The territory of the Central African Republic is made up of a vast Precambrian shield like the country in general. It is composed of a succession of flattening surfaces that are delimited by steep slopes. The relief is almost monotonous, that is to say that the altitudes or the distances between the tops of the reliefs vary little.

In a general way, the country goes from 325 m to 1410 m (Mount Ngaoui). These extreme altitudes give a strength of relief of about 1100 m in the northwest-southwest, northwest-southeast, and northwest-north directions. The main relief units in CAR include mountain ranges above 1000 m, plateau areas (1000-500 m) and plain areas (500-300 m).

The mountainous massifs are located in the northwestern and northeastern extremities of the country, and their extension is small, covering 3% of the country. They include reliefs with an altitude of 1,000 m or more. These are:

- In the northwest, the Yadé massif is a real natural water tower on the scale of Central Africa, since it gave rise to the sources of the Chari, Logone, Sangha, Lobaye (Nguimalet\*, 2013).
- Beyond Mount Ngaoui (1,410 m) are the Bakoré massif (1,242 m), not far from the Chadian border, and the Yadé massif (1,309 m). Mount Ngaoui, formed of granitic rocks, dominates a succession of terraced plateaus whose altitudes vary from 1,200-1,100 m to 1,000-900 m.

To the northeast, the Dar Chala massif, another natural water tower, is a group of isolated reliefs that clearly divide the three regional basins, Chadian, Nilotic and Congolese. Their meeting point is located at the source of the Ngaya River, 15 km as the crow flies to the south of the relief bearing the name of this river. The altitudes exceed 1300 m. Mount Toussoro (1330 m) is the highest point, followed by Mount Ngaya (1326 m) and Mount Koubo (1310 m).

The plateau areas occupy nearly three-quarters of the country's surface area. They include both the area raised in its median part, also called the Central African ridge (the Ubangi ridge), which delimits the Chadian high basin in the north and the Congo high basin in the south. These include the Carnot Plateau in the west-southwest and the Mouka-Ouadda Plateau in the east-central part of the country, the Lim-Bocaranga Plateau (1,200-1,100 m) in the northwest, which forms a series of steps, and the lower Bouar-Baboua Surface (1,000-900 m).

**The lowland sectors** occupy 30% of the territory. Their extension is more remarkable in the Central African part of the Chadian basin to the north than in the Congo basin to the south. This is characterized by residual relief such as the Bangui Hills (581 m) or Daouba-Kassaï (600-700 m), and marshy depressions.

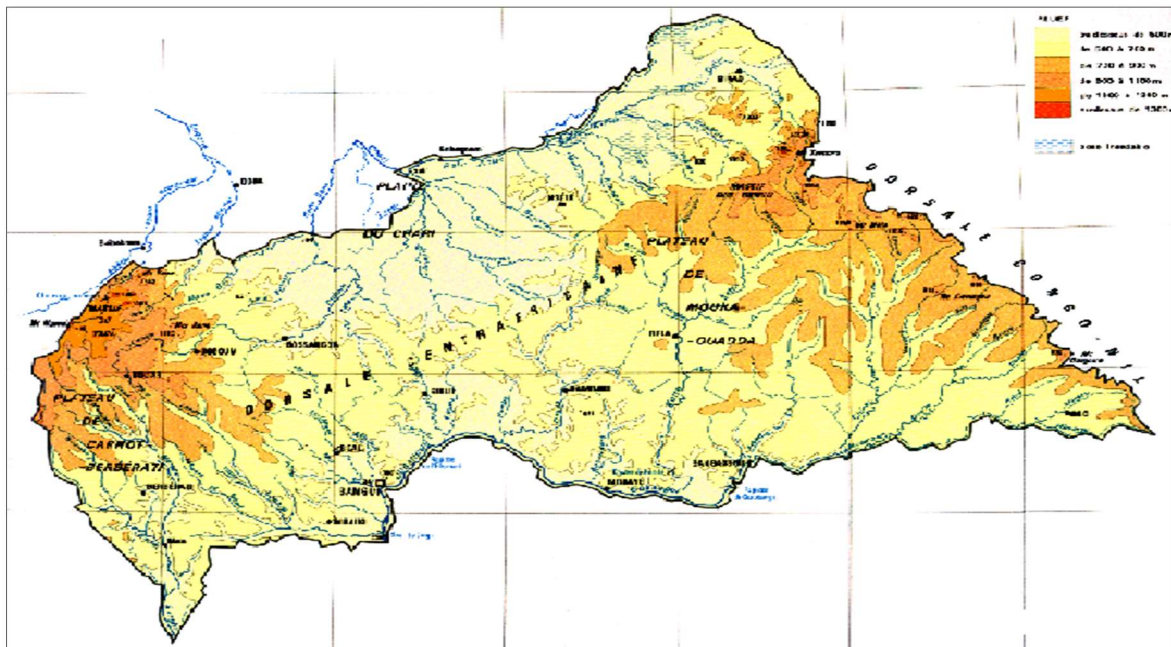


Figure 2: Geophysical map of the CAR

### 1.2.1.1.2. Hydrography

The Central African Republic is divided into two main river basins separated by the Ubangi Ridge: On the one hand, the Ubangi basin, covers the southwest, south and southeast of the country; it has a minimum altitude of 334 meters in an area located at the crossroads of three borders (that of Congo, CAR and Democratic Congo) and on the other hand, the Chari-Logone basin (or Chad basin) which covers the northwest and north of the country, has a minimum altitude point of 376 meters, it is located near the border of Chad in the Bamingui-Bangoran Prefecture. In addition to these two main basins, there is the Nile basin in the far east (Bar el Ghazal).

A landscape of hills, plains and forest, the Central African Republic is a real water tower for Central Africa. In addition to the two main rivers, the Ubangi and the Chari, the country is drained by numerous rivers with countless tributaries, which provide fresh water at all times of the year, maintain lush vegetation and play an important role in domestic life as well as in relations with neighboring countries. The abundance and number of waterways make CAR a green country, with multiple forest galleries, agropastoral vocation and an important reserve of fishery resources.

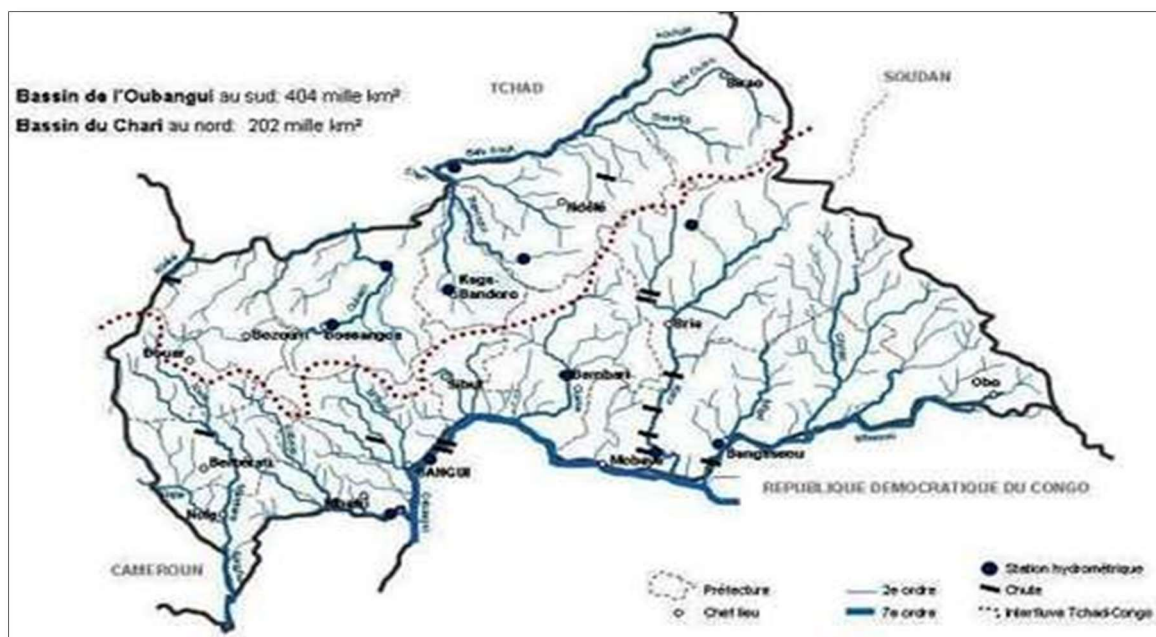


Figure 3: Hydrographic map of the CAR

The tributaries of the Ubangi can be divided into 3 groups:

- The tributaries that descend from the Bongo mountain range or neighboring regions form the Eastern family characterized by a fast, sometimes torrential upper course, a steep bed often cut by rapids and waterfalls; the longest and fastest tributary is the Kotto flowing sometimes in steep gorges and sometimes in flat, swampy terrain where it forms large loops.
- The rivers of the Center all descend from the Ubangi Ridge at altitudes ranging from 500 to 700 meters. The fastest is the Ouaka, the others are : Bangui Ketté, the Bamba, the Tomi, the Ombella, the M'Poko with the Pama and the Mbali, on which the Boali Falls are located.
- The western group includes the Lobaye and its tributaries the Mbaéré and the Bodengué as well as the upper reaches of the Sangha fed by the Mambéré, the Nana and the Kadéi. For the Chari Basin, the main rivers are the Aouk, which also serves as a natural border between Chad and CAR, and the Ouham; the others are the Péné, the Nana Bakassa, the Nana Barya and the Mbéré.

#### 1.2.1.2. Vegetation and Soil

##### 1.2.1.2.1. Vegetation

Based on the data provided by the studies of Chevalier (1933), Aubreville (1948), Sillans (1958) and Boulevert (1980), we now have a precise idea of the phytogeographical layering in Central Africa, which is divided into five domains stretching from south to north.

The dense, evergreen humid forest is variously called evergreen forest, ombrophilous forest or hygrophilous forest. Three factors determine its development, namely, humidity, temperature and light. In 1986, the dense rainforest extended to the south of the country, over an area of 92,500 km<sup>2</sup>, or 15% of the national territory. It is formed by two forest massifs. The first massif occupies the southwest and the other, the southeast. There are two zones, the rainforest zone in the south and the tropical forest zone in the north. The rainforest is located at the southwestern tip of the country, between 2°10' and 3°30' N. It is the northern fringe of the equatorial forest. It includes two types of forest, the flooded forest along the low banks of the Sangha River, on which a strip of *Uapaca* and *Guibourtia* stands can be observed. This type of forest gives the impression of a disturbing vegetal barrier by its silence.

As for the flooded forest, it covers the interfluves and the flooded banks of the Sangha. Better developed on compact clay, the exundated forest is mainly made up of *Meliaceae* such as *Entandrophragma angolensis* (Trama), *Entandrophragma cylindricum* (Sapelli). Several strata characterize it. Towards the north of the flooded forest, *Meliaceae* mix with *Sapotaceae* such as *Austranella congolensis* (Muculungu), with *Sterculiaceae* such as *Triplochiton scleroxylon* (Ayous) and with *Moraceae* such as *Chlorophora excelsa* (Iroko) to announce a forest adapted to seasonal alternation. It extends from Gamboula in the west to Rafaï in the east with an interruption on the loop of the Oubangui. In the southwest, it includes the forests of Yamando, Mbaéré, Ngotto and Basse Lobaye, while in the southeast, it is composed of the forests of Satéma, Kémbé and Bangassou. To the north of the latter, savannah species appear, such as *Borassus aethiopicum*. At the edge of the forest, there are patches of dense dry forests that are intermediate formations, particularly in the central-western, central-northern, eastern and central-eastern parts

of the country. Through degradation, the dense dry forests evolve into wooded savannahs or trees. They are found on the Mouka-Ouadda Plateau, between Dékoa, Kaga-Bandoro and Mbrès.

The Central African savannahs present an extreme physiognomic heterogeneity, characterized by a change in the size and density of trees and grasses, the further north one goes in the country. The savannahs cover part of the territory and integrate several forms dispersed more or less in parallel bands from south to north. The woody species are illustrated by *Annona senegalensis*, *Danielliaoliveri*, *Terminaliaglaucescens*, *Isoberialiadoka* and *Lophiraalata*. The herbs include the most widespread strata of the country, *Imperatacylindrica*, *Panicum maximum*, *Pennisetumpurpureum*, *Loudetiaarundinacea*, *Andropogon gayanus*, *Hyparrheniarufa*, *Aframomum citratum* and *Chromolaenaodorata* (Laos grass). In the savannah zone, forest galleries are also found along streams. The main types of shrub savannah and grassy savannah.

The tree savannah comprises the herbaceous stratum often dominated by *Panicum maximum* and *Aframomum citratum*; the woody stratum, composed of tall trees grouped in groves or parks. This is why we speak of park savannah. We find the tree savanna with *Terminaliaglaucescens* in Bakala, the wooded savanna with *Isoberialinia* in Yalinga, *Burkeaafricana* in Bozoum, *Danielliaoliveri* in Boali and *Terminaliaglaucescens* in M'Brès.

The shrub savanna is a plant formation composed of a herbaceous mat and an open woody stratum. We can cite the shrub savanna with *Anogeissusleiocarpus* near Bocaranga. The grassy savannah is a formation characterized by a continuous expanse of more or less tall grasses, and by the total or almost total absence of trees or shrubs. The herbaceous layer includes *Imperatacylindrica*, *Pennisetumpurpureum* and *Panicum maximum*.

The steppe, located between 7°40' and 10°50' North is influenced by the length of the dry season. This area is divided into two sectors. The first, the pseudo-steppe extends between Gordil and N'Garba. It is a transition zone between the Sudanian and Sahelian domains. The second sector stretches from north of Birao to the Tizi pond. This is the Sahelo-Sudanian sector. The dominant species are: the spiny *Acacia raddiana* and the *Balamites*. The grasses consist of bulbs and rhizomes. There are also the *Aristida* and the *Cram Cram*.

#### 1.2.1.2.2. Soils

The color, morphology, thickness and fertility of Central African soils vary spatially according to local conditions or other components of the country, including relief, vegetation or rock. Thus, the combination of climate, vegetation and relief determines the formation of soils in the country, whose boundaries coincide with those of the climatic zones.

Ferralitic soils cover three quarters of the country, especially where high rainfall favors the hydrolysis of rock minerals to great depths. These soils are poor in nutrients and are acidic and fragile. They have several facies, with typical ferralitic soils formed on dolerites in the southeast in the Mbomou and Basse-Kotto regions and in the southwest in the Mambéré-Kadéï region. Some are depleted in clay and occur on sandy materials from quartzites (Mbrès) or sandstones (Mouka-Ouadda, Kembé-Nakando and Carnot). The most widespread are the reworked and nodular soils that are observed on the ridge (Ubangian) at Mbrès, Dékoa and Bakala. They are distinguished by the presence of gravel or hardened ferruginous nodules. The particular evolution of these types of soils contributes to the formation of lateritic indurations, notably bare ferruginous cuirasses called lakéré. These ferruginous cuirasses are very common in Ippy and are hostile to any cultivation.



Photo 1: Soil type (MamberéKadei). (CNC, 2018)

Young erosion soils appear on the rocky reliefs in the west and east of the country and especially on the escarpments separating the leveling surfaces. These are the lithosols of Bocaranga and the lithic soils of Ouandja-Kotto (or Sam-Ouandja).

The tropical ferruginous soils appear around 7° North. They are slightly denatured and have a less advanced evolution. They are found in the Bahr-Aouk basin at Golongosso. They show concretions and stains and become pseudogley if they are waterlogged at depth. These soils take the form of sandy veneer under the influence of wind erosion in the Sahelian zone.

Alluvial and hydromorphic soils are located on the outwash plains and recent alluvium. They are derived from sandy or clayey deposits that are not very developed, from alluvial deposits, and sometimes from the topomorphic Vertisols of Saint-Floris Park. The soils of the river valleys are sandy-clay with temporary waterlogging. They are hydromorphic soils with pseudogley.

The diversity of soils reveals the richness of the edaphic conditions available in the Central African Republic. These resources are still under-exploited, with only 1% of the land currently under cultivation. However, these resources are fragile due to their shallow horizons and the violence of rainwater.

### 1.2.1.3. Climate

The Central African climate is governed by flows that control the climatology of tropical Africa. The division of the year into seasons is conditioned by the movement of the intertropical front (ITF) on which the rains depend. During the dry season, the Libyan High directs the Harmattan, a hot and dry wind from the northeast to the southwest, and raises temperatures in the country. During the rainy season, the St. Helena high pressure system located in the Atlantic, a warm and humid wind of maritime origin, waters the territory in a southwest-northeast direction. Throughout the country, average annual temperatures range from 23°C in the south to 26°C in the north. The stations located in the north have a temperature range of about 13°C. As one moves southward, this difference decreases to 11.6°C in Bangassou and 10.1°C in Bangui.

Altitude plays a role in temperature variation. It is the reason for the increase in the diurnal temperature difference in Bouar. The highest average annual temperatures are observed in March and the lowest in July during the rainy season.

The Central African territory receives an average of 1,420 mm/year. The isohyets are almost zonal and show the classic pattern of decreasing rainfall heights as one moves away from the equator. These zonal nuances can be seen in the distribution of the number of rainy days, which decreases from the south (135 days in Bangassou) to the north (70 days in Birao), a difference of 65 days.

The areas with the highest rainfall are located in the northern margin of the Congolese forest basin and on the Yadé massif, which also has a high annual rainfall of around 1,600 mm. Rainfall is favored by evapotranspiration in the forest zone and orography in the west and east. The average annual rainfall totals between 1,200 and 1,400 mm of rain per year constitute a vast area that extends globally between 5°C and 9°C of northern latitude. Finally, the extreme northeast of the country, with an average of 800 mm/year.

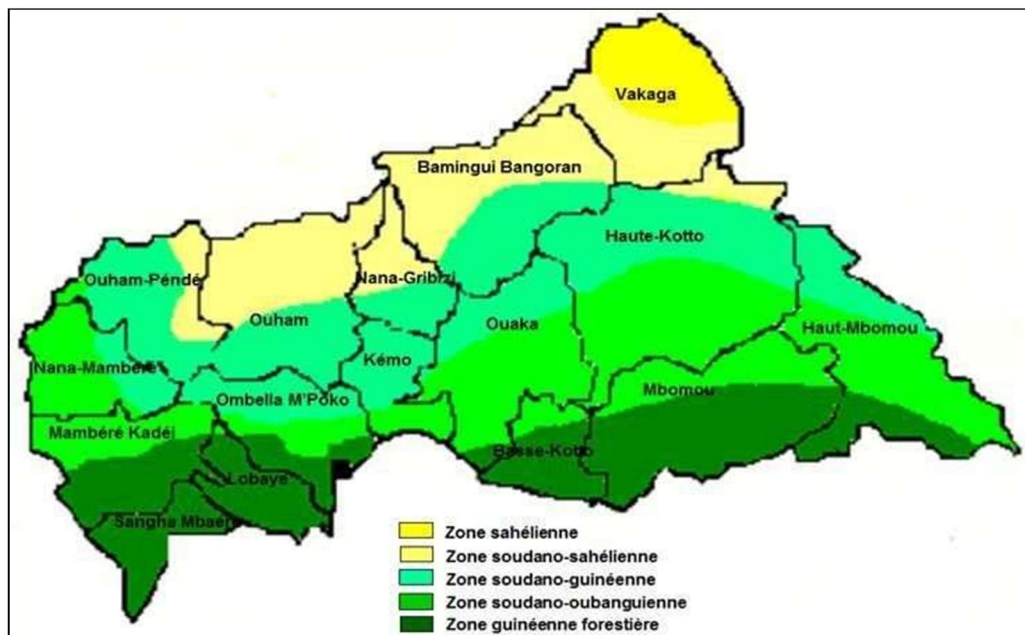


Figure 4: Climatic data (Geo climatic distribution, cf. Atlas RCA, published by the Department of Geography in 2013)

As illustrated in the figure above, the rainy season index determines five (5) major climatic zones in Central Africa:

- the Guinean forest zone, which is characterized in the western band by an index of 9-2-1, i.e., nine (9) months of rainy season, two (2) of inter-season and one of dry season. In the eastern band, it is 9-1-2. Total rainfall is almost everywhere above 1,600 mm. This is the domain of the great forest;
- The Sudano-Babangian zone, which corresponds to index 7-2-3, occupies a narrow strip between Bossembélé and Baboua, and is slightly wider towards Bambari and Yalinga. Less dense semi-humid forests are found here;
- The Sudano-Guinean zone borders exactly on the preceding area, with an index of 6-3-3, which marks a significant deterioration in the rainy season;
- the Sudano-Sahelian zone, which extends from Paoua to Ouadda-Djallé, is characterized by an index of 5-2-5. Relative humidity is more variable and annual sunshine is significantly higher. This is the savannah area and finally,
- the Sahelian zone with an index of 4-2-6, around Birao. It belongs to the large central Chadian zone where the dry season is longer than the rainy season. The steppe horizons announce a Sahel burned by drought, as rainfall can be less than 700 mm/year.

## 1.3. Socio-economic context

### 1.2.6. Demography

Based on the 2003 General Census of Population and Housing (RGPH03), CAR has a population of 5.3 million (ICASES 2016). The country is sparsely populated and the population is unevenly distributed: The areas of greatest concentration are in the south, center west, and west. Nearly empty areas are found in the east and northeast. The population density at the national level is 8.65 inhabitants per square kilometer; it varies from 1 inhabitant per square kilometer in Region 5 (Haute-Kotto, Bamingui-Bangoran, and Vakaga) to 12,218 inhabitants per square kilometer in Region 7 (Bangui). The rural population was originally estimated at 62% in 2015. These projections should be taken with great caution, as recent events (renewed violence), in which armed groups have retreated into the hinterland and occupied 14 of the 16 prefectures, have caused population movements towards the capital and the main urban centers.

The growth rate remains at 2.5 percent. Women currently account for 51% of the population, and children under 5 and 5 to 14 years of age account for 19.1% and 23% respectively. Young people, more than 60% of the population, are under 25 years old, 50% of whom are women. Life expectancy at birth is estimated at 47 years, below the African average of 51.9 years in 2014.

Table 1: Population Growth

SECTION	INDICATORS
Population	5,3 millions habitants
Growth Rate	1,8%
Infant mortality	112 p/1000
Infant mortality under 5 years	173 p/1000 naissances
Maternal Mortality	980/100 000
Life expectancy at birth	47,7 ans

Table 2: Population estimates (2016)

City	Population (number of inhabitants)
Bangui	860 181
Bimbo	143 690
Berberati	128 430
Carnot	92 466
Bouar	49254
Bambari	53835
Nola	76 282
Bria	70398
Bossangoa	44492
Bangassou	39611
Kaga-Bandoro	29706

### 1.2.7. Economy

The CAR is an agricultural country. More than 80% of the population lives from agriculture. The main industrial crops are cotton, coffee, tobacco, sugarcane and oil palm. The main food crops are cassava, peanuts, corn, millet-sorghum, plantains, squash, sesame and rice.

Livestock farming is an important sector of the Central African economy. Pastoral activities are mainly based on cattle, sheep, goats and poultry. Extensive cattle breeding occupies entirely the savannah zones, with a progression towards the forest zones. This declining livestock population is composed of approximately 2.5 million head of cattle. Small-scale livestock (sheep, goats, poultry) is practiced in all regions.

The main characteristic of Central African agriculture is low labor productivity. This is due in particular to the use of traditional techniques such as rudimentary tools, slash-and-burn agriculture and the almost total absence of inputs and improved seeds.

The CAR is rich in mining potential: diamonds, gold, uranium, iron, limestone, copper, etc. However, only diamonds and gold have been mined. However, only diamonds and gold are exploited.

The CAR imports manufactured goods, construction materials, mechanized equipment, pharmaceutical and medical products, school books, etc. The trade balance is in deficit and a balance between imports and exports cannot be achieved immediately. Trade is largely with European countries, the United States of America, the CEMAC countries and other countries.

Landlocked and dependent on the Oubangui-Congo river and roads to Chad and Cameroon, CAR is among the poorest of the least developed countries. The crisis has severely affected all economic sectors, particularly in rural areas, where insecurity has disrupted or destroyed activities. Economic activity is slowly recovering, but GDP is far from having returned to its pre-crisis level. Food production has recovered, but coffee, oil palm, and cotton production have reached a paltry level.

Activity in the agri-food, trade and construction sectors is growing, thanks in particular to the foreign presence. The partial lifting of the diamond embargo and the revival of logging are also opening up new prospects. Log production increased by almost 1/3 in 2015, thanks to the restoration of security in the forest area. Investments in processing are needed to improve the profitability of the sector, which has been penalized by low wood prices.

Even before the crisis, public finances were characterized by a structural cash flow deficit, a very low investment capacity, a high dependence on external budgetary aid and difficulties in servicing the debt. From March 2013, the collapse of the country's customs and tax revenues made support from its international partners all the more important. Budgetary revenues increased significantly in 2015, without allowing the government to finance development. Expenditures are generally under control. The IMF approved in 2016 a new program (3 years) based on the gradual recovery of the economy.

In November 2016, the government presented the Recovery and Peacebuilding Plan for the Central African Republic (RCPCA) to the donor community.

This plan, which articulates the intervention of the Government and its partners over five years (2017-2021), is structured around three pillars, namely:

- Supporting peace, security and reconciliation;
- Renewing the social contract between the State and the population
- Ensuring economic recovery and the revival of the productive sector.

Of the \$2.5 billion obtained at the Brussels Round Table in terms of commitments from donor countries and donors for the recovery of the Republic, a little less than 10% had been disbursed by December 2017.

After collapsing under the impact of a long political and security crisis, economic activity in the Central African Republic experienced a timid recovery in 2014, which strengthened in 2015 (+5.5%), mainly thanks to international aid. According to the World Bank, growth reached 4.5% in 2016 and remained at the same level in 2017 after initially being projected at 5.2%. This lower-

than-expected result is explained in particular by a further deterioration in the security situation, which has hampered the transport sector and agricultural production. In addition, public investment remained insufficient. Nevertheless, exports are estimated to have been buoyant in 2016, thanks to increased production of exported products (gold, diamonds, timber, coffee, and cotton). Traditionally, the economy has been driven by the high-potential agricultural sector (cotton) and timber and diamond exports. The country has a rich soil (diamonds, gold, wood, uranium), but is under-exploited. Industry is poorly developed and there are many handicaps (poor electricity network, competition from the informal sector, difficult access to credit, insecurity).

The agricultural sector represents 55% of GDP and employs 80% of the population. This sector suffers from a lack of financing and low productivity and was penalized by insecurity in 2016.

Since mid-2015, the embargo on diamonds mined in the country has been partially lifted. This supported growth in 2016. In addition, the persistent conflict that began in 2012 and initially pitted a coalition of northern rebel movements, the Séléka (mostly Muslims), against self-defense groups, the Anti-balaka, and the military has resulted in widespread destruction of infrastructure and looting.

Securing infrastructure is crucial to support economic recovery from the crisis, as the productive apparatus has been almost completely destroyed.

The banking sector and sugar production are the sectors least damaged by the conflict. In 2016, inflation was well contained (4%) and is expected to be 4.2 in 2017, thanks in particular to a slight improvement in agricultural production.

However, domestic demand has remained sluggish, with just over one million people having left the country since the outbreak of the conflict. The government is focusing its efforts on promoting social reconciliation, improving security, and implementing a National Recovery and Peacebuilding Plan with a pillar dedicated to economic reconstruction.

In 2016, the Central African Republic continued to suffer from declining budgetary revenues that are difficult to compensate for with foreign aid. The IMF and the new government intend to resume the fiscal reform program and the international financial institution validated a three-year aid plan (equivalent to about 6% of GDP) in July 2016.

In addition, at the end of 2016, the international community announced the payment of substantial aid that should help the Central African Republic reduce its public debt. In 2017, the government saw an increase in revenue thanks to improved tax collection and the recovery of trade. Exports of agricultural products remain handicapped by logistical problems.

In addition to cyclical problems, landlockedness, poor transportation infrastructure, a largely unskilled workforce, ineffective economic policies, and internal political conflicts continue to hamper the country's economic development.

CAR is one of the poorest countries among the Least Developed Countries (LDCs), ranking 188 out of 188 on the United Nations Development Program's Human Development Index (HDI). The majority of the population lives below the poverty line, unemployment is high, and access to basic education and health services is inadequate. There are very high inequalities and life expectancy at birth is the second lowest in the world.

Table 3: Human Development Indicator

Indicateurs de croissance	2015	2016	2017	2018 (e)	2019 (e)
GDP (USD billion)	1,59e	1,78e	1,99e	2,23	2,50
GDP (annual growth in %, constant price)	4,8	4,5	4,7	5,0	5,2
GDP per capita (USD)	332	364	400	440	482
Government debt (% of GDP)	51,1	44,3	38,8	33,4	28,7
Inflation rate (%)	4,5	4,6	3,8e	3,7	3,0
Current account balance (USD billion)	-0,14	-0,16	-0,19	-0,15	-0,13
Current account balance (% of GDP)	-9,0e	-9,1e	-9,7e	-6,5	-5,3

*Source : FMI - World Economic Outlook Database - Latest data available. Note: (e) Estimated data*

Table 4: Monetary Indicator

Indicateurs monétaires	2012	2013	2014	2015	2016
CFA Franc BEAC (XAF)					
Average annual exchange rate for 1 EUR	631,06	630,96	630,63	631,22	630,86

*Source : Source: World Bank - Latest available data*

Table 5 : Main economic sectors

Répartition de l'activité économique par secteur	Agriculture	Industrie	Services
Employment by sector (% of total employment)	72,2	4,3	23,4
Value added (% of GDP)	42,9	16,0	41,1
Value added (annual growth in %)	5,7	2,0	4,2

*Source: World Bank - Latest data available.*

### 1.2.8. Health and nutrition

A transition plan for the health sector for 2015-2016 was developed and adopted in 2015 in order to find appropriate responses to the profound dysfunction in the health system and facilitate recovery.

The expected results are linked to the following priority areas of intervention: (i) support for the institutional strengthening of the Ministry, (ii) provision of a minimum package of quality activities, (iii) improvement of maternal and child health care, (iv) improvement of the management of emergencies and other disasters and; (v) improvement of disease control.

In the area of health, the sector is faced with: (a) insufficient immunization coverage, (b) one of the highest maternal and infant mortality rates in the world, (c) low prevalence of modern contraception, (d) a high fertility rate among adolescents, and (e) a high proportion of early marriages among girls aged 15-19.

The crisis has caused life expectancy at birth to decline to just over 49 years. Under-five mortality per 1,000 live births increased from 129 in 2012 to 139 in 2015. Infant mortality (under 1 year) per 1,000 live births also increased from 91 in 2012 to 96 in 2015, with maternal health worsened

by the crisis. Approximately 880 women per 100,000 live births died in childbirth in 2015 compared to 540 per 100,000 live births in 2012.

In the area of nutrition, OCHA (2016) indicates that 37,200 children under 5 years of age suffer from severe acute malnutrition and moderate acute malnutrition as a result of the effects of the military-political crisis. Physical or financial access to food has been hampered by population displacement, insecurity, and major disruptions in the agricultural sector.

Rural food stocks are down 40 to 50 percent from the pre-crisis average. The decline in agricultural production has also caused food prices to rise significantly. In addition, consumers have lost a third of their purchasing power compared to 2012, which has further increased their precariousness. Women, displaced populations, minorities trapped in enclaves, returning populations and refugees are the most severely affected by food insecurity.

### **1.2.9. HIV/AIDS**

The prevalence of HIV infection among adults aged 15 to 49 years was 4.9% in 2010 according to the results of the Multiple Indicator Cluster Survey (MICS4), compared with 6.2% in 2006. There is a great disparity between the different prefectures of the country. Indeed, it varies from 1.0% in Ouham to 11.9% in Haut Mbomou.

The epidemic is therefore generalized. Seroprevalence is higher in urban areas (7.9%) than in rural areas (2.9%). This trend is observed among women (10.3% vs. 3.7%), men (4.8% vs. 1.9%) and young people (4.4% vs. 1.6%). Women are infected at a younger age than men. Regardless of gender, prevalence increases with age to 9.2% among women aged 40-44 years and 6.9% among men aged 35-39 years.

The average HIV prevalence among young people aged 15-24 years is 2.8%. The prevalence among pregnant women is 4.5% in 2010 compared to 5.3% in 2006. The prevalence is 4.1% among young pregnant women aged 15-24. The latest humanitarian crisis with the significant movement of the population and the interruption of prevention and care services, especially in the interior of the country, is likely to lead to an increase in incidence, a change in the distribution of cases according to regions and the resurgence of cases of resistance to ARVs.

In the second quarter of 2014, the situation of health facilities involved in AIDS control activities shows 93 sites for ARV treatment, of which 26 or 28% are not functional, and 131 sites for prevention of mother-to-child transmission of HIV (PMTCT), of which 62 or 47% are not functional. Of the 21 Voluntary Testing Centers, 10 are still functional.

In 2015, HIV prevalence was estimated at 4.1%, but remains the highest in the subregion among people aged 15 to 49. This estimate shows a 2% decline in 10 years compared to MICS3 data coupled with HIV serology. The proportion of new HIV infections is also declining.

### **1.2.10. Water and sanitation**

The water sector includes drinking water supply, water mobilization for agriculture, livestock, navigation, hydroelectricity, industry, and independent and collective sanitation.

Despite the existence of significant potential water resources in the country, the rate of satisfaction of drinking water needs remains low (about 34%). As for sanitation, the situation is very worrying with a coverage rate of less than 10%.

According to the results of the ECASEB survey, the sources of water commonly used by households in the Central African Republic are boreholes (29%), unprotected springs (19.8%), kiosks (14.4%), protected wells (12.5%) and protected springs (8.6%).

The proportion of the Central African population using a drinking water source rose from 47% in 2003 to 64% in 2008 and fell to 58.4% in 2011. This rate has already deteriorated significantly with the crisis, as the rate of access to drinking water is estimated at 32%.

The use of improved toilets by households at the national level is low. It is twice as high in urban areas as in rural areas; 28.6% of urban households use them compared with 13.2% of rural households. The rate of sanitation in urban areas (sewers and drainage channels) is relatively low due to lack of funding. It should be noted that more than 680,000 people live in IDP sites in the interior of the country. Most of these IDPs do not have access to adequate sanitation despite emergency interventions by NGOs and UN agencies.

Access to clean water and improved sanitation is one of the goals the country has set for itself, but unfortunately it has not been achieved. Difficulties in supplying drinking water have been noted in certain provincial towns such as Kembé in the lower Kotto region. In rural areas, people continue to obtain water from springs, which has an impact on the health and life of the population.

The management of household waste and garbage remains a concern at the national level due to the weak capacity of the local authorities that have this responsibility. Logistical and financial means are often lacking for a better sanitation of the urban environment.

In both cases, access to drinking water and sanitation services is better in cities than in rural areas. In fact, the work of cleaning out gutters and water pipes is carried out in the city of Bangui thanks to the support of Technical and Financial Partners through High Intensity Labor Works (THIMO).

### **1.2.11. Education**

In addition to the academic and scientific knowledge that it transmits, the education system brings together men, women and young people from different regional and social backgrounds. In general, schools, universities and training institutions are the only places where universal values such as civic-mindedness, patriotism and love of work are instilled. As a result, education is a powerful factor for stability throughout the country. However, the Central African education system faces enormous problems.

Even before the political crisis of 2013, the education sector in the Central African Republic faced challenges, including:

- access to education: the net enrollment rate in primary school is 72%, but enrollment rates are very low in pre-primary (3%) and secondary education (7%);
- a lack of teachers (83 students per teacher on average in elementary school), including a lack of qualified teachers, due to the high prevalence of parent-teachers (40 percent before the crisis) and untrained teachers ;
- a lack of classrooms, schools, basic infrastructure, and textbooks;
- the quality of education is also a concern, as the country has one of the highest repetition rates in the world.

In 2012, the gross primary school enrollment rate reached 95 percent, showing signs of slow improvement in school access.

In the aftermath of the 2013 political crisis, more than a third of schools were damaged in CAR, making the situation worse.

The Central African government has affirmed the importance of education, and the country has developed its education transition plan for the period 2015-2017 to restore the education sector to its pre-2013 status. The government is reviewing this plan and the possibility of expanding it.

### **The transition plan focuses on three specific objectives:**

1. Facilitate the transition from emergency activities to normal teaching conditions ;
2. Ensure that the primary and secondary education system is able to reach the level of results achieved before the 2013 crisis regarding school access and quality ;
3. Restore the capacity of education authorities to develop long-term education perspectives and sector strategies.

### **In order to achieve these objectives, the plan outlines 6 priorities:**

2. Supporting emergency activities;
3. Resume teacher recruitment, training and deployment policy;
4. Progress towards free primary education through the piloting of parent-teacher salary coverage;
5. Improve access to school by implementing remedial programs, providing schools with textbooks, resuming school construction and rehabilitation programs, and implementing various activities for the benefit of the most vulnerable populations;
6. 5. Restore institutional, political and administrative capacities to ensure governance of the education sector;
7. Establish a new long-term sector plan.

### **The PME (Global Partnership for Education) has injected nearly \$15.5 million for 2014-2017 which aims to:**

1. Improve access to elementary school for all school-age children, with a particular focus on vulnerable groups (girls, orphans, people living with HIV/AIDS...) and those in disadvantaged areas;
2. Improve the quality of education and learning outcomes for children;
3. Restore the effective functioning of the Ministry of Education's essential services and the sector's governance capacity through the following key activities
  - Resume the recruitment of contract teachers;
  - Experiment with grants to communities to pay community teachers' salaries, and provide training;
  - Provide textbooks to reduce student/teacher ratios;
  - Re-establish basic governance by supporting the operating costs of priority services;
  - Rehabilitate and construct classrooms, separate latrines for boys and girls, and provide equipment;
  - Respond to emergencies.

The Ministry of Education leads the program in partnership with UNICEF, which is both the managing entity and the coordinating agency.

In CAR, the PME has played a unique role in promoting donor coordination through the creation of the first local education partners group, which in turn has proven to be an important mechanism for planning during crises. It has also helped mobilize additional funding aligned with the education transition plan.

The latest SME funding and additional funding from other donors such as the African Development Bank (AfDB) and the World Bank (WB) have helped to slightly improve the situation in terms of infrastructure, availability of teaching materials, recruitment, training and retraining of staff, and coordination capacity.

#### **7.2.1. Gender**

An analysis of human development performance reveals remarkable differences between the sexes. The illiteracy rate among women is very high (68% of women compared with 46.2% of men), and the school dropout rate worsens as girls reach puberty.

It is also noted that women are more affected by poverty than men and that their contribution to national wealth appears to be low or underestimated. The 2009 African Development Bank Country Gender Profile for CAR reveals that 23.46% of girls versus 76.53% of boys attend university, an important imbalance that needs to be corrected.

In the area of employment, only 16.5% of women are employed in the non-agricultural sector. Disadvantaged in the labor market compared to men, they also participate little in local governance. Women are still poorly represented in public and political life and in decision-making bodies. The 23-member government that emerged from the last elections includes only four women. However, efforts have been made in terms of legislation, notably with the adoption and promulgation of the law on gender parity in December 2016, but its application remains a real challenge due to limiting factors and socio-cultural constraints.

### **7.2.2. Employment**

Nearly one in four (24.2 percent) of the working population is unemployed, including 25.7 percent of people in urban areas, compared with 23.4 percent in rural areas. The issue of the high rate of unemployment among young people, which is a majority in the country, is one of the factors of fragility that characterize the CAR.

### **7.2.3. Housing and Infrastructure**

The diagnosis of the housing and construction sector concludes that there are a number of shortcomings: (i) a lack of supply capacity in terms of housing and accommodation; (ii) uncontrolled self-construction, which is a factor of insecurity and complicates urbanization problems; (iii) an absence of an appropriate housing and construction policy; and (iv) the non-existence of a real estate code and a housing bank.

With this in mind, the government plans to: (i) provide decent housing for the population; (ii) provide the population with serviced land; and (iii) implement urbanization plans for the cities.

Many of the social housing construction programs planned as part of the government's emergency projects with the support of its partners are struggling to get off the ground because of the security crisis in the targeted areas. However, in Bangui and its outskirts, some timid projects are being carried out, but the total falls far short of the enormous needs.

## **1.4. Political context**

### **1.4.1 Political system and decentralization process**

The organization of the Central African State established and codified by the Constitution of March 30, 2016 establishes the institutions, enacts the rules and determines the modalities of their operation. It is a democratic, secular and republican state with a semi-presidential regime, with a parliament and a judicial organization of Germano-Latin essence. Based on these constitutional provisions and following the general elections of 2016 in favor of the return of constitutional legality, all the planned institutions have been put in place except for the Senate.

An elected Head of State and the government in place provide the executive branch. The National Assembly has been established and is playing its role as legislator and controller of government action. All judicial and administrative jurisdictions are in place and functioning. The administrative organization includes 7 regions, 16 prefectures, 71 sub-prefectures, 2 administrative control posts, 175 communes and more than 9,500 villages and districts. Each of these entities is administered by authorities whose legitimacy is derived from their appointment by the executive.

Nearly one hundred legal political parties are active in the democratic process and can participate in the various elections when they are held.

Alongside the political parties and associations and the public authorities, civil society is trying to make a place for itself, year in and year out. Freedom of opinion and of the press are enshrined in the constitution and the media (print, audiovisual and online) play a role in informing and shaping public opinion.

On the other hand, the regionalization and decentralization process, which began nearly 25 years ago and which could have organized the governance of development in such a way as to mobilize local energies as close as possible to the realities of the population, has never led to the establishment of regional and municipal councils. The public authorities at the central level seem reluctant to transfer some of their powers to the local level. The current security situation does not appear to be conducive to rapid change.

#### **1.4.2 Political crises and the stabilization and peacebuilding process**

For more than two decades, the Central African Republic has been going through multifaceted political crises with serious consequences for socio-economic and human capital development. It seems to have settled into a situation of socio-political instability. The latest crises, which began in December 2012, have destroyed the economic fabric, the administrative and socio-cultural heritage. However, as early as 1999, following the first crises that shook the country, the national authorities, like other heavily indebted poor countries, embarked on the process of developing a poverty reduction strategy in the form of a National Poverty Reduction Plan (PNLCP). In August 2007, the first Poverty Reduction Strategy Paper (PRSP) covering the period 2008-2010 was adopted. The resources mobilized during the Brussels Round Table on October 26, 2007 did not benefit the country's development but went towards humanitarian assistance following the first rebellions in the north of the country in 2008.

The government's sustained efforts to implement the reforms set out in the PRSP1 during 2008 and the first half of 2009 enabled the country to reach the completion point of the enhanced Heavily Indebted Poor Countries (HIPC) initiative. This period of PRSP implementation was marked by several crises, including a surge in the price of hydrocarbons, of which the country is a net importer, a sharp increase in the price of basic foodstuffs, and an acute international financial and economic crisis, which had the effect of obliterating CAR's economic growth by about two percentage points.

As the PRSP1 expired in December 2010, the Government embarked on the preparation and adoption of the Second Generation PRSP (PRSP2) for the period 2011-2015. While the national authorities were preoccupied with mobilizing the funds announced by the partners at the Brussels Round Table on June 26, 2011, the rebellion of December 2012, which had more devastating consequences, came as a surprise to all development actors (government, international community, civil society) and once again forced the reorientation of these mobilized funds toward humanitarian assistance to the detriment of development actions.

This crisis, which arose from the 2011 elections after the re-election of the former President of the Republic, went through several phases of negotiation, as follows

- The Libreville Agreement, which led to the establishment of a Government of National Unity with the entry into the Government of the armed coalition and the political parties of the opposition, in this case the appointment of a Head of Government from the political opposition and a Deputy Prime Minister from the armed rebellion;
- the establishment of a red line at Damara to prevent forces from reaching Bangui.

Despite this, the armed coalition seized power on March 24, 2013, bringing a president from this group to power, resulting in the dissolution of all existing institutions and the Constitution of the Republic. It was put in place:

- a constitutional act;
- a transitional parliament; and
- a transitional constitutional court.

The anti-Balaka militia was born as a result of the odious behavior of the elements of the ruling armed coalition. Faced with the magnitude of the situation, resolutions were passed by the Security Council to strengthen the existing African-led International Support Mission to the Central African Republic (MISCA) and to come to the rescue of the Central African people, hence the "Sangaris" operation led by the French army and later the deployment of MINUSCA (United Nations Multidimensional Stabilization Mission in CAR), which replaces the MISCA and EUFOR-RCA. The decision by the CEMAC Heads of State in N'Djamena, Chad, to remove the president and his prime minister had once again plunged the country into an unprecedented spiral of violence. Thus, the National Transitional Council (NTC) after a 15-day power vacation, elected Ms. Catherine SAMBA PANZA, to ensure the Transition and lead the country towards a return to constitutional order.

In February 2016, Professor Faustin Archange TOUADERA was elected President, with a new Constitution adopted that marked the end of a political transition led by the Transitional Head of State, Ms. Catherine SAMBA PANZA, and the return to constitutional order.

Already in 2012, in response to the crisis that hit the country, the government drew up the Emergency and Sustainable Recovery Program (PURD) from which the transition roadmap presented to the International Contact Group for CAR (ICG-CAR) was derived. The PURD was adopted in August 2015 and presented to the donor community in September 2015 on the margins of the 70th Ordinary Session of the United Nations General Assembly. It outlines the investments needed to address priorities related to humanitarian emergencies and those preparing the reconstruction of the country.

Faced with the devastating effects of this crisis and in order to respond to the concerns of a population that has been battered for all these years, the legitimately elected and installed authorities have developed the RCPCA (Recovery and Peacebuilding Plan for the Central African Republic), which received the support of the country's bilateral and multilateral partners in July 2016 at the Brussels Round Table to the tune of US\$2.5 billion. This document is broken down into three pillars namely:

- Supporting peace, security and reconciliation ;
- Renewing the social contract between the State and the population; and
- Ensuring economic recovery and the revival of productive sectors.

After one year, in August 2017, the assessment of the level of resource mobilization for the implementation of the RCPCA gives 10% of the promised funding, added to the disbursed own fund, they are estimated at 16%. However, there are complaints about projects that are poorly executed and do not meet the expected results of the projects.

In the meantime, the Head of State and the government, in their approach to resolving the conflict, have offered the various protagonists in the crisis dialogue and the implementation of the DDRR (Disarmament, Demobilization, Reintegration and Repatriation). This process has struggled to produce results due to the weak commitment of MINUSCA forces, the absence of the Internal Defense Forces, and the lack of sincerity of the stakeholders.

Since 2017, a peace initiative launched by the African Union and supported by the United Nations has been trying, through a panel of high-level negotiators, to bring the views of the protagonists (armed groups, political leaders, civil society leaders, and public authorities) closer together in order to hold yet another national dialogue. Despite this, the clashes between various rebel factions and armed groups in Ouham-Pendé and northern Ouham, and the latest attacks on a church in Bangui by elements of the KM5 self-defense forces, are reminders of the volatility of the situation and the complexity of the road ahead to achieve peace and national cohesion.

This latest socio-political situation, which began in 2013 and is made up of political and security unrest, has seen regular spikes in violence and serious crimes against the civilian population. Armed groups have taken control of most of the territory, seized mining sites to finance warlords, and engaged in acts of destruction and looting of property, crimes, and unprecedented abuses. This has further weakened the state's ability to respond to the urgent needs of the population, giving rise to a complex humanitarian crisis whose consequences, to date remain internal and external.

Since mid-2017, even prefectures that were spared the horrors of these crises have been severely affected, particularly in the Mbomou and Haut-Mbomou prefectures, with their corollaries of serious human rights violations (deaths, rapes, injuries, etc.) causing the massive displacement of populations within the territory into IDP camps or abroad in neighboring countries. The United Nations Office for the Coordination of Humanitarian Affairs (OCHA) reports that at the end of 2017, there were more than 1.2 million people living outside their usual areas of residence, including more than 688,700 internally displaced persons and more than 510,000 refugees in neighboring countries (Cameroon, DR Congo, Congo Brazza) and Sudan.

The borders of the Central African State are now crossed by flows of diverse actors with multiple ambitions that do not converge towards a rapid pacification of the country. Controlling these flows is becoming an increasingly difficult exercise for the public authorities and the UN mission. For the 2.2 million people in need of humanitarian assistance out of a total population of just over 5 million. The government, overwhelmed, is calling on technical and financial partners to provide significant support. Hopes remain based on the outcome of the African Union initiative, which should in principle lead to yet another dialogue bringing together all segments of the Central African community, but also on the improved performance of MINUSCA troops in protecting the civilian population.

### **1.4.3 Poverty profile and determinants in CAR**

The profile of poverty includes three dimensions: monetary, non-monetary (based on living conditions) and subjective or the perception of poverty. Surveys show that poverty, which affects 62% of the population, is widespread in CAR, with a depth rate of 33.1%. Non-monetary poverty remains significant with an average incidence of 75% (37% in urban areas and 94% in rural areas) and is a more prevalent form of poverty than the others.

The incidence of poverty appears to depend on the area of residence, the region and also on certain specific characteristics of the household, such as age, sex, level of education, the sector of activity of the head of the household and whether or not the household owns agricultural land. Even though the 2008 poverty profile shows a decline in incidence, it nevertheless shows a worsening in terms of the depth and severity of poverty, particularly in four of the country's seven regions (Region 1: Ombella M'Poko and Lobaye, Region 4: Kémo, Nana Gribizi and Ouaka, Region 5: Haute Kotto, Bamingui Bangoran and Vakaga, and Region 7: Bangui).

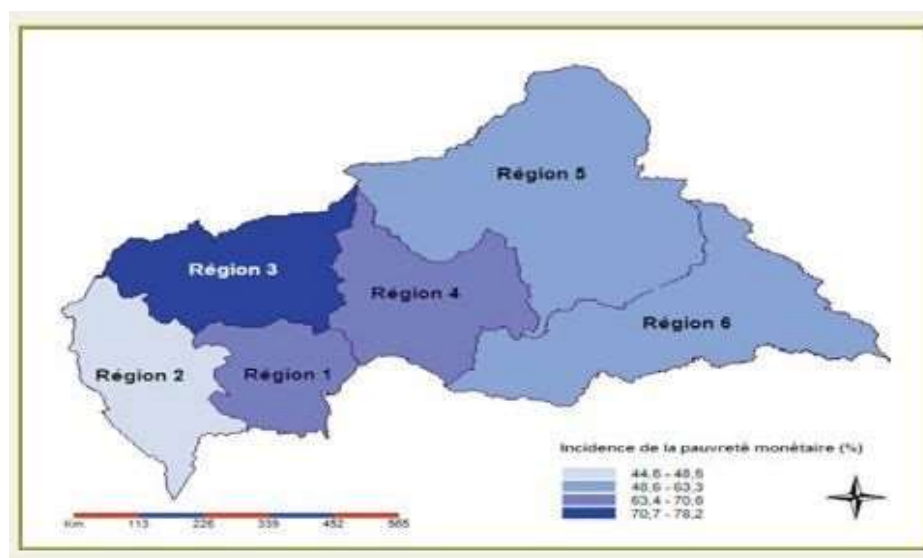


Figure 5: Poverty incidence map - Source: PRSP II (2011-2015)

Table 6: Profile of monetary poverty in CAR - Source: PRSP II

	Incidence (P <sub>0</sub> )	Profondeur (P <sub>1</sub> )	Sévérité (P <sub>2</sub> )	Structure de la population	Répartition des pauvres	Indice de Gini
<b>Ensemble</b>	62	33,1	21,1	100	100	0,543
<b>Milieu de résidence</b>						
Urbain	49,6	29,8	20,5	37,2	29,7	0,533
Rural	69,4	35	21,5	62,8	70,3	0,533
<b>Région</b>						
Région 1 : Ombella MPoko et Lobaye	66,1	36,6	23,5	16,3	17,4	0,616
Région 2 : Sangha Mbaéré, Mambere Kadéi et Nana Mambere	48,5	30,1	21,2	16,9	13,2	0,437
Région 3 : Ouham et Ouham-Pende	78,2	36,4	21,2	19	23,9	0,51
Région 4 : Kemo, Nana Gribizi et Ouaka	70,6	37,5	23,7	14,8	16,8	0,516
Région 5 : Haute Kotto, Bamingui Bangoran et Vakaga	58,5	33,3	21,9	5,1	4,8	0,544
Région 6 : Mbomou, Basse Kotto et Haut Mbomou	63,3	29,2	16,9	12,4	12,7	0,623
Région 7 : Bangui	44,6	27,3	19,1	15,5	11,1	0,553

Table 7: CAR performance on HDI indicators - Source: UNDP HDI Report 2015

Rubrique	Position	Score
Human Development Index (HDI)	Valeur	0,352
	Valeur	0,199
Inequality-adjusted HDI (IHDI)	Perte globale (%)	43,5
	Différence par rapport au classement selon l'IDH	0
Gender Development Index	Valeur	0,776
	Groupe	5
Gender Inequality Index	Valeur	0,648
	Classement	149
Multidimensional Poverty Index	Valeur	0,424

## 1.5. Environmental profile

### 1.5.1 Natural Resources-Environment-Biodiversity-Agroecology

The Central African Republic is one of the poorest countries in the world, but it has enormous natural resource potential and agro-ecological assets. The end of the crisis that began in 2012 will provide a peaceful political context so that CAR can embark on the path of national reconciliation and sustainable development.

In the context of adaptation to and mitigation of the effects of climate change, the government is acting in accordance with its international commitments. To this end, it intends to strengthen the capacities of the populations and key actors and their effective participation in the sustainable management of natural and environmental resources according to the international standards in force. The actions undertaken aim to achieve the following results: (i) the inclusion of environmental issues and the fight against climate change in sectoral policies, strategies and plans; (ii) the definition and operationalization of the legal and regulatory framework for environmental management; and (iii) the provision of the sector with an adequate and functional working framework

The Central African Republic has relatively abundant natural resources and agro-ecological conditions that are generally favorable to agriculture and livestock. The climate throughout the country is favorable to rain-fed agriculture with relatively long crop cycles.

In terms of water resources, the country has an important hydrographic network that allows a good availability of surface and ground water for agriculture, livestock feeding, wildlife, floristic development and natural regulation.

The availability of fresh water per capita is estimated at 36,911 metric tons, which constitutes an important potential for crop intensification and livestock sedentarization.

The agricultural potential is 15 million hectares of arable land of which only about 800,000 hectares (ha) are cultivated each year, corresponding to 5.3% of the total and less than 0.5 ha exploited on average per agricultural worker. In addition, out of a total area of pasture and rangeland estimated at 16 million hectares, only 9 million hectares are exploited for an estimated 3.7 million head of cattle.

Generally speaking, there is no legislative framework (Land Code) governing land tenure (access to land, mode of exploitation, property rights, etc.) in the country. Access to and use of agricultural land are regulated by customary law, except for certain individuals (retirees, civil servants) who have land titles issued by the cadastral service for estates used for agricultural purposes in the vicinity of urban centers (Bangui, Boali, Damara, M'Baïki, etc.).

In agro-ecological terms, the country is divided into four zones (Fig. 1.3), from south to north, as follows

- **The forest or equatorial zone**, known as the forest-coffee zone, covers the southwestern (Lobaye, Sangha-Mbaéré, and Mambéré-Kadéï prefectures) and southeastern (Haut-Mbomou, Mbomou, and Basse-Kotto prefectures and the southern part of Ouaka prefecture) parts of the country. It is an extension of the equatorial zone of the Congolese basin. Rainfall exceeds 1,600 mm per year and allows for a plant growth period of 270 days with lush vegetation. This zone is characterized by a one-month dry season, two months of inter-season and nine months of rainy season. The soils are generally ferralitic, slightly to moderately denatured, red in color and very deep. This is the production area for perennial crops (coffee, cocoa, oil palm, pepper), root and tuber crops (cassava, taro, yam), bananas and plantains, and fruits (pineapple, avocado, etc.). This zone is characterized by significant forestry, wildlife and mining resources.
- **The Guinean zone**, known as the food-livestock zone, is a transition zone between the forest zone and the Sudano-Guinean zone. It covers the central-western part of the

country, notably the prefectures of Ombella-M'Poko and Nana-Mambéré, and is characterized by a three-month dry season, a two-month inter-season, and a seven-month rainy season with annual rainfall ranging from 1,400 to 1,600 mm.

The vegetation growth period varies between 240 and 270 days. In general, the soils are ferralitic, weakly to strongly denatured, less deep with good porosity. The average temperature is 26°C. The Guinean zone is located mainly in the savannahs, where root and tuber production (cassava, yams, taro, sweet potatoes), market gardening, and large livestock production predominate.

- **The Sudano-Guinean zone**, known as the cotton-grazing-livestock zone, extends from west to east to the north of the food-livestock zone and the forest-coffee zone. Annual rainfall is between 1,200 mm and 1,500 mm with a plant growth period varying from 240 days to 180 days. It is characterized by 3 months of dry season, 3 months of inter-season and 6 months of rainy season. The soils are ferruginous, relatively rich in chemical elements, but sensitive to erosion. Their depth is shallow and constitutes, along with lateritic cuirasses, a limiting factor to their exploitation. The average temperature is 28°C. Located in the savannahs, this area is suitable for the production of cotton, cereals (sorghum, millet, maize, paddy), seed legumes and protein crops (groundnuts, cowpeas, sesame, squash). Livestock is also raised here thanks to the extent and richness of the pastures.
- **The Sudano-Sahelian zone**, known as the hunting and tourism zone, covers the prefectures of Bamingui-Bangoran, Vakaga and Haute-Kotto. It is characterized by a long dry season of 7 to 8 months and a short rainy season of 4 to 5 months. This zone is located between isohyets of 1,200 mm and 800 mm with a plant growth period of between 180 and 120 days. The soils are sandy, associated with indurations, at low depth. The average temperature is 30°C. This area is mainly suitable for the production of cereals (millet, sorghum), dates and gum arabic. It also contains important wildlife and mining resources. The "cotton - food - livestock" zone and the "forest - coffee" zone account for 60% of the national population and 75% of farms.

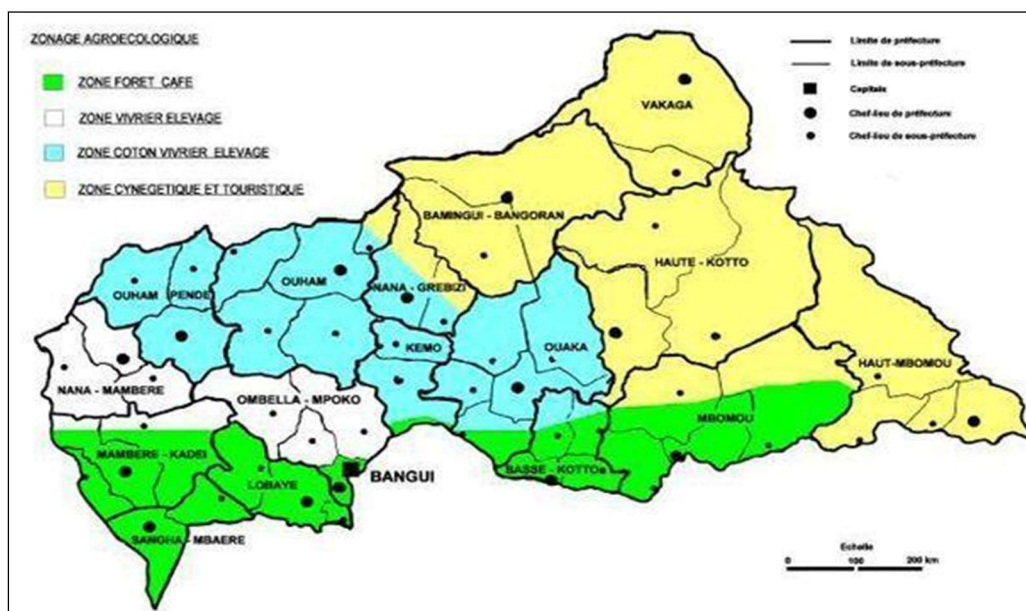









Figure 6: Agro-ecological zoning of the CAR; (Source: SDRASA 2011 - 2015, April 2011)

## 1.5.1 From the MDGs to the SDGs: Key Development Challenges

Even today, nearly 80% of the Central African population lives below the poverty line and over 2 million people are in need of humanitarian assistance. The assessment of the MDGs provided mixed results for the Central African Republic, see Assessment. They were declared impossible, although significant progress was made on some levels.

Table 8: 2015 MDG achievement levels in CAR

MILLENNIUM DEVELOPMENT GOAL	Main indicators	Basic data in 2012	Goal in 2015	Data in 2015	
 ÉLIMINER L'EXTREME PAUVRETE ET LA FAIM	<b>REDUCING EXTREME POVERTY AND HUNGER</b>	Proportion of the population living on less than \$1 a day	61,3%	31%	62%
		Proportion of children who are underweight	23,5%	11,5%	20,8%.
 ASSURER L'EDUCATION PRIMAIRE POUR TOUS	<b>PROVIDE PRIMARY EDUCATION FOR ALL</b>	Primary school enrollment	68%	100%	55%
		Proportion of students starting grade 1 and completing grade 5	71,5%	100%	45%
 PROMOUVOIR L'EQUALITE DES SEXES ET L'AUTONOMISATION DES FEMMES	<b>PROMOTING GENDER EQUALITY AND WOMEN'S EMPOWERMENT</b>	Ratio of girls to boys in primary education	72%	100%	68,1%
 REDUIRE LA MORTALITE INFANTILE	<b>REDUCE INFANT MORTALITY (UNDER 5 YEARS)</b>	Under-5 mortality rate	179‰	70%	96‰
		Proportion of 1-year-olds immunized against measles	63%	100%	73%
		Proportion of 1-year-olds immunized with Pentavalent-3	58%	100%	48%
 AMELIORER LA SANTE MATERNELLE	<b>IMPROVING MATERNAL HEALTH</b>	Maternal mortality rate	890 /100 000 naissances vivantes	171 pour 100 000 NV	880 pour 100 000 NV

	<b>FIGHTING HIV/AIDS, MALARIA AND OTHER DISEASES</b>	HIV prevalence among 15-25 year olds	2,8%	1,5%	<b>2,8%</b>
		Malaria prevalence rate	32,2%	20%	<b>25,7%</b>
	<b>PRESERVE THE ENVIRONMENT</b>	Proportion of the population not using a drinking water source	45,9%	40%	<b>68%</b>

**Source : PNUD-CAR**

While for the African continent as a whole, it has been noted that significant progress has been made by African countries in implementing the Millennium Development Goals (MDGs), in particular the increase in the number of women in parliament reduction in maternal and child mortality and HIV-related deaths, as well as the number of children with access to basic education, the same cannot be said for CAR, which, due to the exacerbation of violence from 2012 onwards, saw all performance indicators fall by the wayside at the time of the 2015 review. CAR continues to be characterized by difficult and unequal access to basic social services, high unemployment and greater vulnerability to shocks.

With this in mind, the CAR government, like those of other countries in the world, subscribed to and adopted the 2030 Agenda for Sustainable Development in 2015 in order to make it a central axis in the fight against poverty, to contribute to the good health of the planet for future generations and to build peaceful societies, open to all to enable everyone to live in dignity. It is an inclusive universal program broken down into 17 goals for sustainable development. In August 2016, the government launched the implementation of Agenda 2023 in Bangui, one of the stages of this program. From now on, the Sustainable Development Goals (SDGs) will be the yardstick against which national programs and plans will be developed and evaluated.

It should be noted that the 2030 Agenda on the SDGs, which is broken down into 17 objectives, extends the efforts made in the framework of the MDGs.

Table 9: Sustainable Development Goals

Goal 1	No poverty
Goal 2	« Zero » Hunger
Goal 3	Good health and well-being
Goal 4	Quality education
Goal 5	Gender equality
Goal 6	Clean water and sanitation
Goal 7	Clean and affordable energy
Goal 8	Decent work and economic growth
Goal 9	Industry, innovation and infrastructure
Goal 10	Reduced inequality
Goal 11	Sustainable cities and communities
Goal 12	Responsible consumption and production
Goal 13	Action on climate change
Goal 14	Aquatic life
Goal 15	Land life
Goal 16	Peace, justice and effective institutions
Goal 17	Partnerships to achieve the goals

## 1.5.2 Commitment of the Central African Republic to Sustainable Development

The political will in favor of sustainable development was reinforced by the 1992 Rio Earth Summit. The National Charter for the Environment and Sustainable Development, whose general orientations were called for by His Excellency the President of the Republic, Head of State, in his Year 2 speech, places the concerns of sustainable development among the pillars of the government's policy on environmental protection. The proof of this strengthened political commitment to Sustainable Development is justified in the actions carried out by the Central African Government in recent decades:

- the ratification of regional and international treaties and conventions relating to the environment, the economy and social issues
- the development of legal texts governing the three pillars of sustainable development;
- the creation of a department in charge of the Environment and Sustainable Development;
- the study and implementation of projects for each sector;
- the development of national sectoral programs/action plans and the PRSP;
- participation in international conferences and meetings on SD
- Recognition and support to civil society organizations working for SD in each sector;
- the achievement and monitoring of the MDGs;
- Finally, public policy reform at all levels.

More specifically, with a view to strengthening political support for sustainable development, the CAR has carried out the following main actions

- the organization of a national dialogue in 2003 and an inclusive political dialogue in 2008
- the organization of a national seminar on Security Sector Reform (SSR) in April 2008
- the organization of a national seminar on Security Sector Reform (SSR) in April 2008; - the organization of general meetings in the mining, forestry, agricultural, justice and finance sectors
- the organization of a national youth forum;
- the adoption of the pole approach to development
- the ratification of international conventions;
- the adoption of new laws and regulations;
- the elaboration of different strategies and programs;
- the development and implementation of projects;
- the creation of new institutions in charge of the management of the environment and other sectors. Despite this political will, its level of integration into national priorities is very low and some laws lack implementation texts.

## 1.5.3 Regulatory framework for environmental protection

Well before the Rio Conference, CAR created a National Committee in charge of the protection and rational use of the environment, by decree n°89.047 of 23 February 1989. It is a consultative body in charge of pronouncing on all issues related to the environment policy. After Rio, the country created a National Committee for the Environment and Sustainable Development (CNEDD) by decree n°94.124 of April 26, 1994.

The mandate of these structures is to integrate the decision-making process on the environment and development within the framework of a national and decentralized consultation, and to ensure that sustainability is taken into account in the policies and strategies of economic development. In addition to this, the CAR, signatory of the Rio Convention of 1992, has worked to honor its commitments by putting in place a process aimed at safeguarding the environment and establishing sustainable development in the country through the implementation of several

reforms, strategies and action plans in order to consolidate the political, institutional and regulatory framework.

To this end, it has signed and/or ratified numerous protocols, treaties and international conventions, some of which are presented in the following box:

## BOX 1

### International protocols, treaties and conventions

- Protocols, treaties and international conventions
- Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) (signed in 1975);
- RAMSAR Convention on Wetlands (signed in 1980);
- Convention on the Conservation of Migratory Species of Wild Animals (signed in 1983);
- Vienna Convention for the Protection of the Ozone Layer (signed in 1986 and ratified in 2011);
- Convention on Biological Diversity (signed in 1992 and ratified in 1995);
- Cartagena Protocol on Biosafety, signed in 2011;
- Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising out of their Utilization, ratified on June 17, 2017;
- United Nations Framework Convention on Climate Change (signed in 1992 and ratified in 1995);
- Kyoto Protocol on Climate Change (ratification 2008);
- Convention to Combat Desertification (signed in 1994 and ratified in 1996);
- Convention on Persistent Organic Pollutants (Stockholm Convention);
- Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal
- Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade (Rotterdam Convention);
- Stockholm Convention on Persistent Organic Pollutants (signed in 2001 and ratified in 2004).

### 1.5.4 Sectors with a direct impact on Greenhouse Gas Emissions

With regard to the fight against global warming, the SOP-CC, which has developed a territorial approach, is the basic tool for the implementation of climate change governance in CAR.

As a non-Annex I country, CAR is obliged to report regularly on its information and actions to meet the climate challenge. The Third National Communication is the result of a fruitful collaboration between several institutions related to the issue of climate change and which participated in the different phases of its preparation. These include ministerial departments, public institutions, local authorities, civil society, universities, NGOs, socio-professional organizations and the country's cooperation and development partners.

This Third National Communication follows a plan defined by the Conference of the Parties and is a follow-up to the Initial National Communication published in 2001. It describes the national measures undertaken to curb and reduce Central African greenhouse gas emissions and to anticipate and limit the impacts of climate change on the national territory through appropriate adaptation measures. While it should help CAR to evaluate the progress made and to fulfill its own commitments to the Convention, it also allows for the cross-cutting communication of information between all Parties linked to the Convention.

The definition of the GHG emission mitigation and adaptation measures recommended in this communication is based on the various sectoral development strategies that the Central African

Republic has drawn up to support its development in the short, medium and long term. Their implementation, however, requires financial and technical support that should be mobilized through the various sources of multilateral cooperation. The various sectors that have a direct impact on greenhouse gas emissions are Energy, Agriculture, Transport, Industry, Mining and Waste.

## 1.6. Presentation of sectors vulnerable to climate change impacts

### 1.6.1 Water resources

The alternation of sequences of high rainfall and sequences of drought of varying intensity and duration is a dominant feature of the country's hydro-rainfall regimes.

In order to meet the needs of its current and, above all, future socio-economic development, the Central African Republic will have to face a double challenge:

- on the one hand, that of continuing the effort to mobilize water resources under increasingly difficult technical and economic conditions
- on the other hand, to improve the performance of existing infrastructure and to promote the efficient use of water, in order to ensure sustainable management of this vital and increasingly scarce resource.

A natural vulnerability of the water sector marked by climate extremes: Climate change has caused a significant decrease in rainfall in the Democratic Republic of Congo as well as in CAR (BOUKA and MPOUNZA, 2008), specifically, a 13% decrease in rainfall (NGUIMALET and ORANGE, 2011). Since the 1980s, the country has been in a dry phase and does not receive enough rainfall to, among other things, replenish the volume of the Ubangi River. This "long drought" has also caused soil degradation, which affects the flow of rivers and silting. A significant increase in average temperatures can also be observed during heat episodes that occur in cities with higher population densities such as Bangui, Bimbo and Bégoua.



Photo 2: Aerial view of the Oubangui River bed

## 1.6.2 Agriculture

The Central African Republic has relatively abundant natural resources and agro-ecological conditions that are generally favorable to agriculture and livestock farming. Indeed, this potential includes: (i) a climate that is favorable to rain-fed agriculture with relatively long crop cycles; (ii) arable land that is lightly exploited over nearly 15 million hectares, of which about 5% is cultivated each year, and less than 0.5 ha is exploited on average per agricultural worker; and (iii) a total area of pasture and rangeland estimated at 16 million ha, of which only 9 million ha are exploited by a herd of 3.7 million head of cattle.

There is also an abundance of water resources, thanks to an important hydrographic network. This constitutes a potential for the intensification of crops and the sedentarization of livestock, and the revitalization of fishermen's and fish farmers' groups.

### 1.6.2.1 A sector subject to the vagaries of time

Agriculture occupies 66% of the Central African population and 9% of cultivated land. The soil potential is estimated at 15 million hectares, while the Central African forest covers an area of 3.8 million hectares. Agriculture and forestry contributed 58% of GDP in 2014, compared to 12% if we take the extractive (gold and diamonds) and processing (beverages, sugar, cigarettes, sheet metal) industries.

While agricultural and pastoral activities play a major role in the national economy, they generally provide low incomes, and while the Central African population is among the poorest in the world, rural Central Africans are even more like the poorest of the poor. Indeed, despite favorable environmental conditions (climate, soil, land availability), farmers are poorer than the urban population: in Bangui, 30% of the population lives below the poverty line, while in rural areas 57% of the population lives below this line.



Photo 3: Agricultural fair in Bozoum

The challenges of climate change" (FAO, 2008), indicated that the situation with significant changes in climate will make agricultural production more vulnerable. In this context, an increase in temperature associated with a sharp decrease or increase in precipitation, would lead to more significant decreases in agricultural yields. This will lead to negative repercussions on the population and the accentuation of poverty.

### 1.6.1.1. A worrying warming for agriculture

In CAR, the effects of the increase in temperature on agriculture are still not very noticeable compared to those of rainfall and its increasing scarcity. It can therefore be said that Central African agriculture is indeed vulnerable to climate change, both because of the warming brought about by this change and because of the lack of water that this brings. The effects of climate and its hazards have played a large part in the crises that agriculture has experienced in CAR in recent decades.

### 1.6.3 Fishing

Central African fisheries are essentially of the riverine type, with fisheries in the north being strongly influenced by the floodplain system. Production is estimated at approximately 10,000 t/year of fish, of which nearly 80% comes from the northern region. On the basis of a potential production of between 20,000 and 50,000 tons/year depending on hydro-climatic conditions and the quality of the environment, there may be opportunities for development. Fishing has a long tradition in the Central African Republic, characterized in particular by seasonal migrations of fishermen and fairly well-structured marketing channels despite the precarious state of the country's communication routes. The fishermen use a wide range of gear and methods that allow them to efficiently catch fish in bioecologically unstable environments. The main development constraints relate to the access of fishermen to resources for economic (landlocked), security (border areas) and political (protected areas) reasons.

A policy for the development of the fishing and fish farming sector in CAR is currently being formulated. One of the prerequisites for its implementation should be the establishment of an appropriate institutional and legal framework, making the best use of the human and financial resources available within the integrated regional development projects.

Variations in temperature and other elements resulting from climate change will have a profound impact on fisheries and aquaculture, with significant consequences on food security for certain populations.

Changes in fish distribution due to climate variation have already been observed, generally involving poleward expansion of warm-water species and contraction of cold-water species.

### 1.6.4 Forest

Forest: a sector subject to all kinds of pressures: The Central African forest as a whole is under the influence of several pressures that can be of anthropic origin or linked to the climate and its hazards in our region.

The vulnerability of the Central African forest under the impact of anthropogenic pressures can be assessed by :

- Damage caused by illegal logging;
- Abusive cutting of firewood: the forest offers 3.25 million tons/year and the needs are 6 million tons/year;
- Fires: on average 2,938 ha are burned per year;
- Clearing, pruning of tree branches to provide food for livestock in times of drought, collection of acorns and pine nuts that are consumed by the population.

To these anthropic pressures on the forest are added those related to climate change that are observable. They have had visible consequences on the forest massifs with massive deaths of standing trees and this, in the total absence of young seedlings. This gives the Central African forest the qualification of a static state which is the ultimate stage of climatic equilibrium. The fauna follows the flora in this regressive dynamic and also shows its vulnerability.

### 1.6.5 Health

Health and risk of reactivation of disease outbreaks : The health system in the Central African Republic is organized around the public sector and the liberal private sector.

The second generation National Health Development Plan (PNDS II) was implemented through three-year rolling plans within the overall framework of the poverty reduction strategy, also in connection with the Poverty Reduction Strategy Papers (PRSP 1 and 2).

This Transition Plan, which is the result of a broad and inclusive consensus, has the merit of proposing general principles that facilitate the process of collaboration between the various actors, while relying on the development of a better coordinated regulation from which constant consultation between the actors should result. To do this, it will be necessary to focus on the immediate priorities of the moment, the differentiation of approaches according to zones and the arbitrations necessary for the operational relaunch at the level of the health districts. The expected results are linked to the following strategic areas

- Support for the institutional strengthening of the Ministry;
- the provision of a minimum package of quality activities
- Improving the management of maternal and child health;
- Improving the management of emergencies and other disasters;
- Improving disease control.

The vulnerability of health to climate change in CAR can be explained by the presence of endemic foci of diseases likely to be aggravated by climate change, notably malaria, bilharzia, typhoid and cholera. Although efforts are being made to control these diseases, the risk of their reactivation as a result of climate change is still possible.

### 1.6.6 Tourism

In 2009, the tourism sector injected 83,145,575 CFA into the economy, creating 2,305 jobs. Indeed, with its fifteen (15) Protected Areas equipped with reception centers and thirteen (13) hunting companies, two (2) National Parks and Reserves, notably the Dzanga-Sangha Park, and the Mbaéré Bodingue Reserve as well as the Bayanga site, the Central African Republic has promising ecotourism potential.

However, the poor road infrastructure and the presence of pockets of insecurity resulting from the actions of various armed groups are obstacles to the movement of tourists and the development of the sector in CAR.

For tourism, climate change is not a phenomenon that will occur in the distant future; it is already having an influence on the sector in different settings and destinations, from polar regions to tropical islands, mountains, coasts, arid zones, heritage sites, etc. It must be recognized that there are interactions between tourism and climate change. Tourism also contributes to the causes of climate change, mainly through emissions from tourist transport and the energy used in the sector's facilities.

To ensure the development of this sector of activity, in addition to the security measures to be strengthened, the government must anticipate on the adaptation measures to be put in place to limit the impact of climate change will have to be quickly implemented.



# CHAPITRE II

## NATIONAL GREENHOUSE GAS INVENTORY

The Central African Republic is in its third exercise at a time when, like the international community, it is preparing to implement its commitments to the new 2015 Paris Climate Agreement. However, this experience has not allowed for a capitalization of the lessons learned due to its "project approach" and the use of independent expertise, on the one hand, and the multiple structural crises from which it suffers, on the other.

## **2.1. Methodology of the inventory**

The process of preparing the IGES began with capacity-building workshops for national experts on the methodologies of the UNFCCC and the Intergovernmental Panel on Climate Change (IPCC) for the preparation of IGES, as well as the Good Practice Guidance and Uncertainty Management of National GHG Inventories (GPG 2000), the Good Practice Guidance for the Land Use Sector (GPG LULUCF 2003), the IPCC Data Bank (IPCC EFDB) and the decisions and recommendations of the subsidiary bodies of the Convention.

### **1.6.7 Source of the data used**

The inventories covered the direct gases, carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>) and nitrous oxide (N<sub>2</sub>O), and the indirect gases, nitrogen oxides (NO<sub>x</sub>), carbon monoxide (CO) and non-methane volatile organic compounds (NMVOC). The methodology used is the one described in the Intergovernmental Panel on Climate Change (IPCC) guidelines (revised version 1996) and the recommendations contained in the IPCC 2000 and IPCC-LULUCF 2003 best practice guides. The data used are collected from different public and private institutions and traditional data banks. Some unavailable baseline data were generated from expert judgment and/or extrapolation, taking into account national circumstances. The IPCC default emission factors are used for the estimates.

### **1.6.8 Key and non-key source categories**

The results of the key source analysis are based on the assessment of the sources that contribute to the uncertainty of the inventory. This implies contribution to the direct GHG emissions of the country, contained in the SNA were used to plan the inventory of the TCN. The update of the national circumstances allowed for a better identification of the sub-sectors on which internal actions could be effective.

A quantitative analysis of the relationship between the emission levels of each source category and total emissions was conducted for the base year 2010. In addition, a trend analysis of emissions was conducted for the 2011 - 2016 time series.

### **1.6.9 General evaluation of uncertainties**

The information on quantitative uncertainties is mainly used to prioritize the accuracy of future inventories and to guide the choice of methods to be used.

In most non-Annex I Parties, uncertainty in activity data is the main problem. National carbon content coefficients are unlikely to significantly improve CO<sub>2</sub> emission estimates. It is important to document the likely causes of uncertainty as well as the steps taken to reduce it.

The Good Practice Guidance and Uncertainty Management for National Greenhouse Gas Inventories (RBP2000) provides a systematic approach to estimating uncertainties in a variety of national circumstances using « decision logs ».

## 2.2. National Framework of the Greenhouse Gas Inventory

### 1.6.10 Legal basis

Decision-making tools such as statistics have been developed with the modernization of the Central African administration. It was particularly in 2001, with the promulgation of Law No. 01.008 regulating statistical activities in the Central African Republic, that the foundations of a formal organization were established.

This law created and defined the fundamental principles of the current organization of the public statistics structure, which was given the mission of providing statistical information related to the economic, social, demographic, cultural and environmental domains.

This law provides for:

- a National Statistics Council ;
- a Central African Institute of Statistics and Economic and Social Studies, the linchpin of national statistics
- as well as the possibility of creating other specialized public statistical structures and statistical training institutes.

It also establishes the principles or methodological rules that guarantee the credibility of the national statistical system's mission, notably statistical secrecy, the obligation of inter- and intra-institutional communication, transparency and harmonization with current international standards.

In addition, in a drive for efficiency and accountability, several sectoral departments have included in the legal framework of their public services a regulation on the development of specific statistics. It is in this optic that the Code of the Environment dedicates the section 2 (chapter 1) of the Title III to the protection of the air.

In this respect, the United Nations Framework Convention on Climate Change could find in this entire legal arsenal the basis for the national framework of the greenhouse gas inventory system.

### 1.6.11 Institutional Arrangement

The two texts mentioned above each define the institutional framework and the administrative means necessary for the production, dissemination and archiving of national and sectoral statistics.

The 2001 law created the Central African Institute of Statistics and Economic and Social Studies (ICASEES), which has an Environmental Statistics Department housed in the Directorate of Demographic, Social, Gender and Environmental Statistics. In close collaboration with the institutions concerned and within its areas of competence, this subdivision is responsible for developing methodologies for the production of statistics, monitoring data and indicators, and conducting studies on the impacts of changes in environmental parameters on the living conditions of the population.

At the same time, the second law, in the single chapter of its Title II, entrusts the Ministry of the Environment with the task of developing and implementing environmental policy, and delegates this task to the General Directorate for the Environment.

Meanwhile, in a bid to ensure the coherence and effectiveness of national climate actions a National Climate Coordination was created on January 25, 2017. The latter thus becomes the institution in charge

of the greenhouse gas inventory in the Central African Republic and implements its mission in collaboration with the sectoral structures as well as their decentralized subdivisions, including:

- the Energy Information System Unit (SIE), created with funding from the European Union, the International Organization of la Francophonie and CEMAC and located at the Ministry of Energy
- the Agency for Sustainable Management of Forest Resources (AGDRF), a structure under the Ministry in charge of Forests;
- the Central African Agency for Agricultural Development (ACDA) and the National Livestock Development Agency (ANDE)
- the National Water and Sanitation Agency (ANEA) and the Bangui Municipality.

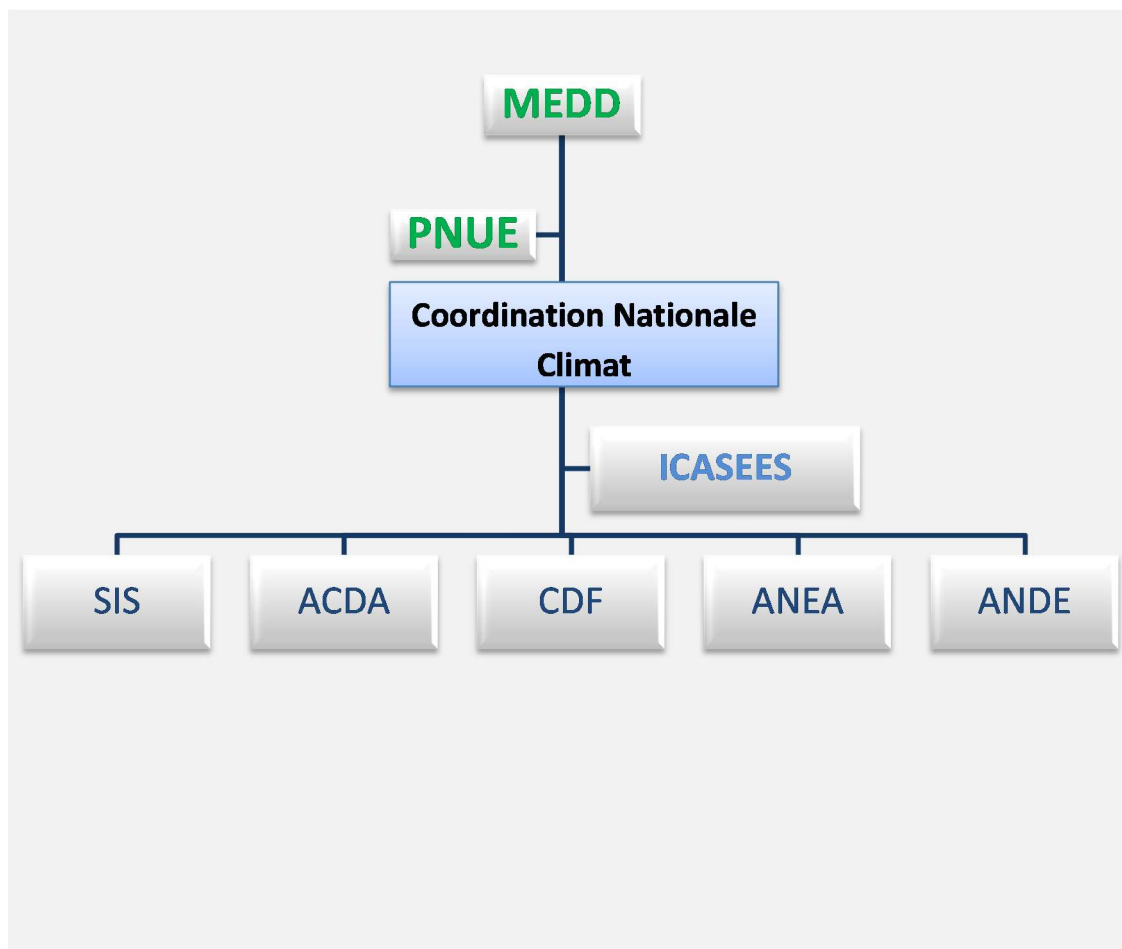


Figure 4 : Arrangement Institutionnel des GES en RCA

### 1.6.12 Strategic and operational approach

The Central African Republic still suffers from the "project approach" for conducting its greenhouse gas inventories. It should be noted that this activity is only carried out in the context of national communications. This restriction does not currently allow it to develop national capacities in this area.

Nevertheless, several sectoral departments making the development of decision-making tools a priority have received technical and financial support from development partners to strengthen the subdivisions in charge of statistics. Thus :

- the department in charge of Energy took advantage of the joint project financed by the European Union to set up the Energy Information System (SIE) in March 2012 in accordance with strategic axis 1 relating to strengthening the operational capacities of institutions in the field of planning and control. The technical unit in charge of the EIS, which came to an end in 2014, has received departmental budgetary support for the continuation of its mission.
- The department in charge of Water and Forests has capitalized on the achievements of the Support Project for the Implementation of Forest Management Plans (PARPAF) in order to create the Agency for Sustainable Management of Forest Resources (AGDRF) by entrusting it with the mission of managing the national forest heritage.
- In line with its Strategy for Rural Development, Agriculture and Food Security, the Department of Agriculture has created the General Directorate for Agricultural Studies, Planning and Statistics, which works with ACDA and ANDE to develop agricultural statistics.
- Finally, the PURISU Project has enabled the Direction des Grands Travaux of the Municipality of Bangui to develop a statistical database on the planning and management of municipal solid waste.

### 2.3. National Anthropogenic Emissions Cadastres - Greenhouse Gas Inventory

#### 1.6.13 Emissions from Energy

##### 2.3.1.1. Presentation of the Energy Sector

Greenhouse gas emissions in the energy sector come from fueling activities and fugitive emissions of hydrocarbons. These include

#### Stationary sources

- Energy industries
  - Extraction, production and processing
  - Electricity generation, oil refining
  - Self-generation of electricity
- Manufacturing and construction
  - Printing
  - Food, beverage and tobacco processing

#### Commercial/Institutional Sources

- Residential sources
- Agriculture, forestry, fishing
- Mobile sources
- Civil Aviation
- Road transport
  - Cars
  - Light trucks
  - Heavy trucks and buses
  - Motorcycles
- Marine Transportation
- International bunker fuels are reported separately.

The fuels involved are petroleum products (Super, Gasoil, Kerosene, Jet A1, Fuel Oil and LPG) and biomass consumed in the Other Sectors and the energy industry (for information). Gasoil is

consumed by almost all sectors, while Super is consumed in the transport sector and by chainsaws in forestry companies, small generators in households, small computer stores etc. Kerosene and LPG are consumed entirely by the residential sector, and fuel oil by MOCAF and SUCAF. Finally, JET A1 is used only in aviation.

It should be noted that the greenhouse gases emitted in the sector are: carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O) and nitrogen oxides (NO<sub>x</sub>).

### 2.3.1.2. Methodological approach to emissions estimation

The inventory of greenhouse gases in the Energy sector benefited from the different reports of the Energy Information System, in particular the energy balances of the period. During the mission, we collected and processed a number of primary data. Finally, the ASRP and SOCASP provided us with the statistics of hydrocarbon outflows by marketers and by geographical destination, except for those of the year 2012 which were not archived.

Thus, for Super and Gasoil, we retained the SOCASP data for the entire period. Extrapolating the 2011 SOCASP data with the overall consumption in 2012 from the 2012 EIS balance sheet allows us to inform the final consumption for 2012. Data collected from marketers are retained for Jet A1 and fuel oil

Apart from the density of petroleum products taken from the EIS-RCA energy balances (see Table1 below), all other emission factors are taken from the IPCC guidelines.

Tableau 1 : Densité des produits pétroliers

	Super	Gasoil	Lamp oil/Jet A1	Fuel	LPG
<b>Density (kg/m<sup>3</sup>)</b>	740,7	843,9	802,6	963,4	522,2

The lack of country-specific emission factors leads us to opt for the Tier 1 method for all estimates.

### 2.3.1.3. Greenhouse gas emissions

#### 2.3.1.3.1. Evolution of total Greenhouse Gas Emissions

The evolution of overall emissions over the period has three (3) speeds, as shown in the following figure: (i) a gradual fall from 2011 to 2013 due to the crisis; (ii) a period of stagnation between 2013 and 2014 and then (iii) from 2014 onwards we see a growth in emissions due to the gradual recovery of activities.

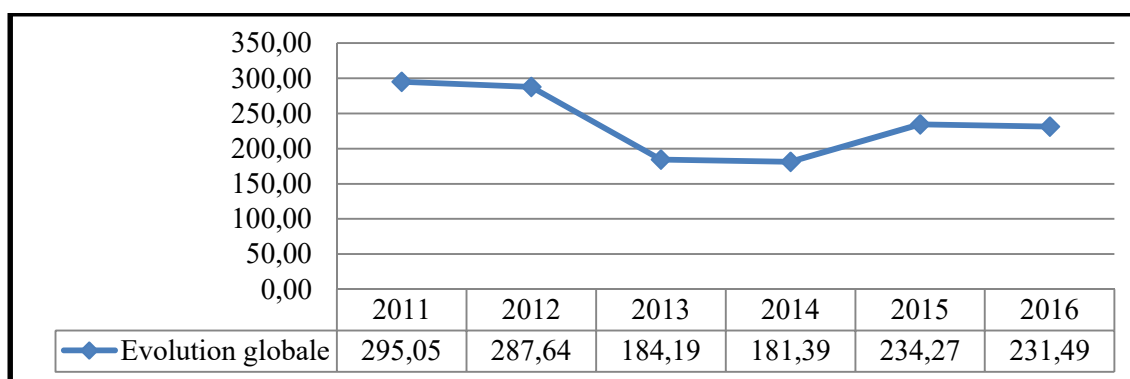


Figure 5 : Global evolution of GHG emissions from the Energy sector (In Gg)

This evolution also represents that of CO<sub>2</sub>, which constitutes more than 99% of the sector's greenhouse gas emissions.

Table 11: Overall greenhouse gas emissions (in Gg) Energy

	2011	2012	2013	2014	2015	2016
<b>CO<sub>2</sub></b>	294,943	287,528	184,111	181,292	234,146	231,466
<b>CH<sub>4</sub></b>	0,030	0,028	0,018	0,016	0,022	0,023
<b>N<sub>2</sub>O</b>	0,003	0,003	0,002	0,002	0,002	0,002
<b>NO<sub>x</sub></b>	0,074	0,076	0,062	0,085	0,097	

### 2.3.1.3.2. Evolution des Emissions de GES par secteur d'activités

In the Transport sector, we find that road transport polluted slightly more than civil aviation. The low emission in 2013 is explained by the looting of the car fleet caused by the last military-political crisis. The emissions from civil aviation follow the same trend as those from road transport. But these could not be estimated in 2016 due to lack of statistical data on hydrocarbon consumption. elle a enregistré une régression entre 2011 et 2014 avant d'afficher une croissance du fait du relèvement économique national.

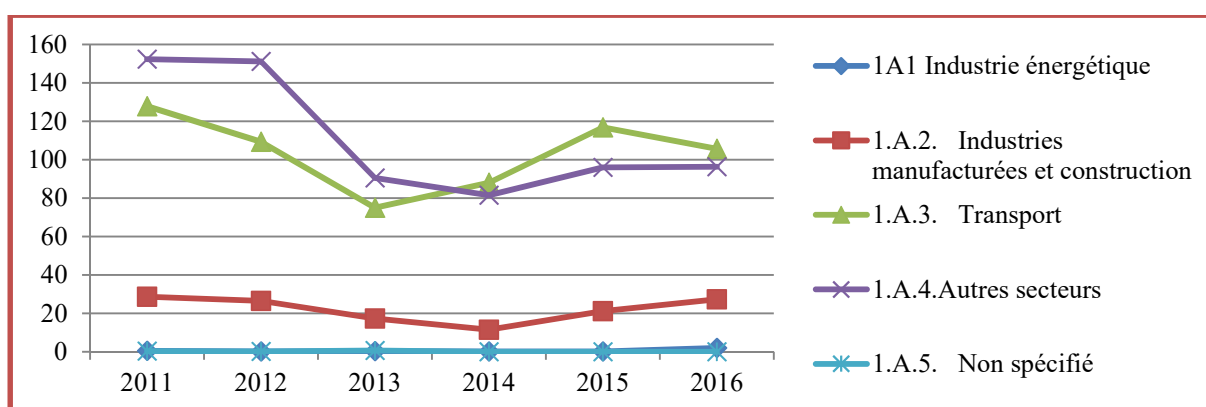


Figure 6 : Evolution des émissions par secteur

In the Transport sector, we find that road transport polluted slightly more than civil aviation. The low emission in 2013 is explained by the looting of the car fleet caused by the last military-political crisis. The emissions from civil aviation follow the same trend as those from road transport. But these could not be estimated in 2016 due to lack of statistical data on hydrocarbon consumption.

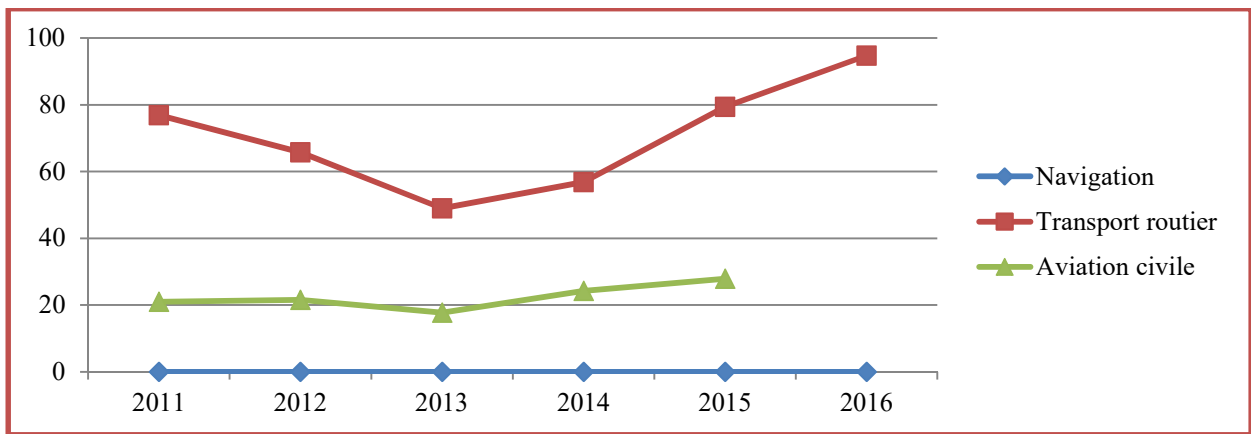


Figure 7 : Tendence des émissions par catégorie de transport

On the other hand, until 2014, emissions from gasoline-powered cars dominate the transport sector and will decrease from 2015 onwards. This is explained by the increase in the importation of diesel vehicles. The exponential growth of motorcycles from 2015 is justified by the phenomenon of motorcycle cabs.

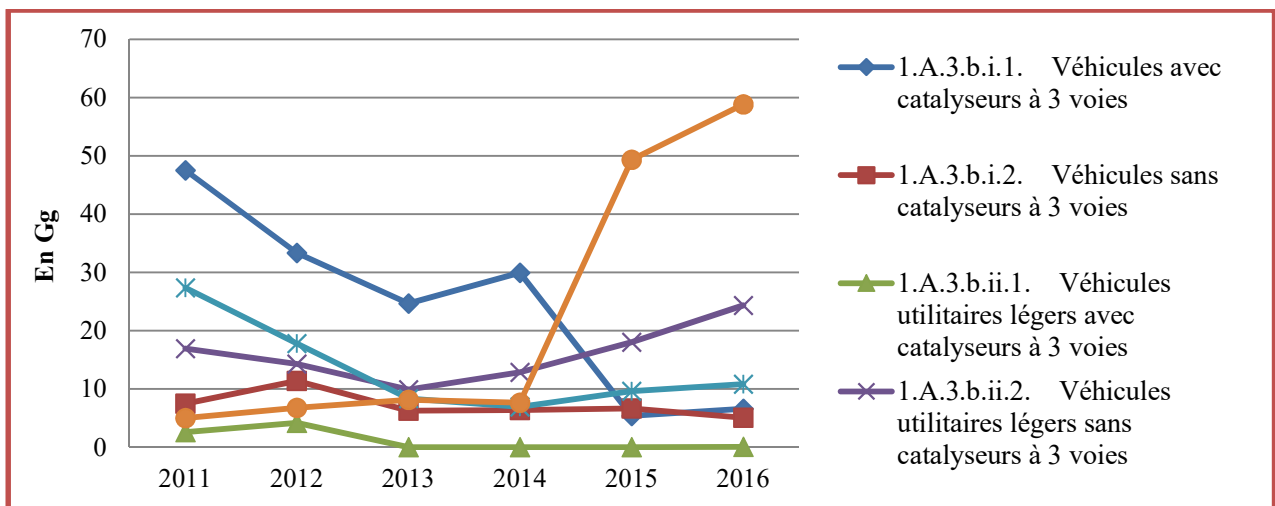


Figure 8 : Emission trends by road transport category

### 2.3.1.3.3. Sectoral contribution to GHG emissions

Overall, Other Sectors slightly exceeded Transportation in GHG emissions over the period.

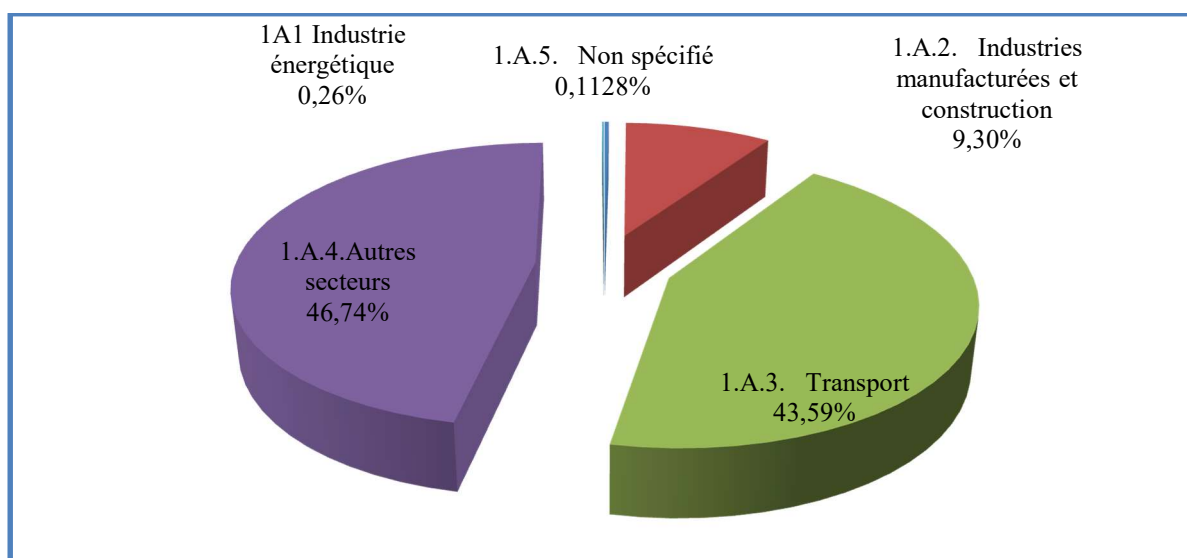


Figure 9 : Breakdown of emissions by sector of activity over the period

### 2.3.1.4. Emissions from Industrial Processes and Product Use

#### 2.3.1.4.1. Presentation of the sector

The Industrial Processes and Product Use (IPUP) sector covers greenhouse gas emissions from industrial processes, solvent use and non-energy fossil fuel carbon emissions.

Among the processes attributable to this sector are the production and use of mineral products, the production of nitric acid, the production of sulfuric acid, the production of ferrous metals, the consumption of halo carbons, the consumption of solvents, the production of pulp and paper, the production of wine and beer, and the production and use of foodstuffs.

To these activities, we must add the use of asphalt for pavement, lubricant for engines, organic solvents in analysis and research laboratories, halogenated hydrocarbons for refrigeration and the production of foams and aerosols.

The main companies whose activities fall within this sector are listed in the following table:

Table 12: Main industries operating in the Central African Republic

SOCIETES/INDUSTRIES	DOMAINE D'ACTIVITE
MOCAF	Brasserie
HUSACA	Savonnerie
SAVEX	Savonnerie
COLALU	Tôlerie
ALUBA	Tôlerie
SUCAF	Sucre
SOCAGI	Gaz
SOCAPS	Peinture
SOCACIG	Cigarette
PALM D'OR	Huilerie
CENTRAPALM	Huilerie
RAYAN	Eau minérale, céramique

The two main contributing gases are carbon dioxide (CO<sub>2</sub>) produced mainly by the clinker and lime industry and non-methane volatile organic compounds (NMVOCs) generated by the food industries.

In the second national communication, the GHG emissions generated in the Industrial Processes sector between 2003 and 2010 is 5.80 Gg. The CO<sub>2</sub> emissions represent 14% against 86% for NMVOCs. The two main gases produced are carbon dioxide (CO<sub>2</sub>) emitted during the use of soda in soap making and non-metallic volatile organic compounds (NMVOC) from the food and beverage industries (beverage, bread and other foods).

#### 2.3.1.4.2. Methodological approach to estimating the sector's GHG emissions

Data was collected from various companies in the area. These data were completed with information collected from the data depository administration, mainly ICASESS.

The calculation of emissions was based on data from the year 2011 taken as a reference year. The methodology applied to make this GHG inventory is that provided in the IPCC guidelines. The Tier 1 methods were used for the estimation of emissions related to the industrial processes and product use sector with default factors provided in the IPCC Good Practice Guidance (versions 1996, 2000 and 2006).

#### 2.3.1.4.3. Main GHG emissions of the sector

- **General equation**

$$\text{TOTAL}_{ij} = \text{DA}_j \times \text{FE}_{ij}$$

- where :
  - TOTAL<sub>ij</sub> = emissions (tons) of gas i from industrial sector j
  - AD<sub>j</sub> = measure of material activity or production (activity data) in industry sector j (tonne/year)
  - EF<sub>ij</sub> = emission factor (EF) associated with gas i per unit of activity in industry sector j (tonne/ton)

##### 2.3.1.4.3.1. CO<sub>2</sub> emissions from lubricant and soda use

1.6.14 The estimates of CO<sub>2</sub> emissions from the use of lubricants and soda ash are shown in the figure below.

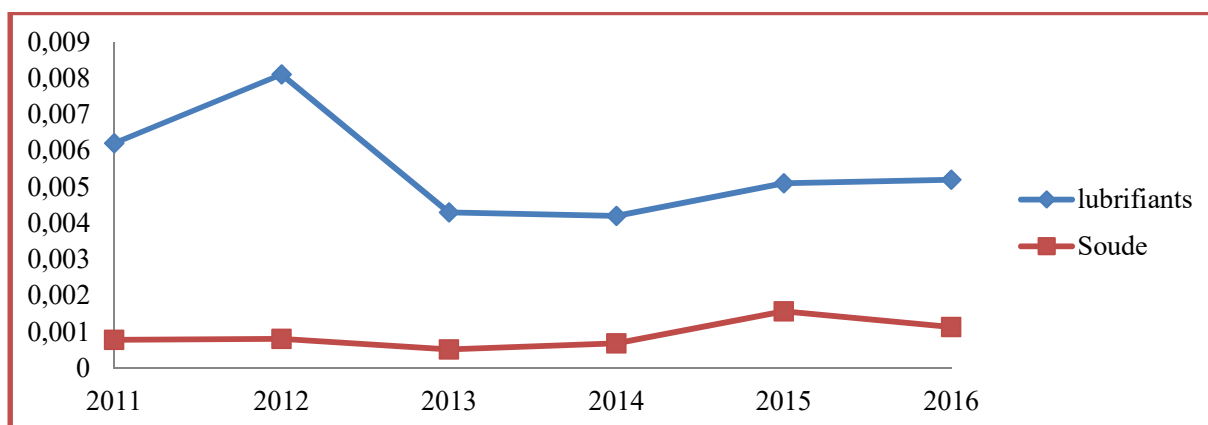


Figure 10: Emissions de CO<sub>2</sub> issues d'utilisations des lubrifiants et d'utilisations de la soude

### 2.3.1.4.3.2. Non-methane volatile organic compound emissions

It includes estimates of emissions particularly from the use of asphalt for pavement and those resulting from the production of alcoholic beverages and food (sugar, cakes, meat, bread and coffee roasting). The emissions are shown in the figure below.

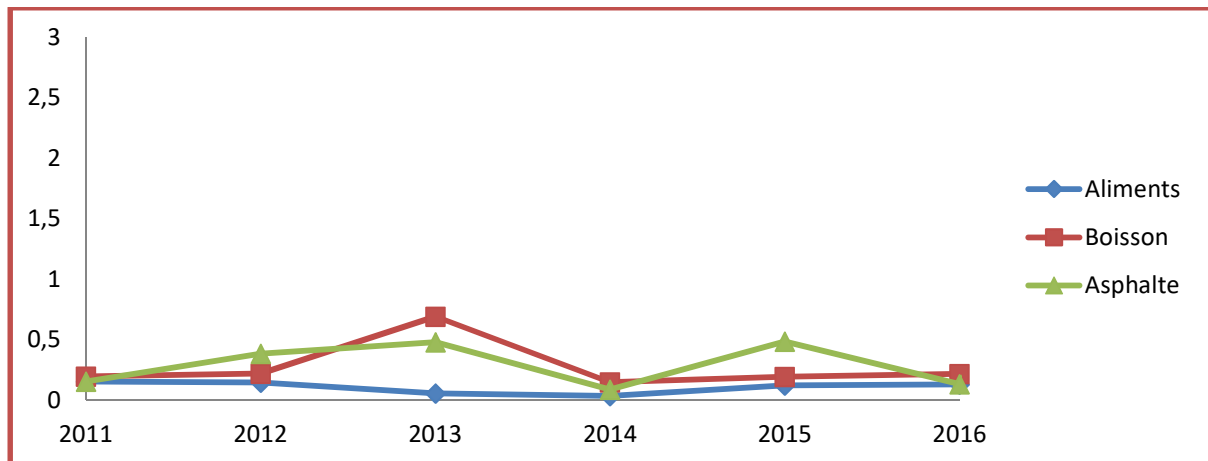


Figure 11 : émissions de COVNM issues d'utilisations d'asphalte, des aliments et des boissons

Noting that the use of asphalt for road paving and roofing is very negligible in CAR. Data on the use of solvents is not available (ND) due to the unavailability of data from the services concerned.

### 2.3.1.4.3.3. Carbon halo emissions

There are no hydrofluorocarbons (HFCs) or perfluorocarbons (PFCs) production units in the country. The Central African Republic only imports HFC/PFCs for air conditioning and refrigerators. Data on the number of air-conditioned vehicles and trucks circulating in CAR are not available from the Ministry of Transport. Since statistics on the destruction rate do not exist, we based our estimates on imports of refrigerators and consider their average life of 3 years and the average charge during filling, which is estimated at 250 g of HFC134a per refrigerator. Moreover, the data available at the Customs level on imports of refrigerators and air conditioners do not allow to clearly identify the gas content (CFC or HFC). Thus, the estimated emissions are represented in the following figure.

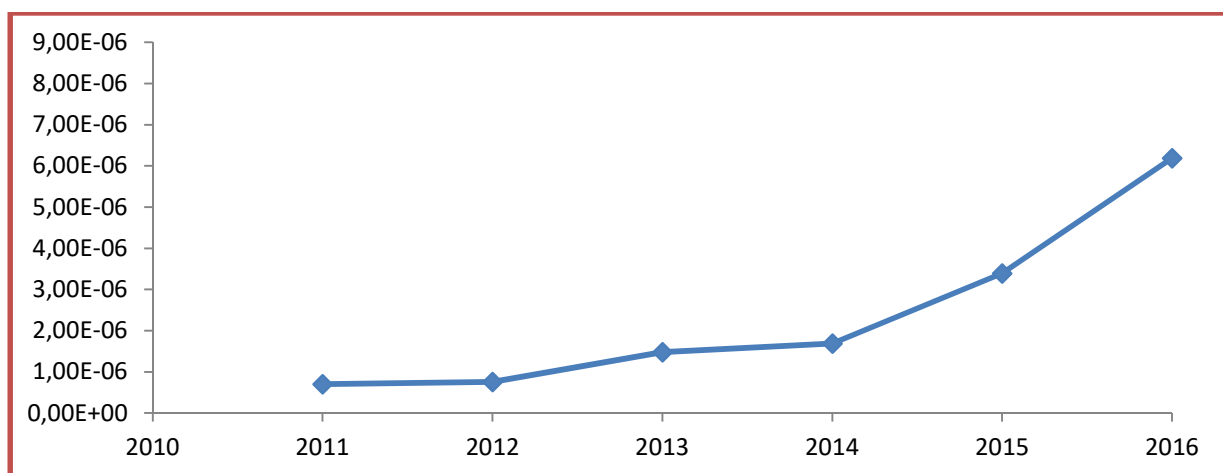


Figure 12 : émission de HFC provenant de l'utilisation des réfrigérateurs et climatisations

## 1.6.15 Emissions from Agriculture, Forestry and Land Use

### 2.3.1.5. Main land uses and agricultural and forestry operations

The Central African territory covers an area of approximately 623,000 km<sup>2</sup> with a monotonous relief whose altitudes vary between 325 m and 1,410 m (Mount Ngaoui). It is located in the heart of the African continent between latitudes 2°10' and 11° North and benefits from a tropical climate with Guinean-Forest, Sudano-Guinean, Sudano-Abanguinean, Sudan-Sahelian, and Sahelian characteristics from South to North.

This physical setting gives it a dense and diversified vegetation. There is a dense rainforest of 5.4 Mha in the South, of which more than 70% is dedicated to industrial timber exploitation for a total of 14 exploitation and development permits (PEA) currently attributed to forestry companies. The savannah occupies most of the country. It is of a great physiognomic heterogeneity and dotted with numerous forest galleries linked to the hydrographic network. It is composed of three main types: the tree savanna, the shrub savanna and the grassy savanna. Finally, the steppes located in the extreme northeast of the country in the Sahelo-Sudanese sector towards Birao. It is characterized by the plant grouping of *Acacia radiana*, which is widespread on sandy substrates.

The combination of climate, vegetation and relief determines the formation of soils in the country, whose boundaries correspond to those of the climatic zones. Ferralitic soils and tropical ferruginous soils dominate over young erosion soils or alluvial and hydromorphic soils. Ferralitic soils cover three quarters of the territory, particularly where high rainfall favors the hydrolysis of rock minerals to a certain depth. These soils are poor in nutrients, and are acidic and fragile.

Nevertheless, the Central African Republic has nearly 15,000,000 hectares of arable land, of which only 800,000 hectares (or about 5.3%) are cultivated each year for food crops and cash crops. In addition, out of a total area of pasture and rangeland estimated at 16 million hectares, only 9 million hectares are exploited for an estimated 3.7 million head of cattle.

### 2.3.1.6. Methodological approach to estimating emissions from the AFAT sector

The methodology used for the GHG inventory is the one recommended by the 2006 guidelines and the IPCC good practice guides. As a reminder, the gain-loss method is applied to estimate GHGs for the different categories of the land use and forestry sector. Due to the absence of some data, only the Tier 1 method is applied. We used national activity data and default IPCC factors. Furthermore, in the calculation of emissions from the conversion of forest land to cropland we assume that since agriculture is slash-and-burn, the emissions from land conversions are equivalent to those from biomass burning (controlled fire).

The identification of key source categories was done on the basis of qualitative criteria and not quantitative because the CSS does not use the same nomenclatures. The main key source categories are presented in the table below.

Table 13: Key source category of the AFAT sector

Code	IPCC source category	Key sources
3 A 1 a	Enteric fermentation (bovine)	Potential sources of CH <sub>4</sub> emissions
3 C 3	Urea application	Potential sources of nitrogen emissions
3 C 5	Indirect N <sub>2</sub> O emissions from managed soils	Potential sources of GHG emissions
3 C 7	Rice crops	Potential sources of GHG emissions
3 B 1 a	Forest land (FT) remaining FT	Important in carbon sequestration
3 B 1 b	Land converted to FT	-Important in carbon sequestration -Potential sources of GHG emissions
3 B 2 a	Cropland (CT) remaining CT	-Important in carbon sequestration -Potential sources of CO <sub>2</sub> -free gas emissions
3 B 2 b	Land converted to CT	Potential sources of GHG emissions
3 B 3 a	Grassland remaining grassland	-Important in carbon sequestration Potential sources of CO <sub>2</sub> -free gas emissions
3 B 4 a	Wetland (TH) remaining TH	-Potential sources of CO <sub>2</sub> emissions Potential sources of N <sub>2</sub> O emissions
3 B 5 a	Establishments remaining Establishments	Potential sources of CO <sub>2</sub> emissions

Data was collected from the various institutions that produce statistics through field missions and by using online resources (e.g., the FAO and WRI databases). It is equally important to note that the databases as well as the FAO definitions (FAOSTAT) were used. We have retained:

**Forests:** Land with an area of more than 0.5 hectares bearing trees taller than 5 meters with a tree crown cover of more than 10 percent, or trees capable of meeting these criteria in situ. This category does not include land that is predominantly in agricultural or urban use. Forest is defined by both the presence of trees and the absence of other land uses. Also excluded are stands in agricultural production systems, such as fruit tree plantations and agroforestry systems. Also excluded from this category are trees in urban gardens and parks. In 2011, Central African forest land represented 35.69% and 35.56% in 2016, including 8.97% primary forest, 0.01% planted forest and 89.67% naturally regenerated forest.

**Permanent grasslands and pastures:** Land permanently (five years or more) covered with herbaceous forage plants, either cultivated or in their natural state (natural grass or pasture).

**Wetlands:** refers to shrub and/or herbaceous vegetation, aquatic or regularly flooded

**Settlement:** refers to artificial surfaces including urban and associated

### 2.3.1.7. Greenhouse gases in the AFAT sector

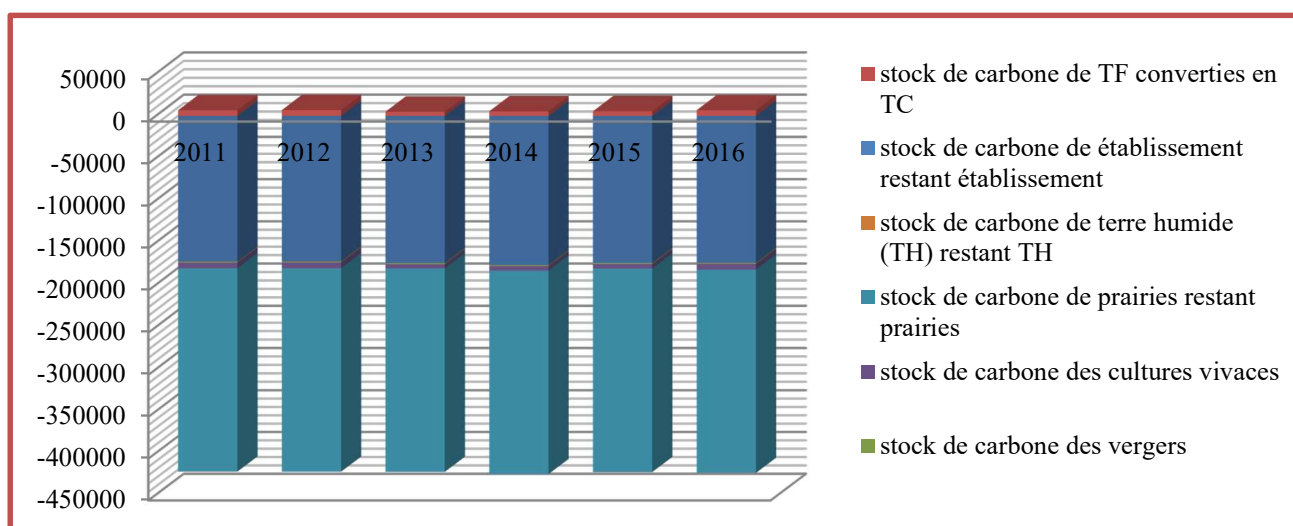
#### 2.3.1.7.1. Emissions related to land use

The main land uses include the natural distribution and the socio-economic exploitation of the national forest and pedestrian heritage, including urban and rural settlements, which are not without consequence on the atmospheric balance. The table below summarizes the emissions of the different categories related to land use.

Table 14: Summary results of greenhouse gas emissions from land use (GgCO<sub>2</sub>/year)

Catégories de sources	2011	2012	2013	2014	2015	2016 <sup>1</sup>
carbon stock TF remaining TF	- 172453,79	- 172300,72	- 174204,21	- 176549,87	-174046,91	-173911,10
carbon stock of TC in TF	- 147,75	- 147,75	-146,68	- 146,68	- 146,68	-146,68
carbon stock of orchards	- 1 146,96	- 1 131,23	- 1 283,20	- 1 215,73	-1 243,89	- 1 257,97
carbon stock of perennial crops	- 6 658,59	- 6 817,42	-4 900,22	- 5 333,70	- 5 390,02	- 6 692,29
grassland carbon stock remaining grassland	- 241 592,91	-241 651,80	- 241 718,10	- 241 695,62	- 241 696,08	- 241 670,90
wetland (TH) carbon stock remaining TH	-152,64	- 152,64	-152,74	- 151,83	-151,83	- 152,34
establishment carbon stock remaining establishment	- 127,57	- 133,62	- 140,74	- 145,20	- 146,56	- 38,74
TF carbon stock converted to CT	6 658,59	6 817,42	4 900,22	5 333,70	5 390,02	6 692,29

The inventory results show that the land use sub-sector is a carbon sink except for the category of forest land converted to cropland which emits CO<sub>2</sub>. Carbon sequestration by soils from forest land and cropland is significant. Respectively, they are 1,990,279.35 and 3,253.57 GgCO<sub>2</sub> for a total of 1,993,532.92 GgCO<sub>2</sub> in six (6) years

Figure 15: CO<sub>2</sub> emissions from land use

The figure shows that the grassland category is the source that sequesters more carbon since this ecosystem is not disturbed by human activities. Next comes the forest land remaining in the same category. The plantations of palm, coffee and cocoa trees on the one hand and orchards on the other have increased the country's carbon sequestration capacity. The source of cultivated land category in forest land, including plantations sequesters less carbon than wetlands but higher than

<sup>1</sup> Certaines données de 2016 ont été obtenues en faisant la moyenne de 2011 à 2015. Ceci concerne les catégories TF, Th, Prairies et Etablissement

the settlements that remained established during the inventory period. In sum, there is no significant variation over the inventory period.

### 2.3.1.7.2. Biomass Burning Emissions

Emissions from biomass burning are related to the grassland and land converted to agriculture categories. The table below summarizes them according to the different GHGs.

Table 15: Emissions from biomass burning (kg)

Catégories de sources	Gaz	2011	2012	2013	2014	2015	2016
Total emissions from biomass burning	CO <sub>2</sub>	467159,72	267283,3	766946,61	338370,33	782531,39	524458,27
	CO	30272,41	17173,85	49806,28	21839,6	50991,39	34016,706
	CH <sub>4</sub>	1956,75	1103,03	3224,53	1407,47	3309,56	2200,268
	N <sub>2</sub> O	456,57	256,16	753,27	327,69	774,57	513,652
	NO <sub>x</sub>	499,36	293,76	813,88	366,48	820,9	558,876

CO<sub>2</sub> emissions are most important followed by carbon monoxide (CO). It should be noted that the 2006 IPCC guidelines do not allow for the estimation of Non-Methane Volatile Organic Compounds (NMVOCs) emissions related to biomass burning.

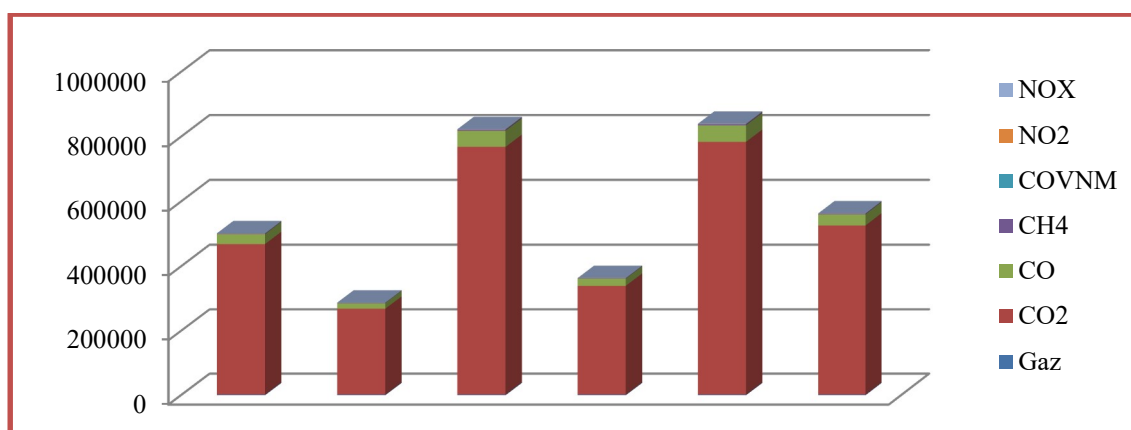


Figure 16: Evolution of GHG emissions from biomass burning

The analysis of the previous figure shows that CO<sub>2</sub> emissions are the most important followed by CO, CH<sub>4</sub>, NO<sub>x</sub> and N<sub>2</sub>O. It should also be noted that the years 2013 and 2015 are the two years where there is a peak in emissions. For the year 2013, this peak is justified by the settlement in the forest of internally displaced persons fleeing the abuses committed by armed groups. On the other hand, the peak in 2015 is supported by the revival of agricultural activities.

### 2.3.1.7.3. Emissions related to agricultural practices

Emissions related to agro-pastoral practices can be classified according to the gases they release. Methane emissions from enteric fermentation, manure management and rice cultivation can be noted. The use of urea and other organic fertilizers releases carbon dioxide (CO<sub>2</sub>) and nitrous oxide (N<sub>2</sub>O).

- **Methane emissions from rice cultivation and livestock management**

The practice of rice cultivation promotes methane emissions. During the period 2011-2016, about 1.54 Gg of CH<sub>4</sub> was produced in the rice fields. However, there was a sharp drop in emissions in 2011, coinciding with the end of the Nierica project, which supported rice farmers in Bouar, Bambari and Bangui and its surroundings, as shown in the following figure. Methane emissions in 2011 peaked at 1.337Gg CH<sub>4</sub>. From 2012 to 2016, emissions dropped to stabilize at around 0.05 Gg CH<sub>4</sub>.

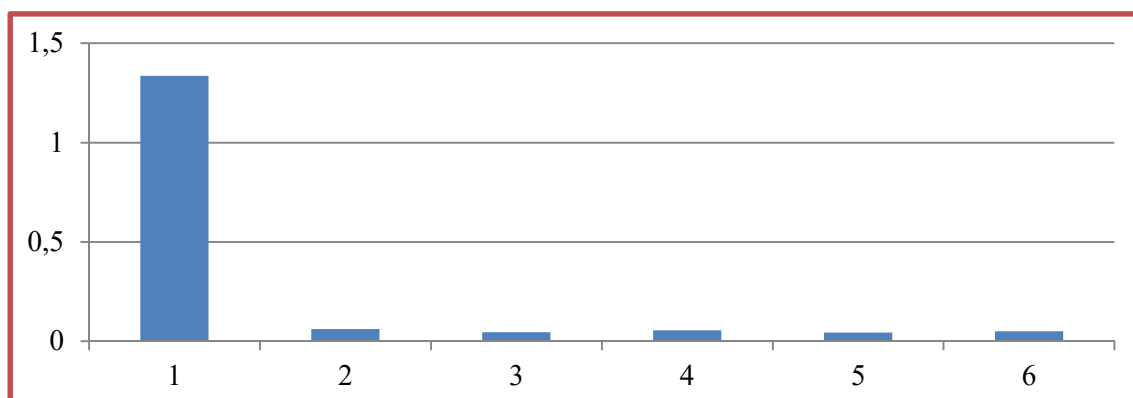


Figure 17: CH<sub>4</sub> Emissions from Rice Production

Furthermore, the table below shows that 95% of the methane emissions from livestock production come from enteric fermentation and the rest from manure management.

Table 16: Methane Emissions from Livestock Production (Gg)

	2011	2012	2013	2014	2015	2016
CH <sub>4</sub> emission from enteric fermentation	0,1523	0,1567	0,08621	0,08782	0,0894	0,09240
CH <sub>4</sub> emission from manure management	0,0073	0,00754	0,00474	0,00482	0,00489	0,00503
<b>TOTAL CH<sub>4</sub> dues aux bétails</b>	<b>0,1596</b>	<b>0,16427</b>	<b>0,09095</b>	<b>0,09265</b>	<b>0,09437</b>	<b>0,09742</b>

The average annual production of CH<sub>4</sub> from livestock in the Central African Republic is around 0.116 Gg over the period 2011 to 2016. The low level of emissions in 2014 is reflected in the migration of livestock farmers with their herds to neighboring countries as illustrated in Figure 17 below.

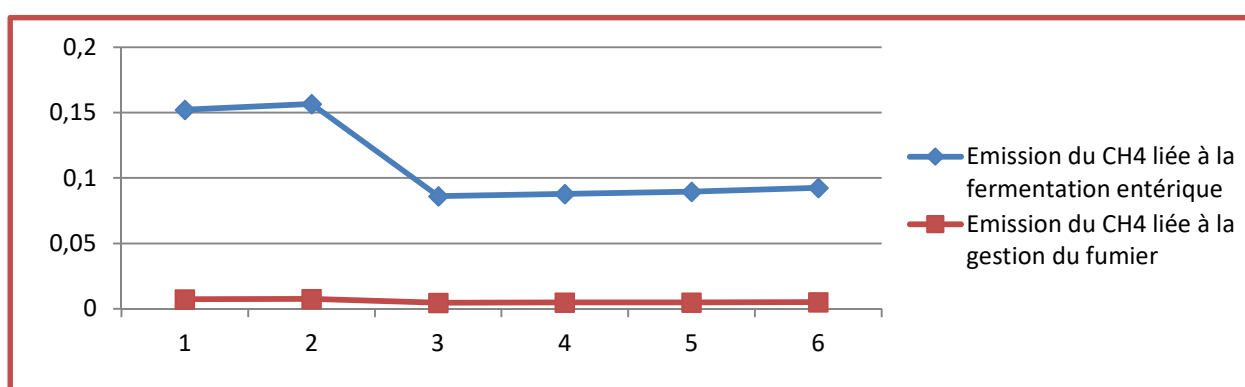


Figure 18: Methane emissions from livestock production

- **Carbon dioxide emissions from the use of urea**

Urea is used as a fertilizer in agricultural production. In the Central African Republic, cotton production is the main source of urea consumption. The state subsidizes these inputs and organizes the supply to

cotton producers. Between 2011 and 2014, support was provided to the cotton unit to re-launch cotton production.

Table 7 below summarizes the annual CO2 emissions per year for the period 2011 to 2016.

Table 17: Carbon dioxide emissions from urea use in agriculture (Tonne CO2)

Année	2011	2012	2013	2014	2015	2016
Emission CO <sub>2</sub>	7416,2	15224	17600	254,466	192,86	354,2

In 2014, the crisis that the CAR experienced did not allow the cotton unit to sustain its technical assistance to producers. This disruption in the supply of nitrogen fertilizer justifies the decrease in CO2 emissions related to its use.

- **Nitrous oxide emissions linked to the use of mineral and organic nitrogen**

Crop production is dependent on the supply of nitrogen, of which manure and mineral fertilizer are the main sources in Central Africa. Livestock excreta mineralize and release nitrous oxide into the atmosphere. Table 8 below summarizes the quantities released into the atmosphere following fertilization with mineral and organic fertilizers.

Table 18: N2O emissions from agricultural practices (Gg)

Type d'émission	2011	2012	2013	2014	2015	2016
Direct N2O emission to soil from agricultural residues	9,48*10 <sup>-6</sup>	25,99*10 <sup>-6</sup>	13,62*10 <sup>-6</sup>	15,61*10 <sup>-6</sup>	12,75*10 <sup>-6</sup>	5,80*10 <sup>-6</sup>
Indirect soil N2O emission from organic fertiliser use	1,352	1,381	0,981	0,497	0,507	0,517
Indirect soil N2O emission from manure use	11,987	12,206	11,469	4,101	4,196	9,243
<b>Emission Total du N<sub>2</sub>O du secteur agricole</b>	<b>13,337</b>	<b>13,587</b>	<b>12,451</b>	<b>4,598</b>	<b>4,703</b>	<b>9,760</b>

During 2011-2016, approximately 58 Gg of N2O was emitted as a result of soil fertilization by organic and mineral amendments.

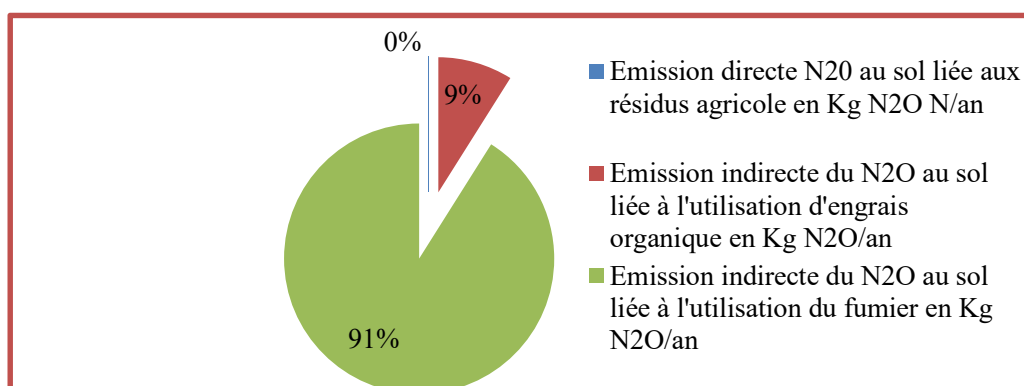


Figure 19: Contribution of the main sources of N2O emissions from agricultural practices.

As shown in the previous figure, more than 90% of the emissions come from animal manure, 8% from the use of organic fertilizer and about 1% from the decomposition of agricultural residues. The average N<sub>2</sub>O emission during the period 2011 to 2013 is about 13 Gg. This emission dropped in 2014 which corresponds to the crisis period. This period is marked by the migration of livestock farmers to neighboring countries. Livestock activities have decreased.

#### **2.3.1.7.4. Emissions due to waste management**

##### **2.3.1.7.4.1. Presentation of the waste sector**

The Central African Republic's greenhouse gas (GHG) inventory for the waste sector is based on the management of municipal solid waste and domestic and industrial wastewater.

Solid waste management is still the responsibility of the municipalities. However, the latter do not have sufficient means to ensure effective and sustainable management covering their jurisdiction. Only the Central African capital, Bangui, benefits from an embryonic organization resulting from the Emergency Project for the Rehabilitation of Urban Services (PURISU) funded by the World Bank.

Apart from this project, there is no collective sanitation system of the sewerage type in the Central African Republic. The only type of domestic wastewater treatment in effect is autonomous sanitation managed within the plots or homes through latrines (improved or traditional) and septic tanks. According to estimates by the General Directorate of Hydraulics, which is also in charge of sanitation, the access rate to improved sanitation services is 65.9% in urban areas and 43.1% in rural areas. The rates for access to unimproved sanitation services are 34.1% in urban areas and 56.9% in rural areas.

Finally, industrial wastewater does not undergo any prior treatment and is discharged into the M'Poko River for infrastructures located nearby and into open spaces for others, despite the requirements of the Environmental Code.

##### **2.3.1.7.4.2. Methodological approach to estimating emissions**

The IPCC methodology for estimating CH<sub>4</sub> emissions from SEDS is based on the First Order Decomposition (FOD) method. This method assumes that the destructible organic component (Degradable Organic Carbon, DOC) of the waste decomposes slowly over several decades; during which time CH<sub>4</sub> and CO<sub>2</sub> are formed. CO<sub>2</sub> emissions are not included in the national totals because this carbon is of biogenic origin and the net emissions are accounted for in the AFAT Sector. In contrast, N<sub>2</sub>O emissions from solid waste disposal sites are insignificant and no methodology is provided for them.

Although covering barely 50% of the city of Bangui, the PURISU project has generated some statistical data on municipal solid waste production, collection and dumping rates, particularly for the Kolongo landfill site, which is considered to be a controlled landfill that practices waste burial, during its implementation phase from 2009 to 2016. Outside this circuit, municipal solid waste is dumped in unconventional "wild" dumps (gutters, open spaces, fields, shallow holes, etc.) subject to the vagaries of the weather (winds and rains) and often burned.

In the Central African Republic, open burning of waste is a common practice, especially in the dry season. It can be defined as the burning of combustible materials such as paper, wood, plastic, rubber, used oil and other debris contained in municipal solid waste in the open air or in open dumpsites where smoke and other emissions are released directly into the air without going through a chimney. Unfortunately, no statistical data on this practice exists and the use of default

data from South America with the same development characteristics has been used to estimate emissions from open burning of solid waste.

In addition, wastewater can be a significant source of methane (CH<sub>4</sub>) when treated or disposed of anaerobically, as well as a source of nitrous oxide (N<sub>2</sub>O) emissions. Carbon dioxide (CO<sub>2</sub>) emissions from wastewater are not addressed in the IPCC Guidelines because they are biogenic in origin and should not be included in national total emissions.

#### 2.3.1.7.4.3. Greenhouse Gas Emissions from the Waste Sector

Methane, carbon dioxide and nitrous oxide are the main gases assessed for the Waste sector.

- **Methane Emissions from Municipal Solid Waste (MSW) and Wastewater**

As noted above, municipal solid waste dumped in so-called "fly-tipping" sites and effluents from industries such as MOCAF Brewery, SUCAF, and HUSACA discharged into the river or into the wild do not generate any estimable gases. Only CH<sub>4</sub> emissions from domestic wastewater (latrines and septic tanks) from households and some establishments (hotels, restaurants, etc.) are included in the table and represented in the figure below:

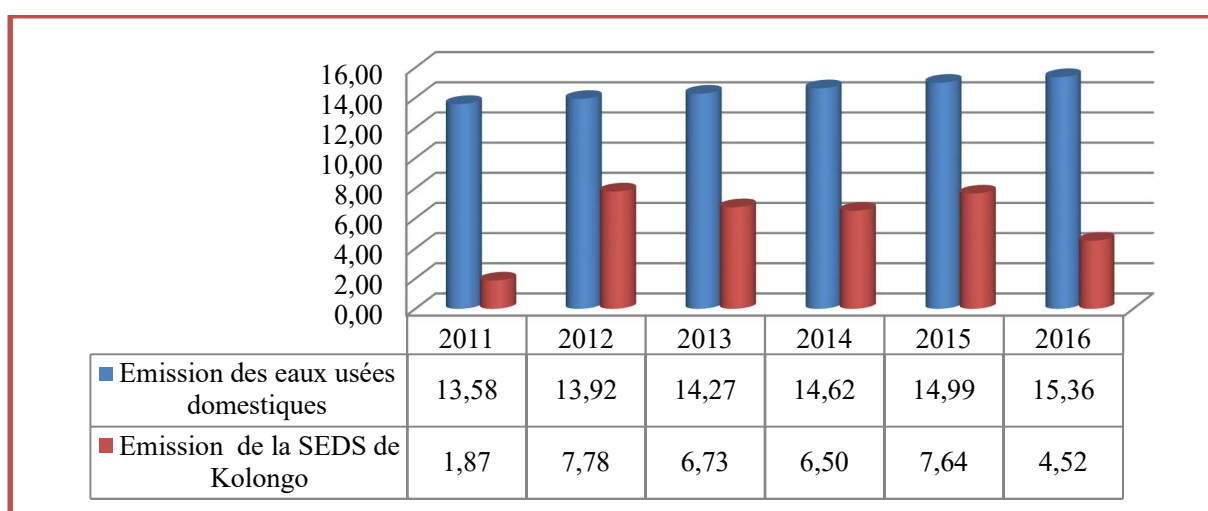


Figure 20: CH<sub>4</sub> emissions from waste management (Gg)

The growth in emissions from domestic wastewater treatment is synoptic with population growth. On the other hand, the growth in estimated emissions from the disposal of wastewater at the controlled site in Kolongo reflects that of the implementation periods of the PURISU project. 2011 and 2016 are respectively the year of the launch of the MSW collection phase through the contracting of private companies and the closure of activities at the end of the World Bank grant contract.

- **Carbon dioxide emissions from open burning**

The CAR has little capacity to manage waste, which is either burned in the open air or dumped in the wild without statistical monitoring. In addition, some hospitals have installed incinerators, but their use is not subject to prior quantification of the waste treated. The only existing data is for the year 2017 estimated at 0.033369 Gg CO<sub>2</sub>.

Emissions from biomedical waste incineration and open burning of municipal solid waste are shown in the figure below:

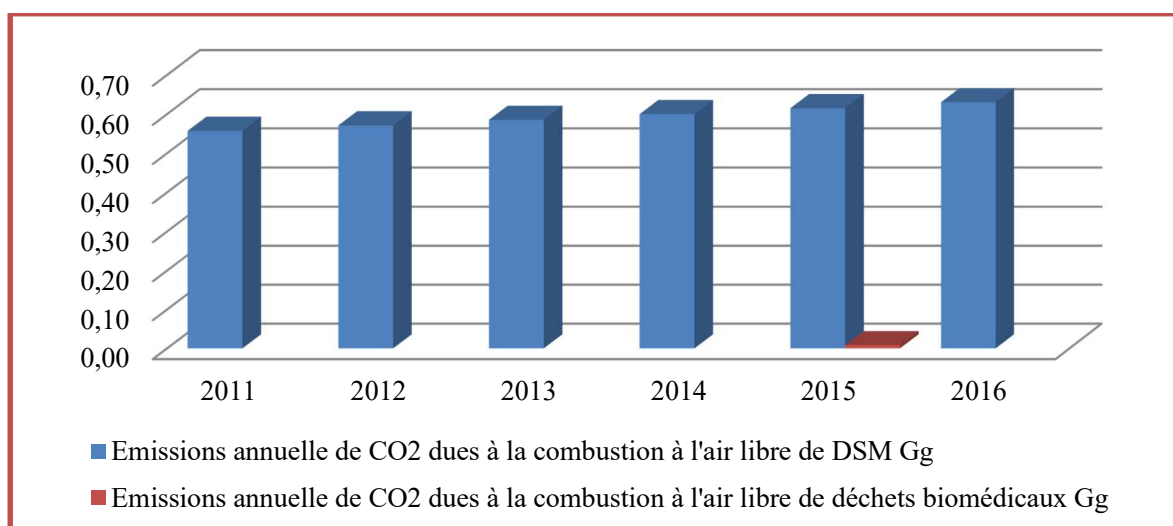


Figure 21: Carbon dioxide (Gg) emissions from open burning

### 2.3.1.7.5. Total greenhouse gas emissions in CAR from 2011 to 2016

The cadastre of greenhouse gas emissions carried out within the framework of the Third National Communication on Climate Change does not present the emissions due to the multilateral operations of the different missions of the United Nations System in the Central African Republic as well as the fugitive emissions due to the oil exploration activities carried out in the Vakaga prefecture due to the lack of official published data.

In six (6) years, the Central African Republic has emitted 57,488.40 Gg CO<sub>2</sub>e or 9,611.35 Gg CO<sub>2</sub>e on average per year with a regression rate of 9.03%. The evolution of emissions has experienced a clear regression since 2013 of about 19.04 persisting in 2014 (20.81%) fateful period of the crisis and then a resumption of the growth of emissions of about 36.03% in 2016 characterized by the beginning of recovery of socio-economic activities.

Table 19: Evolution of national greenhouse gas emissions (Gg CO<sub>2</sub>e) over the last six years.

	2011	2012	2013	2014	2015	2016
Total GHG emissions (Gg CO <sub>2</sub> e)	11 364,07	11 566,55	9 361,90	7 258,48	7 599,73	10 337,67
CO <sub>2</sub> sequestration (Gg CO <sub>2</sub> )	- 754435,7	- 754590,67	-754801,38	- 757494,12	- 755077,46	- 756125,51
Net CO <sub>2</sub> emission (Gg CO <sub>2</sub> )	- 743 71,63	- 743024,12	- 745 39,48	- 750235,63	- 747477,72	- 745787,83
Per capita contribution (kg CO <sub>2</sub> eq/capita)	1 555,35	1 585,87	1 134,09	1 221,67	1 237,42	1 507,24
Carbon footprint of the economy (kg CO <sub>2</sub> eq/F CFA)	3,17	3,28	3,36	3,24	3,55	3,95

On the other hand, the country has sequestered 4,532,624.82 Gg CO<sub>2</sub>e (of which 56% thanks to its dense and diversified vegetation and 44% by the soils) with an average of 755,437.5 Gg CO<sub>2</sub>e. But this sequestration capacity evolves very little, i.e. about 0.04% on average, due to the under-exploitation of natural resources and the insufficient investments made for the restoration of the landscape.

The previous summary table shows that the per capita contribution was about 1,555.35 kg COD in 2011 against 1,507.24 kg COD in 2016, i.e. a regression of 48.11 kg COD in six (6) years. While the carbon footprint of economic activities increased by 0.78 kgCO<sub>2</sub>e during the inventory

period from 3.17 kgCO<sub>2</sub>e in 2011 to 3.95 kgCO<sub>2</sub>e in 2016. Note that this carbon footprint of the economy is still growing, reflecting the low productivity of the country during this crisis period.

As shown in Figure 17(a), the main contributor was the Agriculture, Forestry and Land Use sector (AFAT) with 96% of the emissions attributable to the country, followed by the Energy sector (3%), the Waste sector (1%) and finally the Industrial Processes and Product Use sector (IPUP) for a tiny share. It should be noted that the emissions due to the AFAT sector are mainly constituted by those resulting from the burning of biomass (bush fires and slash-and-burn agriculture) and also include those due to the supply of wood energy.

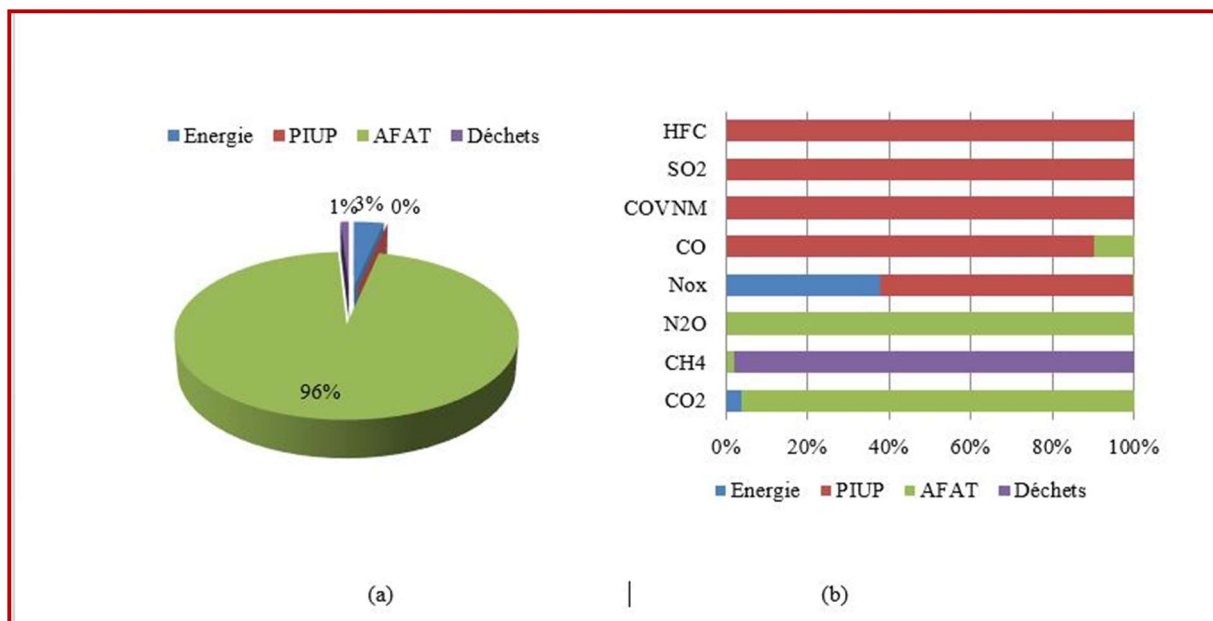


Figure 22 Sectoral contributions to (a) total anthropogenic emissions and (b) individual greenhouse gases

In addition, Figure 17(b) will allow to orientate the strategies of fight against the different greenhouse gases according to the main emission sectors. From the mass point of view, CO<sub>2</sub> is the main greenhouse gas accounted for as it represents 99.52% of the emissions, against 0.30% for methane and 0.16% for nitrous oxide.

### 1.6.16 Quality Assurance / Quality Control and Verification

The controls carried out are in accordance with the Quality Control (QC) procedures for the general inventory of level 1 which appear in the IPCC Good Practice Guide (IPCC, 2000). Since the Central African Republic has not developed an official QA/QC plan, in carrying out the GHG inventories within the framework of the Second National Communication, the expert teams based their quality control procedures on the IPCC recommendations and the Good Practice Guide.

These include

- raw data collection, acquisition and processing (e.g. completeness, accuracy of data sources and units, consistency of activity data dynamics, etc.);
- meetings around the inventory coordinator where the different data were presented and discussed by all the experts. This allowed for an improvement in the quality of the information and also to avoid double counting in some cases;
- Data entry into the IPCC inventory software;

- analysis of the results;
- the return to the inventory team where the observations were made;
- taking into account the observations and searching for complementary data except for the national emission coefficient for CO2 resulting from the production of clinker determined by the SNC; all others are taken by default from the IPCC software manual.

The Quality Assurance procedure was carried out through the presentation and validation of the draft sectoral reports by the steering committee.

### 1.6.17 Planned improvements

There are several things to be improved in the TCN development framework. In addition to the strengthening of the institutional framework set up for the management of the IGES, the technical capacities for the preparation, updating and improvement of the IGES, the setting up of a network for the collection and exchange of data between the different institutions, the sensitization and integration of the institutions with data banks, the improvement of the emission factors specific to the national conditions, the next IGES will have to take into account the following sectoral specificities

Energy	PIUP	Agriculture	Waste
Strengthen the monitoring of the implementation of the current regulations on the import and sale of petroleum products in the country in order to improve the quality of the data and consequently reduce the bias in the inventory results.	have the means to control industrial processes for the detection of GHG emissions and precursors for an exhaustive accounting and an adequate choice of emission factors.	Have a means of disaggregating data on the main crops, particularly cereals (corn, sorghum, millet, rice), tubers (yams, cassava, taro), legumes (groundnuts, soybeans) and cash crops (cotton, coffee, cocoa), and of estimating the quantities of waste burned on site by region and by species and at the national level  Mobilize more resources for periodic forestry sector inventories and initiate forestry inventories in urban areas for future inventories.	Provide the sector with the means to conduct a systematic survey to determine the quantity of solid waste produced by households, businesses, markets and the administration, as well as the fraction of waste burned and households using latrines and septic tanks.

# CHAPTER III



## 3. POLICIES AND MEASURES TO MITIGATE CLIMATE CHANGE

This chapter describes the actions undertaken or planned by the Central African government to mitigate the effects of climate change. It also details information on the assessment of technological needs and the modalities of access to clean technologies in CAR as well as the valorization of endogenous know-how, knowledge and capacities. It also provides information on the commitments and vision of the CAR in order to face the challenges of climate change in connection with sustainable development efforts.

Indeed, in the face of CAR's paradoxical socio-economic development challenges, the fight against climate change constitutes an opportunity for significant financing of sustainable development actions through various funds set up under the UNFCCC agreements.

### 3.1. Methodology adopted for the definition of mitigation measures

The mitigation strategies proposed in the framework of the CAR's TNC aim to contribute to the international community's efforts to combat climate change in a sustainable development context. The methodology used to carry out this study included preliminary investigations on the scope of services, the definition of the projection horizon, the identification of the various partners relevant to the feasibility of the identified projects and the approach followed for the evaluation of mitigation measures.

The reference scenario is the one according to which GHG emissions are produced in a system where no emission control policy is implemented. This baseline was used to estimate the effectiveness of policies and measures to control GHG emissions. To do this, the study used the various reports produced during the CAR GHG Inventories. The estimation of GHG mitigation was based on bottom-up models that are very useful for studying options that have sectoral and technology specific implications. The disaggregated technology data is progressively aggregated to reflect the choices in each category.

The focus has been on measures that can mitigate GHG emissions while enabling the Central African Republic to meet its economic growth and social development challenges. The main objective of the identified mitigation measures is to ensure the integration of GHG reduction imperatives into all development programs of the Central African Republic.

The suggested measures are based both on current programs in the country revitalized in the context of the implementation of this Communication, and on new projects resulting from consultations with the various operators.

The establishment of the Action Plans that would result from the recommended measures has distinguished two types of actions:

- raising awareness among private and public decision-makers and consumers ;
- reduction going as far as the elimination of the generation of GHG emissions.

The process of developing these action plans to reduce GHG emissions is based on a collective awareness of the issues among the various stakeholders.

The analyses carried out thus targeted mainly the policies and measures, as well as the programs and strategies likely to have an impact on the evolution of these parameters. The approach of the

prospective studies favored the use of official data of projection of sectoral activities provided by the various departments concerned. In the same way, models of evolution were proposed for the parameters which lend themselves to it. The selected options and the prospective data thus defined were used to establish the reference scenario of evolution of the GHG emissions to 2040.

Following the establishment of this scenario, the possible mitigation options for the sectors contributing to GHGs were analyzed. A long process of consultation with the concerned ministerial departments, public institutions and the private sector has been initiated in order to identify relevant mitigation projects in line with the country's economic and social development objectives and priorities. The consolidation of avoided emissions from mitigation activities in CAR has allowed the establishment of a likely mitigation scenario for 2040.

A "REDD+" scenario, i.e., a path that is both compatible with the country's economic and social development objectives and more respectful of the environment, where a set of levers linked to the forest could be activated to reduce emissions and sequester more GHG.

### **3.2. Definition of a business-as-usual (bau) scenario for 2040.**

Protection and enhancement of sinks and reservoirs through sustainable management, wetlands, natural areas and other ecosystems.

- Development of national greenhouse gas inventories (emissions by sources and removals by sinks);
- Analysis of economic factors and policies related to climate change, including national plans for mitigation;
- Climate change legislation development;
- Assessments and studies of technology needs to address climate change;
- institutional capacity building.

The National Livestock Program was found to be a suitable programmatic framework for a NAMA

Close alignment with the national development strategy and national food security and livestock policies;

Improved productivity and reduced GHG intensity of livestock production. Through the Livestock Action Program, specific NAMA actions would provide assistance to livestock producers on issues related to animal health and productivity and related trade constraints. These actions would support a gradual shift from extensive and risk-prone grazing systems to semi-intensive and more remunerative management systems. They would also increase the resilience of pastoralists to climate risks and provide incentives for good land management.

- Education, training and public awareness on climate change.
- Research and monitoring on climate change mitigation.
- Poverty and hunger alleviation to maintain our natural resources and respond to climate change.

### **3.3. Impact of population growth on the bau scenario.**

Population growth leads to spatial expansion and increased energy consumption and changes in food consumption patterns that lead to an increase in the amount of waste. This poses a problem when this spatial growth is not ordered or channeled by an urbanization policy. This is a current issue in CAR, where land areas are either converted to agricultural or urban land, or degraded into

fragmented formations or transformed into open forests with slash-and-burn cultivation. The loss of soil fertility as a result of population growth and these traditional agricultural practices.

Based on the 2003 General Census of Population and Housing (RGPH03), CAR has a population of 5.3 million (ICASES 2016). The country is sparsely populated and the population is unevenly distributed: The areas of greatest concentration are in the south, center west, and west. Nearly empty areas are found in the east and northeast. The population density at the national level is 8.65 inhabitants per square kilometer; it varies from 1 inhabitant per square kilometer in Region 5 (Haute-Kotto, Bamingui-Bangoran, and Vakaga) to 12,218 inhabitants per square kilometer in Region 7 (Bangui). The rural population was originally estimated at 62% in 2015.

The growth rate remains at 2.5. Women currently account for 51% of the population, and children under 5 and 5-14 years old account for 19.1% and 23%, respectively. Young people, more than 60% of the population, are under 25 years old, 50% of whom are women. Life expectancy at birth is estimated at 47 years, below the African average of 51.9 years in 2014.

### **3.4. Definition of a possible alternative development scenario**

Based on the third pillar of the RCPCA Sustainable Economic Recovery in its sixth cross-cutting objective, which reflects CAR's strategy for economic recovery and growth through investments in productive sectors. This represents an opportunity for the country to make environmentally friendly investments. For a low-carbon development, the country can count on the reduction of emissions from its second source of energy which is the use of wood as a domestic energy source where more than 90% of households at the national level depend on it. And its first energy source which is hydroelectricity if promoted, could alone contribute to avoid more than 5000 kt CO<sub>2</sub>/year of GHG emissions.

Agriculture is the priority sector of the national economy because it alone contributes 55% of the GDP to food security and the fight against poverty and hunger and is a sector that is very sensitive to the effects of climate variability.

The implementation of a national livestock program will support the gradual shift from extensive and risk-prone grazing systems to semi-intensive and more remunerative management systems. It would also increase the resilience of livestock farmers to climatic risks and armed attacks, which would be a vector of social cohesion by providing incentives for good land management between farmers and livestock farmers, for the maintenance of our natural resources and for responses to climate change. It should also be added that CAR, a member country of the United Nations (UN), must reconcile economic recovery and peacebuilding with the Sustainable Development Goals (SDGs) to which the country is committed.

### **3.5. Summary of the results of the emissions forecasts carried out.**

The strategy for emissions reduction and climate resilient green economy can replace open fireplaces and traditional stoves with more efficient improved stoves, which need only half of wood fuels, or with stoves that use other fuels, can reduce the country's total GHG emissions by about 5 percent per year (about 50 Mt of CO<sub>2</sub> equivalent) by 2030. The government can promote and popularize the manufacture and distribution of more efficient improved stoves by 2030 (CDN). The use of improved cookstoves would not only save energy and reduce emissions, but more importantly it could :

- save in fuelwood opportunity costs;
- increase the income of rural households;
- create more jobs in the manufacture of improved stoves;

- reduce serious health risks from smoke inhalation; and
- reduce the hours spent collecting fuelwood, a task traditionally performed by women and children, often in high-risk areas.

The development of an investment plan to finance the development of these activities will include programs to improve production, distribution and financing, ideally through access to carbon credits.

### 3.6. Recommended GHG Mitigation Measures

#### 3.6.1. Methodology for Defining Mitigation Measures

Climate-related investment opportunities were assessed against a set of criteria for selecting priority projects for mitigation actions. Criteria used for country project selection included:

- Actions representing the government's commitments to the UNFCCC through CAR's NDC document;
- The Strategic and Operational Planning for Climate Change Responses (SOP-CC) document;
- The Recovery Plan for Peacebuilding in the Central African Republic (RCPCA 2017-2021);
- Priorities identified in national climate change strategy documents in CAR such as the NAPA, NAMA, and national climate communications;

The views and alignment of the views of different stakeholders (government sectors, NGOs, financial and technical partners, communities, etc.) with the national climate change policy document (NDC and climate strategy options).

#### 3.6.2. Climate Change Mitigation Options in CAR

An activity should be classified as climate change mitigation oriented, it must contribute to the goal of stabilizing greenhouse gas (GHG) concentrations in the atmosphere at a level that prevents dangerous anthropogenic interference with the climate system by promoting efforts to reduce or limit GHG emissions or enhance GHG sequestration.

Mitigation addresses the root causes of climate change by reducing GHG emissions and increasing carbon sinks.

**Opportunities to reduce GHGs can be divided into two groups: supply-side measures and demand-side measures.**

**Supply-side measures include:**

- reducing emissions from land use change, land management, and livestock management;
- increasing terrestrial carbon stocks through carbon capture and storage in soils, biomass and wood products;
- reducing emissions from energy production by replacing fossil fuels with biomass; and
- increasing production without a corresponding increase in emissions reduces emissions intensity (i.e., GHG emissions per unit of product).

**Demand-side measures include:**

- decreasing GHG emissions by reducing food loss and waste and recycling wood;
- changing diets; and

- changing wood consumption.
- Demand-side measures are difficult to implement because they require changes in consumption patterns.
- According to IPCC, 2014, a combination of supply-side and demand-side measures can reduce emissions from the AFAT sector by 80 percent by 2040 (IPCC, 2014a).

**Six mitigation options were developed for the period 2011 to 2040:**

- Efficient lighting in electrified households;
- Rural electrification by solar PV;
- Introduction of improved charcoal and fuelwood stoves in households;
- Introduction of LPG (butane gas) stoves in households;
- Construction of hydroelectric dams;
- Improvement of transport infrastructure and development of public transport.

### 3.6.3. Mitigation options in the AFAT sector are

**Climate smart agriculture** combats the direct causes of climate change by mitigating emissions in the agriculture sector, e.g. conservation agriculture. Climate smart agriculture (CSA) is an approach that identifies the measures needed to transform and reorient agricultural systems to effectively support agricultural development and ensure food security in the face of climate change. Climate-smart agriculture aims to address three main objectives: sustainably increasing agricultural productivity and income (food security); adapting and building resilience to the impacts of climate change (adaptation); and reducing and/or eliminating greenhouse gas emissions (mitigation), where appropriate.

**Practices:** where tillage is replaced by direct seeding under a layer of mulch left over from the previous season's harvest.

**Mitigation benefits:** reduced GHG emissions from soil disturbance and fossil fuel use for farm machinery.

**Increased carbon stocks:**

- agroforestry practices;
- improved, less land-intensive crop varieties that simultaneously provide higher yields and increased amounts of plant residues for carbon sequestration;
- afforestation;
- improved agricultural management, including agronomy, nutrient management, tillage and residue management;
- improved water management, including irrigation and drainage;
- Improved post-harvest practices and irrigation.

**Reducing carbon loss:**

- restoration of cultivated peatlands;
- Preventing deforestation;
- Improved agronomic practices;
- tillage and residue management;
- no burning;
- rehabilitation of degraded lands (e.g., through erosion control, organic amendments, and nutrient amendments).

Improved livestock management combats the direct causes of climate change by reducing non-CO2 emissions from the livestock sector, e.g.:

**Practices:** Improved feeding, breeding and other structural changes; or if meat-producing animals reach slaughter weight at a younger age, methane emissions over the life of the animals can be reduced.

**Mitigation benefits:** Reduction of non-CO2 emissions

#### **Reduction of non-CO2 emissions**

- Improved manure management (e.g., improved storage, handling, and anaerobic digestion);
- No burning.

#### **Increased productive efficiency**

- improved post-harvest practices and irrigation ;
- improved crop varieties and livestock management;
- reduced food loss and waste.

#### **3.6.4. Mitigation options in the Energy sector are :**

This module is split into sub-sectors according to the IPCC model. Thus, mitigation projects have been identified and evaluated for:

- energy production;
- renewable energy and energy efficiency ;
- household and tertiary sector;
- industry sector; and
- agriculture sector;
- urban planning sector;
- transport sector.

Globally, the projects presented in the field of energy require the promotion of :

- energy eco-efficiency.
- public transport.
- the integration of man at the center of urban development.
- the replacement of fossil fuels with renewable energies.

**Energy production:** For the energy production sector, nine (9) projects have been developed:

- National solar parks (of DANZI and Bimbo 3) production of 40 MW by 2040. (Pre-electrification of rural areas with solar energy)
- Program of photovoltaic power plants at the end of the line with a total capacity of 50 MW.
- Hydroelectric power plants: 75MW.
- Micro-hydro power plants of total capacity: 100MW.

**Renewable energy and energy efficiency:** For the renewable energy and energy efficiency section, two (2) projects have been developed, in line with the framework law on energy efficiency and renewable energy in the Central African Republic:

- National program for the promotion of low voltage photovoltaic panels (PV) for a total capacity of 100MWp;
- Energy efficiency program for public lighting.

The scenario calls for the introduction of low-energy lamps in urban households and will reduce the electricity consumed by urban households by 22.7 GWh in 2030 and 58.3 GWh in 2040.

The scenario includes a program that will increase photovoltaic electrification to 25% in all non-electrified households by 2030 and 40% by 2040. The implementation of this scenario will reduce GHG emissions by 82.2Gg CO<sub>2</sub>e in 2030 and 155.2Gg CO<sub>2</sub>e in 2040.

**Household and Tertiary Sector:** In line with the new national energy strategy, two scenarios (2) are considered. These are:

**a) Scenario for the introduction of improved stoves for charcoal**

A program to introduce improved charcoal stoves could reach 50% of Central African households in 2030 and 80% in 2040, reducing GHG emissions by 185.3Gg of CO<sub>2</sub>e in 2030 and 330Gg of CO<sub>2</sub>e in 2040.

**b) Scenario of introduction of LPG stoves in urban households**

The gradual introduction of LPG stoves will reach 20% of urban households in 2030 and 30% in 2040, reducing charcoal consumption by 404 ktoe. In 2040, this reduction will be 463Gg of CO<sub>2</sub>-e.

Improved stoves, can reduce the country's total GHG emissions by about 20 percent per year (about 50 Mt CO<sub>2</sub>-e) by 2040. The use of improved stoves and ovens would not only save energy and reduce emissions, but more importantly it could :

- save in fuelwood opportunity costs ;
- increase rural household income by 10 percent;
- create more jobs in stove manufacturing;
- reduce serious health risks from smoke inhalation;
- Reduce the hours spent collecting fuelwood, a task traditionally performed by women and children often in high-risk areas.

**Other sub-sector activity programs :**

- Energy efficiency program in the building sector (household and tertiary).
- Low consumption lamps program
- Energy labelling of domestic appliances (efficient refrigerators).

Industry sector: Concerning the energy consumption of the industry sector, four (4) project ideas have been identified, essentially going towards renewable energy and energy efficiency components. It is clear that other projects could see the light of day in the next few years depending on the regulations that will be put in place in terms of electrical energy production facilities (wind power, cogeneration, etc.):

- private wind farms-extension to 50MW by 2040.
- Energy efficiency program in industry, excluding energy-intensive industries.
- Program for the implementation of energy and productivity management systems and the ISO50001 standard in industry.
- Biomass Program: organization and valorization of the sector.

**Transport sector:** Specifically for the transport sector, for the last 3 years, a program of city development (construction of asphalt roads with expressways) is being implemented. Assuming that this program is strengthened, public transport will be developed and individual means of transport and cabs will be reduced.

The improvement of road infrastructure and the promotion of public transport will reduce the share of motorcycle cabs in road transport by 20% and that of buses will increase by 50%. This scenario will reduce GHG emissions by 1206 Gg in 2040. Two (2) project ideas were identified:

- Awareness-communication for driving/maintenance behavior change.

Sectors and technologies are not listed in any particular order. Non-technological practices, such as lifestyle changes, are not included in this table (but are discussed separately).

Tableau 2 : Key mitigation technologies and practices by sector

Sector	Activity	Key mitigation technologies and practices	Key mitigation technologies and practices trending towards 2040.
Energy	Reduction or stabilisation of GHG emissions from energy, transport, industry and agriculture through the use of new or renewable forms of energy, measures to improve the energy efficiency of existing generators, machinery and equipment or demand management.	Improvements in the efficiency of production and distribution;  Renewable heat and power (hydro, solar, wind, geothermal and green energy).	Hydroelectric; advanced renewable energy, including solar and solar photovoltaic.
Transport	Reduction or stabilisation of GHG emissions Develop capacities to control, reduce or prevent emissions, particularly in the transport sector.	More fuel-efficient vehicles; hybrid vehicles ; clean diesel vehicles; biofuels; shift from road to rail and public transport systems; non-motorised transport (cycling, walking); land use and transport planning	Second generation biofuels; more efficient aircraft; advanced electric and hybrid vehicles running on more powerful and reliable batteries
Industrie	Reduction or stabilisation of GHG emissions Develop capacities to control, reduce or prevent emissions, particularly in industry	More efficient end-use of equipment; heat and energy recovery; recycling and material substitution; management of non-CO2 emissions; various process-specific technologies	Advanced energy efficiency; PSC for cement, ammonia and steel industries; inert electrodes for aluminium production
Agriculture/Elevage	Reduction or stabilisation of GHG emissions in agriculture through the development, transfer and promotion of technologies and know-how as well as the development of capacities to control, reduce or prevent anthropogenic greenhouse gas emissions.	Improved cropland and pasture management to increase soil carbon storage; rehabilitation of cultivated peat soils and degraded lands; improved rice cultivation techniques, livestock and manure management to reduce CH4 emissions; improved nitrogen fertilizer application techniques to reduce N2O emissions;	Improved agricultural performance ; promotion of agroforestry systems and support for improved agronomic technologies; improved management of agricultural residues; efficient use of fertilisers; promotion of manure management practices; improved waste management in slaughterhouses; promotion of appropriate technologies for animal feed production; and improved rangeland productivity and complementary activities.

		cultivation of specific crops to replace fossil fuels; improved energy efficiency	
Foresterie/UTCAF	Protection and enhancement of GHG sinks and reservoirs through sustainable forest management, forest planting and reforestation, rehabilitation of areas affected by drought and desertification.	Afforestation; reforestation; forest management; reduction of deforestation; management of forestry; use of forest products as green energy to replace fossil fuels	Improved forest species to increase biomass productivity and carbon sequestration. Improved remote sensing technologies for analysis of vegetation/soil carbon sequestration potential and mapping of land use change. agroforestry practice to diversify food resources and income sources; improved agroecology fallows
Déchets	Develop capacities to control, reduce or prevent emissions, particularly in the area of waste management	Methane recovery from landfills; waste incineration with energy recovery; composting of organic waste; wastewater treatment management; recycling and waste minimisation	Optimisation of CH4 oxidation, biogas supply

### 3.6.5. Overall GHG mitigation programmes and measures

All identified and assessed sectoral mitigation projects are given in Table 23 below.

Table 23: Sectoral mitigation project

N <sup>o</sup>	Secteur	Mitigation measures	Impacts
1	Forestry, Spatial Planning and Energy	Restoration of urban and peri-urban forest landscapes in Bangui	reduction of emissions from the forestry sector in the city of Bangui and its surroundings.
2	Land use and forests	Reducing Emissions from Deforestation and Forest Degradation (REDD+) in CAR	This will avoid greenhouse gas (GHG) emissions from deforestation and forest degradation and at the same time facilitate carbon sequestration.
3	Energie	Dimoli hydroelectric scheme (sub-prefecture of Sosso-Nakombo) in Central African Republic	<ul style="list-style-type: none"> <li>- Reduction of greenhouse gas (GHG) emissions</li> <li>- Promote low-cost technology</li> <li>- Electrification of three prefectures (Mambéré Kadéi, Nana Mambéré and Sangha-Mbaéré)</li> </ul>
4	Energie	Renewable energy production and energy efficiency in CAR	production of renewable energy technologies (biofuel, biogas, solar energy, etc)
5	Energie	Promotion of solar energy in rural areas of CAR	Reduction of greenhouse gases (GHG) Promotion of low-cost technology Electrification of 100 communes in the CAR

6	Agriculture	Implementing sustainable agriculture in CAR	contribute to improving the multifunctionality of systems by providing climate change mitigation and adaptation benefits.
7	Foresterie	reforestation of degraded ecosystems;	Thus, by 2035, 224,000 ha of wasteland will be reforested (7.12%) on the basis of endogenous knowledge and the needs expressed by local communities
8	Foresterie	protection of woodland ecosystems ;	The mitigation scenario foresees the protection of 5.2% of the forest land area (124,250 ha). Under this condition, carbon stocks will gradually increase as a result of the reduction of various anthropogenic pressures on biomass
9	AFAT	protection of woodland ecosystems ;	Various projects, including REDD+, CAFI, PGRN, PRESIBALT, PDRSO and Chinko, are working to promote agroforestry as a potential carbon sink. On the basis of this hypothesis, the promotion of practices linked to the formalisation of agroforestry and community forestry will contribute to the mitigation of carbon emissions by 2040 to the mitigation of GHG emissions

### 3.7. Greenhouse Gas Emissions Projections 2011 - 2040

#### 3.7.1. Climate Projections

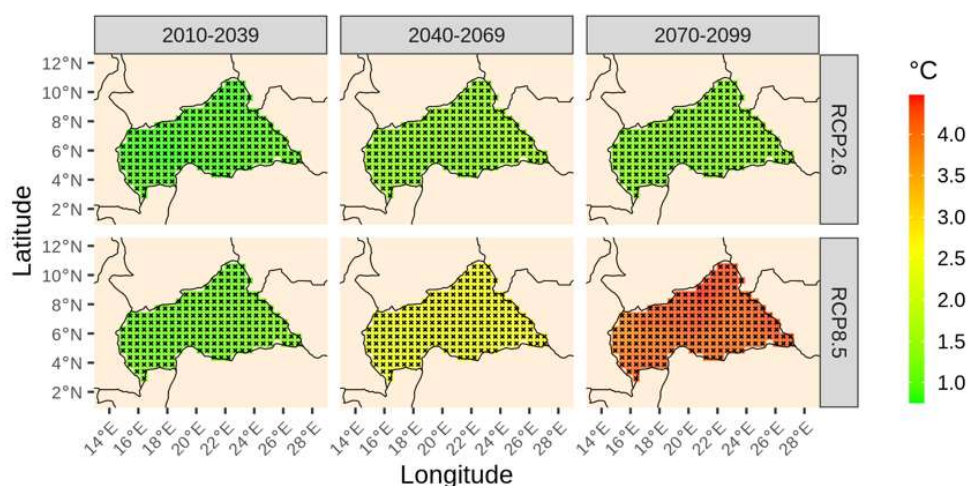
The Climate Hazard Toolbox (CHAT) allows the user to access regional downscaled climate models (CORDEX-CORE) at 25 km resolution for two socio-economic emission scenarios and/or representative concentration pathways (RCP), namely RCP 2.6 (low emission scenario) and RCP 8.5 (high emission scenario). For future projections, the CHAT tool uses the W5E5 merged dataset for the period 1980-2005, which combines WFDE5 land and ERA5 ocean data. One of the main features of the CHAT tool is that the user can examine the agreement of the models with respect to the sign of the climate change signal (as defined by the IPCC) as well as the standard deviation of the climate change signal (not shown for brevity in this study). The CHAT tool also allows the user to apply thresholds, including climate change and agro-climatic indices that are of interest for climate change impact assessments in agriculture.

## 3.7.2. Temperature

### 3.7.2.1. Maximum temperature

Results based on CMIP-6 multi-model ensemble mean simulations show that the central parts of Africa are not presented as the regions with the highest Tmax increase over the continent (IPCC, 2021). Specifically, the Tmax increase in central Africa may be 1.0-2.0°C higher in a 2.0°C global warming and 3.0-4.0°C higher in a 4.0°C global warming at the end of the century compared to the period 1851-1900. Therefore, the global Tmax increase in Central Africa is projected to be 1°C less than the global average increase and 2-3°C less than the Tmax increase projected for the Sahel region and South Africa.

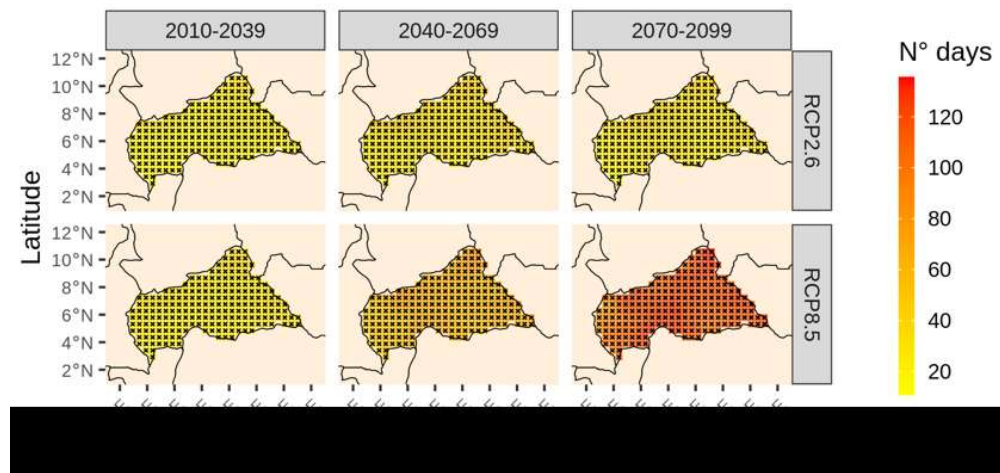
In addition, the CHAT tool shows strong model agreement on the sign of climate change for mean Tmax for RCP 2.6 and 8.5 across CAR (Figure 10). While mean Tmax is projected to increase by 1.0-1.5°C under RCP 2.6, mean Tmax could increase by 3.0-4.0°C under RCP 8.5 by the end of the century (2070-2099). In the medium term (2040-2069), mean Tmax is projected to be 2.5°C higher under RCP 2.6 compared to the 1980-2005 baseline period. Overall, the rate of increase in mean Tmax is projected to be slightly higher along the continental areas than in the southwesternmost part of the country, closer to the ocean, especially under RCP 8.5. Furthermore, according to the WBG (2020), most of the change in mean Tmax is likely to occur between March and May, with increases in mean Tmax greater than 4°C under RCP 8.5 by the end of the century (2080-2099).



### 3.7.2.2. Extreme weather events

According to the IPCC-AR6 report (IPCC, 2021), it is highly likely that observed increases in heat extremes, including heat waves, and decreases in cold extremes may continue and worsen over the 21st century with further climate warming. The CHAT tool describes much of this change in temperature extremes. For example, most of these models agree on an increase in the number of days with warm ( $T_{max} \geq 35^{\circ}\text{C}$ ) and very warm ( $T_{max} \geq 40^{\circ}\text{C}$ ) weather conditions, both of which are likely to be intensified under RCP 8.5 above. For example, while the number of days per year with  $T_{max} \geq 35^{\circ}\text{C}$  could increase by 20-40 days under RCP 2.6, the simulation results for RCP 8.5 show an increase of up to 80-120 days by the end of the century (2070-2099) compared to the baseline period (1980-2005). There are also no major spatial differences in projected temperature extremes over time, although the recurrence of extremes is likely to be slightly higher in the far north of the CAR than in regions closer to the Atlantic Ocean. In addition, very warm conditions ( $T_{max} \geq 40^{\circ}\text{C}$ ) are also expected to increase across the country, with an increase of between 50 and 100 days by the end of the century under RCP 8.5. While major changes in heat stress conditions are expected under RCP 8.5, small to moderate changes are projected under RCP 2.6. Finally,

most models agree on an increase in the number of tropical nights ( $T_{min} \geq 20^{\circ}\text{C}$ ) over the century (Figure 16). The rate of increase is expected to be higher in the eastern and western regions of the country than in the central and northern regions. For example, in the provinces of Ouham-Pendé and Nana-Mambéré, the number of tropical nights could increase by 100 to 200 days under RCP 8.5 in the distant future (2070-2099).



### 3.7.3. Attenuation Analysis

Three models were used in the calculation:

1. The 2006 IPCC methodology for the Energy, PIUP and Waste sectors;
2. The FAO Ex-Ant Carbon-balance Tool (EX-ACT) for the AFAT sector;
3. LEAP for the analysis of the domestic energy sub-sector.

#### ❖ The 2006 IPCC methodology

The IPCC2006 Software is a spreadsheet dedicated to the calculation of greenhouse gas inventories following the IPCC 2006 methodology. The Technical Support Unit (IPCC- TGCCIA) in Hayama, Japan. The purpose of this software is to implement Level 1 and Level 2 GHG inventories of the methodology published in the 2006 IPCC Guidelines for National Greenhouse Gas Inventories. The objective of the software is to facilitate the preparation of complete national GHG inventories or for separate categories or groups of categories.

The main target groups of users are inventory compilers who wish to apply the 2006 IPCC default methodology Level 1 methods, trainers and trainees on national GHG inventory compilation, for national reporting of non-Annex I Parties with limited resources without their own inventory systems.

#### ❖ Projection of reference case emissions by sector

##### 3.7.3.1. Population

The population of the Central African Republic is estimated at 4.9 millions (United Nations Population Division, 2015). With a natural growth rate of 2.0% and an average density of 7.9 inhabitants per  $\text{km}^2$ , this population is essentially rural (60%), and mostly young. Thus, young people in the 0-14 age group represent 39% of the population, those aged 15-64 57% and those over 65 only 4%. Despite this

population dynamic, the human development index is such that, according to the UNDP, CAR is 187th out of 188 in 2015.

Table showing the demographic evolution of the population in thousands in CAR from 2018 to 2040. With a growth rate of 2.5%. Using the natural growth rate formula (a), the population growth rate between 2018 and 2040 is calculated as

**Le taux d'accroissement de la population :**  
 $a = X_2 - X_1 / X_1 * 100$

Habitants en 2018 ( $X_1$ ) : 5 355 816 habitants  
 Habitants en 2040 ( $X_2$ ) : 8 301 515 habitants  
 Le taux de croissance annuel moyen  $a_m = a/n$

(RGPH03), la RCA compte 5,3 millions d'habitants (ICASES 2016).  
 $a_m = a/n$   
 avec : a= taux d'accroissement d'une population  
 n = nombre d'année  
 $a_m$  = taux de croissance annuel moyen (2.5%)

entre 2018 et 2040 : n = 22 ans  
 $a = a_m * n = 2.5 * 22 = 55\%$   
 $a = X_2 - X_1 / X_1 * 100$   
 avec : a = taux d'accroissement d'une population (55%)  
 $X_2 =$  habitants en 2040 ?  
 $X_1 =$  habitants en 2018 (5 355 816 habitants)  
 $X_2 = X_1 * a_m^{*n} = X_1 / 100 = 8 301 515$  habitants

Figure 13 : Calculation of the population growth rate between 2018 and 2040

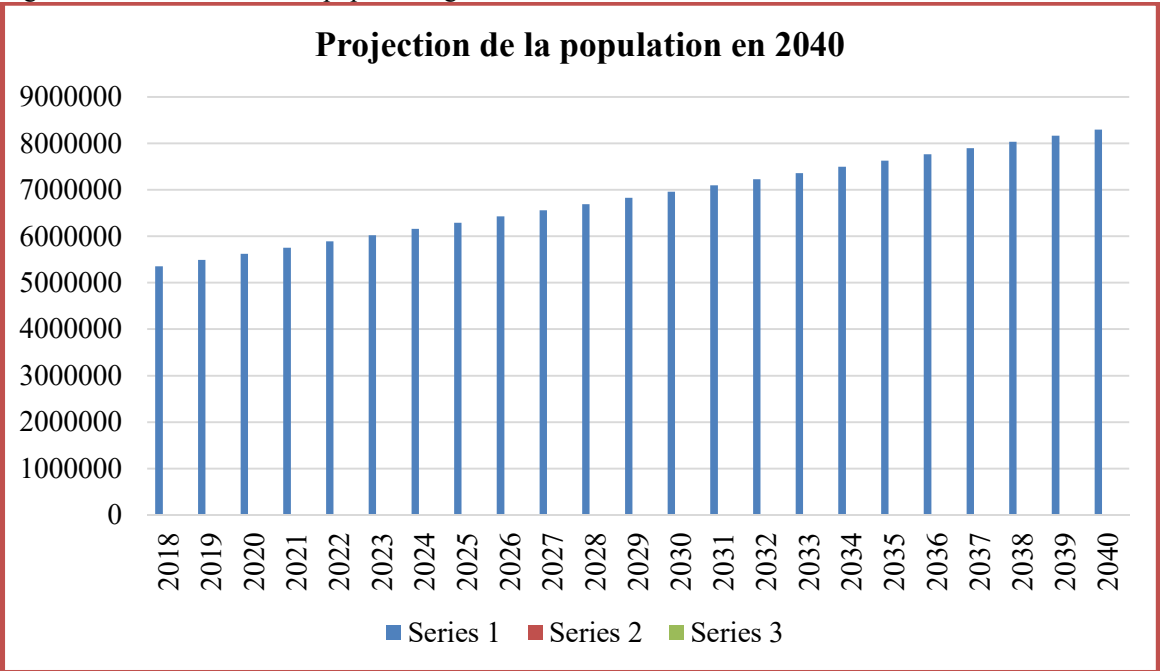


Figure 14: Population projection in 2040

The urban population would continue to grow at a slower pace, while the rural population would stabilize. The urban population, which represented 50% of the population in 1994, would reach 67.4% in 2040. These increases would be due mainly to the rural exodus, climate change, and armed conflict, which have caused the expansion of urban centers.

### 3.7.3.2. Economic activity.

CAR's economy is essentially based on the primary sector, which contributes 55% of GDP and about 90% of exports. It is essentially composed of subsistence agriculture (28% of GDP), livestock (13%), forestry (5.5%) and mining (3%, mainly diamonds). Forestry covers about 2 million hectares. Timber is mainly sold to the European and North American markets, which have reduced their demand due to the global economic crisis.

The CAR's economy is based on agriculture. Although, the share of forestry and mining products in national revenues is significant. However, the distribution of emissions in the AFAT sector is 96% which shows how much more emitting the AFAT sector is than other sectors. This percentage occupies a place of the population by major sectors of activity shows a preponderance of the agricultural population. Various economic and demographic surveys, conducted by the Ministry of Planning through ICASEES, have reached roughly concordant conclusions, according to which approximately 80% of the Central African population lives from agriculture, i.e., nearly three million people. Even in the cities, the percentage of the agricultural population is already very high (more than 60% for the provincial cities and no less than 40% for the capital city of Bangui), and is increasing, especially with climate change and armed conflict.

The performance of the Central African economy, as measured by GDP per capita, which is an indicator of the population's standard of living, remains insufficient compared to the country's real potential. Diversification of production and sectoral productivity are fundamental elements for achieving strong and sustainable economic growth.

Agriculture remains the most predominant economic activity, contributing 40% of GDP, providing jobs and income for more than 95% of rural people, but accounting for barely 10% of export earnings, and absorbing on average between 10 and 20% of the public investment program.

Mining (diamond and gold), transportation, electricity, telecommunications and tourism will also be important sources of growth and foreign exchange for the country. Over the past four years, the primary sector has driven supply-side GDP growth.

### 3.7.3.3. Emissions trends and forecasts to 2040.

Both bottom-up and top-down studies indicate considerable economic potential for mitigating global GHG emissions over the next few decades, which would offset the projected overall increase in emissions or reduce emissions below current levels (high agreement, many highlights)

#### **Recent trends**

In recent years, total CO<sub>2</sub> emissions have increased globally. Indeed, significant increases are observed in the energy transformation sector. Other sectors such as manufacturing industry and transport have also contributed to this increase, but to a lesser extent. On the other hand, emissions from the agriculture and residential/tertiary sectors have a decreasing trend.

#### **Recent trends**

In recent years, the decrease in CAR's CH<sub>4</sub> emissions is mainly due to the decrease in agricultural emissions as landfill emissions have stabilized since 2016 and other sectors remain small contributors to the national total emissions. Nevertheless, this observed trend in agricultural emissions over a few years does not predict a continued decline for the agricultural sector. It is true that there is an overall trend of decrease of livestock farming in France, but there is also a trend of expansion of some livestock farms and therefore of slurry systems potentially emitting CH<sub>4</sub>. In any case, the observation remains: to further and significantly reduce CH<sub>4</sub> emissions in the Central African Republic, it will be necessary to reduce emissions from agriculture.

## Recent evolution

During the last years, and since 2010, we can consider that N2O emissions are stable for all sectors without any real prospect of improvement of the situation. It is clearly the agricultural sector that appears to be the most concerned by this issue: it is therefore important to find solutions to reduce these emissions, but it must be noted that the means of reduction are far from being obvious to implement. This progress could go hand in hand with an understanding of the mechanisms of emissions, which could highlight marked differences between practices and situations, which is currently not sufficiently the case to promote effective actions.

Tableau 3: Overall greenhouse gas emissions (in Gg) Energy

Secteur	Emission de GES (Gg GES/an)							
	GES	2011	2015	2020	2025	2030	2035	2040
1. Energie	CO2	294,94	234,15	244,87	258,27	271,67	285,07	298,47
	CH4	0,03	0,022	0,029	0,035	0,041	0,047	0,0523
	N2O	0,003	0,0025	0,004	0,0065	0,0088	0,011	0,0133
	NOx	0,074	0,097	0,198	0,249	0,299	0,350	0,4001
	CO							
	COVNM							
	SO2							

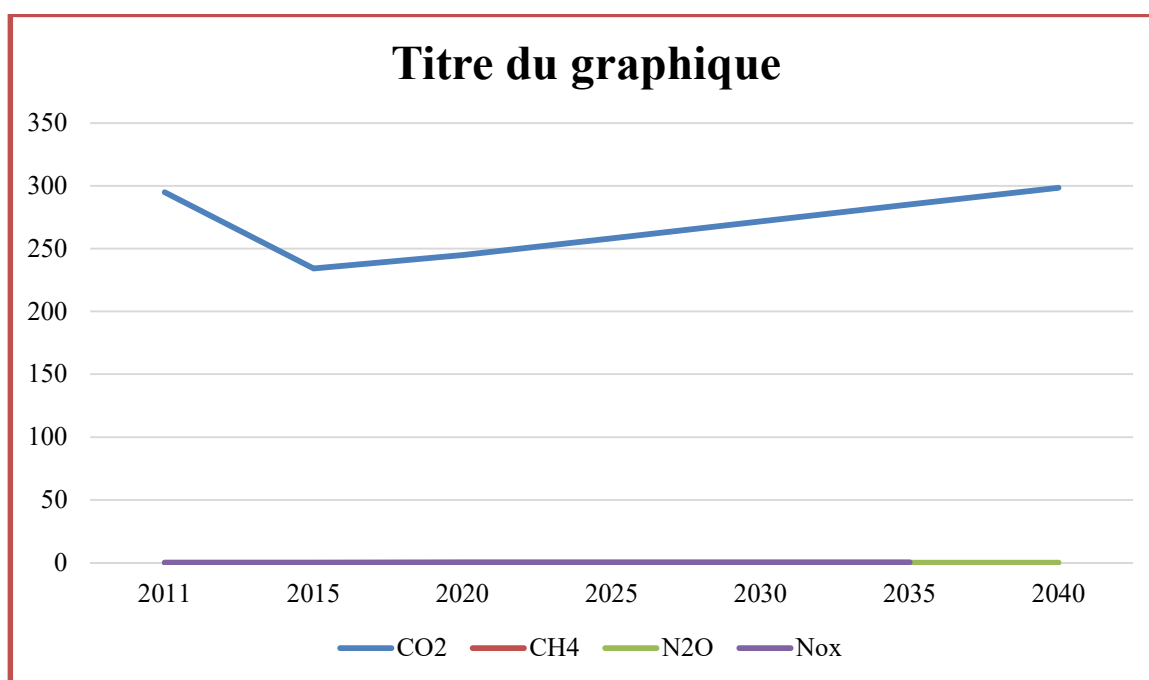


Figure 15: Overall greenhouse gas emissions (in Gg) Energy

Over the study period, the main contributors were Other Sectors (2011-2013) and Transportation. As for Manufacturing and Construction, it registered a regression between 2011 and 2014 before showing a growth due to the national economic recovery.

In the Transport sector, we note that Road Transport polluted slightly more than Civil Aviation. The low emission in 2013 is explained by the looting of the car fleet caused by the last military-political crisis. The emissions from civil aviation follow the same trend as those from road transport. But these could not be estimated in 2016 due to the lack of statistical data on hydrocarbon consumption.

Moreover, until 2014, emissions from gasoline-powered cars dominated the transport sector, and have been decreasing since 2015. This is due to the increase in the import of diesel vehicles. The exponential growth of motorcycles from 2015 onwards is justified by the phenomenon of motorcycle cabs.

Overall, Other Sectors slightly exceed Transportation in GHG emissions over the period.

### 3.7.3.4. Projected GHG emissions from Industrial Processes and Product Use

Tableau 4: Projected GHG emissions from Industrial Processes and Product Use

Secteur	GES	2011	2015	2020	2025	2030	2035	2040
2. Secteur PIUP	CO2	0,0062	0,0051	0,0053	0,0054	0,0055	0,0056	0,0057
	CH4	0,00078	0,00157	0,00157	0,002	0,00243	0,00286	0,00329
	N2O	0,00698	0,00667	0,00667	0,007	0,00733	0,00766	0,00799
	NOx	0,1549	0,1234	0,138	0,1453	0,1526	0,1599	0,1672
	CO	0,197	0,194	0,244	0,269	0,294	0,319	0,344
	COVNM	0,1536	0,4864	0,4864	0,8384	1,1904	1,5424	1,8944
	SO2	0,5055	0,8038	0,8038	1,1235	1,4432	1,7629	2,0826

### 3.7.3.5. Projected GHG emissions from Agriculture, Forestry and Land Use

#### 3.7.3.5.1. Emissions from the AFAT sector

Tableau 5 : GHG emissions (Gg GHG/year)

Secteur	Emission of the GHG (Gg GHG/year)							
	GES	2011	2015	2020	2025	2030	2035	2040
3. Secteur AFAT	CO2	6666,47669	5390,68024	7995,54718	9297,98065	10600,41412	11902,84759	13205,28106
	CH4	1,49815755	0,140209654	0,158623733	0,167830772	0,177037811	0,186244851	0,19545189
	N2O	13,33745657	4,70345657	14,81745657	19,87445657	24,93145657	29,98845657	35,04545657
	NOx	0,00049936	0,00049936	0,00049936	0,00049936	0,00299616	0,00049936	0,00049936
	CO	0,03027241	0,03027241	0,03027241	0,03027241	0,18163446	0,03027241	0,03027241

Tableau 6 : CO2 sequestration (Gg GHG/year)

	Séquestration de CO2 (Gg GES/an)							
	GES	2011	2015	2020	2025	2030	2035	2040
Dues à la végétation		-422 280,21	-422 821,97	- 424 918,07	- 425 966,12	- 427 014,17	- 428 062,22	- 429 110,27
Dues aux sols	CO2	- 332 255,49	- 332 255,49	- 332 255,49	- 332 255,49	- 332 255,49	- 332 255,49	- 332 255,49
Total séquestration annuelle		- 754 535,70	- 755 077,46	- 757 173,56	- 758 221,61	- 759 269,66	- 760 317,71	- 761 365,76

### 3.7.3.6. projected GHG Emissions from Waste Management

Methane, carbon dioxide and nitrous oxide are the main gases assessed for the Waste sector.

- Methane Emissions from Municipal Solid Waste (MSW) and Wastewater

As noted above, municipal solid waste dumped in so-called "fly-tipping" sites and effluents from industries such as MOCAF Brewery, SUCAF, and HUSACA discharged into the river or into the wild do not generate any estimable gases. Only CH<sub>4</sub> emissions from domestic wastewater (latrines and septic tanks) from households and some establishments (hotels, restaurants, etc.) are included in the table and represented in the figure below:

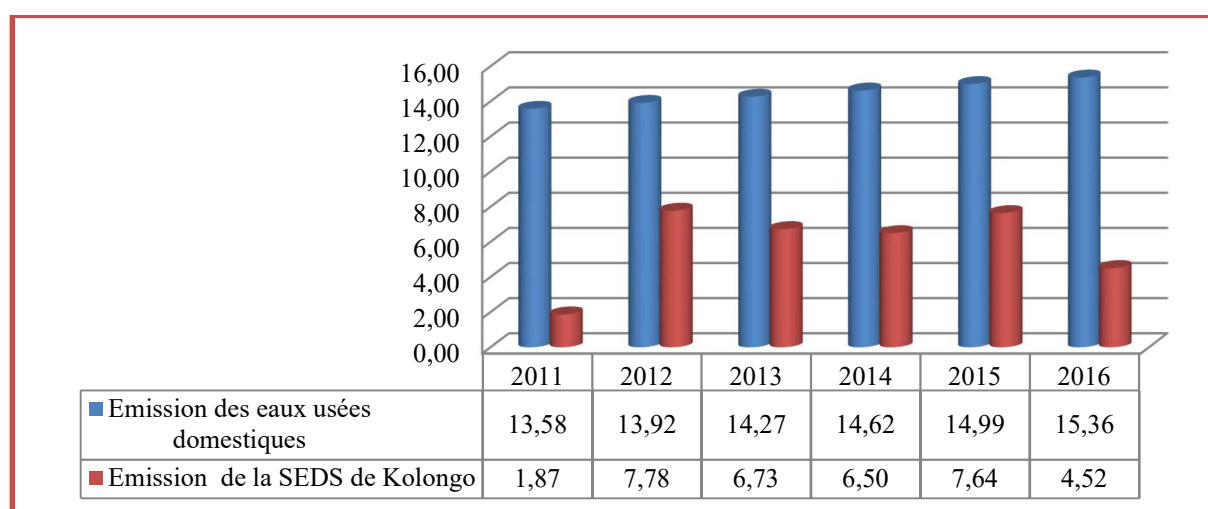


Figure 28: CH<sub>4</sub> emissions from waste management (Gg)

The growth in emissions from domestic wastewater treatment is synoptic with population growth. In contrast, the growth in estimated emissions from waste disposal at the Kolongo controlled site reflects the growth in emissions during the implementation of the PURISU project. 2011 and 2016 are respectively the year of the launch of the MSW collection phase through the awarding of contracts to private companies and the closing of the activities at the end of the World Bank grant contract.

Table 28: Emissions from the waste sector

€ Emissions from the waste sector								
Secteur	Emission de GES (Gg GES/an)							
	GES	2011	2015	2020	2025	2030	2035	2040
4. Secteur Déchets	CO <sub>2</sub>	0,56	0,62	0,64	0,65	0,65	0,66	0,67
	CH <sub>4</sub>	15,45	22,63	22,63	25,38	28,14	30,89	33,64
	N <sub>2</sub> O	0	0					<b>0</b>
	NO <sub>x</sub>	0	0	0	0	0	0	<b>0</b>
	CO	0	0	0	0	0	0	<b>0</b>
	COVNM	0	0	0	0	0	0	<b>0</b>
	SO <sub>2</sub>	0	0	0	0	0	0	<b>0</b>

### 3.7.3.7. Total greenhouse gas emissions of the CAR from 2011 to 2040

Table 29: Evolution of GHG emissions in CAR (GgeqCO<sub>2</sub>)

2.2. Evolution of CAR's GHG emissions (GgeqCO <sub>2</sub> )							
	2011	2015	2020	2025	2030	2035	2040
Emission	11 364,07	7 599,73	13212,69	14141,71	17 644,02	21 146,33	24 648,64
Sequestration	- 754 535,70	-755 077,46	- 757 173,56	- 758 221,61	- 759 269,66	- 760 317,71	- 761 365,76
Net sequestration	- 743 171,63	-743 024,12	-745 439,48	-750 235,63	- 47 477,72	- 745 787,83	- 736 652,99

The Business as Usual (BAU) scenario for greenhouse gas emissions (CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, HFC) over the 2010-2030 cycle is shown below for the following sectors: Energy; Agriculture, Forestry and Other Land Use (AFAT); Industrial Processes; and Waste. Emissions by 2025 and 2030 for CAR are 14141 GgeqCO<sub>2</sub> and 17,644 GgeqCO<sub>2</sub> respectively. The sequestration capacity over the same horizons remains high.

On the other hand, the country has sequestered 4,532,624.82 GgCO<sub>2</sub>e (56% of which is due to its dense and diversified vegetation and 44% by the soils) with an average of 755,437.5 GgCO<sub>2</sub>e. But this sequestration capacity evolves very little, i.e. about 0.04% on average, due to the under-exploitation of natural resources and the insufficient investments made for the restoration of the landscape.



# CHAPTER IV

## 4. VULNERABILITY AND ADAPTATION

### 4.1. Introduction

The Central African Republic is one of the most vulnerable countries to climate change. Global warming will bring additional challenges, in a context where economic growth and social development are dependent on the opulence and viability of the natural resource sector, including agriculture, water resources, health, forestry, energy, as well as the transport network and housing.

The interaction of several factors such as insecurity, poverty, health, and uncontrolled urbanization accentuate this situation, revealing a weak adaptive capacity. To strengthen the country's resilience to climate change, adaptation strategies are imperative for all key sectors of socio-economic development. Sustainable adaptation options involve understanding vulnerability as defined by the nature of the climate risks, the sensitivity of the sectors involved and their current capacity to adapt.

This chapter proposes to assess the vulnerability of sectors affected by climate change in order to propose adaptation measures and strategies based on future climate change in the Central African Republic.

### 4.2. Approach Methodology

In order to understand the vulnerability of the selected sectors, a literature review was conducted to determine their biophysical and socio-economic contexts as well as the relevance of other policy documents related to climate change. Monthly temperature and rainfall data observed over the periods 1951-2010 (Berberati and Birao) and 1951-2017 (Bangui) were subjected to statistical analysis (variability and trend) in order to highlight the impact of climate on the different areas of activity.

Interviews with resource persons and focus groups using the Vulnerability and Adaptive Capacity Analysis (VCAA) method, organized in the prefectures of Mambéré Kadéï, Lobaye, Ombella M'poko and Kémo, collected opinions on the manifestations of climate change, their impacts on agriculture, livestock, forestry and the strategies developed by the communities



Photo 4: A: (photo left) Focus group with Fulani herders at Vangué village PK 17 of Damara, Sibut road on the impacts of drought on cattle breeding. B: Participatory diagnosis of the CC in Goffo village at PK 15, Berberati-Yamado axis.

The methodology used by the countries of the Indian Ocean Commission (IOC) to study their vulnerability to climate change is applied for the analysis of the vulnerability of the selected

sectors. The degree of exposure and sensitivity, as well as that of adaptive capacity, is determined according to the following formula (IOC 2011):

$$\text{Vulnerability (V)} = [\text{Sensitivity (Se)} \times \text{Exposure (Ex)}] / \text{Adaptive Capacity (AC)}$$

The sensitivity of each sector is assessed qualitatively:

- low: no or little disruption of the sector by AC ;
- medium: the sector's functions are affected but not its structure
- high: the functions are strongly affected and the sector is endangered (with disappearance of the sector if the threshold is reached).

According to this IOC approach, adaptive capacity is estimated according to the response capacity in relation to the determinants: political-economic, environmental, social and societal, governance, according to the matrix:

Tableau 7: Adaptability matrix (binary: 0 or 1)

<b>Coping responses</b>	<b>S</b>	<b>D</b>	<b>A</b>	<b>R</b>	<b>Scores</b>
Determinants					
Political-economic					
Environmental					
Social and societal					
Governance					
<b>Total</b>					

Source : COI 2011

- Simple (S): the adaptation response is accessible and simple in its implementation;
- Dynamic (D): the speed of response is relevant to the system and effective over time;
- Autonomous (A): it is not dependent on other factors that condition it and make it uncertain;
- Replicable (R): the response allows for learning and appropriation so that it can be reproduced in all circumstances.
- According to this same source, adaptive responses are in relation to the different determinants:
  - Political-economic resilience determinants: diversity of economic activity, human resources, governance, technology, and finance, innovation.
  - Environmental resilience determinants: biodiversity, ecological continuum or fragmentation, regeneration/reproduction capacity, ecosystem complexity or degree of evolution of the species, etc.
  - Social resilience determinants: demography, poverty level, education, access to basic services (water, housing, education, health, purchasing power, savings system), belief system, traditions and cultures, social solidarity systems, protection, health coverage, family structure and social groups (community, village, etc.).
  - Governance determinants: existence of a decision-making, coordinating, financing and action or support body for the implementation of actions, which ensure that the issue

will be identified, analyzed and that responses will be provided taking into account the stakeholders.

The assessment of adaptive capacity is based on the total score:

- 0 to 4: Low
- 5 to 12: Medium
- > 12: Strong

On this basis, the vulnerability assessment matrix in relation to sensitivity and adaptive capacity is also constructed according to a low, medium or high level of assessment and is limited to a qualitative assessment (IOC: Madagascar National Report 2011).

Furthermore, the adaptation options suggested during the focus groups were prioritized by the experts based on projection data and national policy documents, including the National Recovery and Peacebuilding Plan 2017-2021 (RCPCA) and the National Development Plan of the Central African Republic. The average of the thermal and rainfall data of the eleven (11) models from the RCP4.5 (Representative Concentration Pathway) scenario was compared to that of a reference period (1990-2015) in order to highlight the evolution of the average temperature and rainfall by 2050 over the Central African territory. RCP.4.5 is one of the four scenarios for the evolution of greenhouse gas concentrations during the 21st century (2006 to 2100) used by the IPCC for its fifth report. RCP4.5, describes stabilization without exceedance at 4.5 W/m<sup>2</sup> and stabilization after 2100 (IPCC 2015). This is an optimistic scenario compared to RCP8.5 which is pessimistic.

The thermal regimes simulated by RCP4.5 in CAR reflect those of observed temperatures quite well. Everywhere the correlation coefficients of simulated and observed temperatures are greater than 0.75 with a correlation of 0.98 (GAPIA 2018). However, the simulated rainfall has uncertainties in its height. These data were supplemented by the literature on climate projections in CAR.

### **Observed and projected climate conditions in the Central African Republic**

The analysis of the evolution of the characteristics of the observed and projected climatic parameters makes it possible to identify the climatic risks to which the sectors under study are exposed and will be subjected. However, the Second Communication of the Central African Republic to the United Nations Framework Convention on Climate Change only dealt with the issue in a superficial manner. A bibliographic synthesis allows us to highlight the climatic hazards experienced and likely to occur in the future on the Central African territory.

## **4.3. Current observations on climate change in the Central African Republic**

### **4.3.1. Temperature trends**

Although the thermal data do not present long series (more than 100 years) on the Central African territory, the recorded temperature has been steadily increasing since the end of the 1980s (Figure: 4.1). This increase remains exponential, precisely in the south where recorded data are available until 2017.

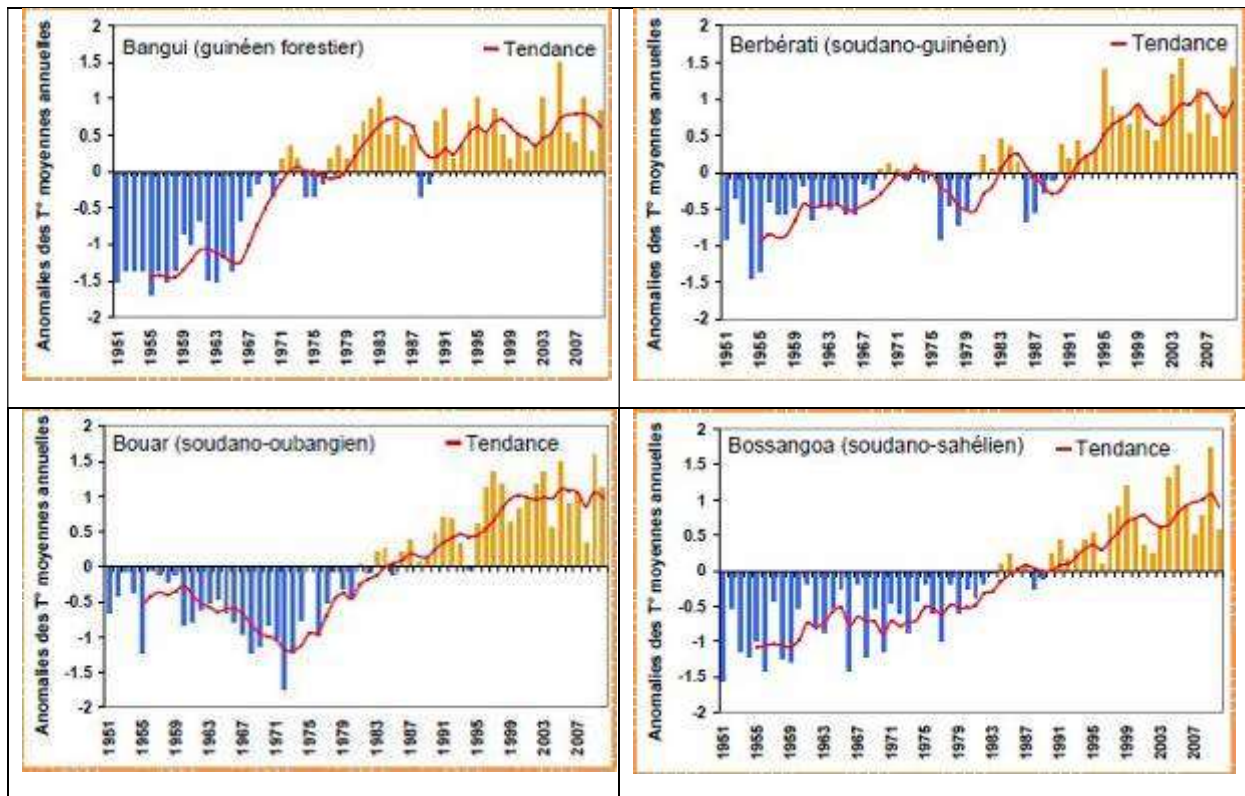


Figure 31: Anomalies and trends in mean temperatures at selected stations in CAR (DOUKPOLO 2014)

According to the work of DOUKPOLO 2014, the average annual temperature thus increased by 0.95°C in western CAR between 1981 and 2010. The average rate of increase between 1981 and 2010 compared to the period 1951-1980 is about 0.33°C per decade. This rate of increase is faster in the Sudanian domain (Bozoum and Bossangoa) with 0.39°C per decade, than in the Guinean domain (Berberati and Bambari), 0.27°C per decade.

### 4.3.2. Rainfall variability

Analysis of the monthly rainfall series over the period 1951-2017 shows that, following the rainfall recession of the 1980s, which is still engraved in the climate statistics for Central and West Africa, an increase in rainfall has been observed in Central Africa since the end of the 1990s (Figure 4.2). This slight increase is + 03.96% compared to the average of the series in the south at the Bangui-Mpoko station. It is characteristic of the month of November. The same trend is observed in the west and north of the country.

However, this period is characterized by years with deficits compared to the average (1196.9 mm in 2012 in Bangui for an average of 1481.87). The study was unable to identify regional contrasts due to lack of data by climatic zone.

### 4.3.3. Future climate in CAR: Changes in temperature and rainfall

In the Central African Republic, climate change will result in an increase in temperature of between +1.31°C and +2.11°C by 2050 according to the RCP4.5 scenario. This increase would be 0.56°C per decade. The warming will be uneven, (+2°C in the West, +2.11°C in the Northwest and +1°C in the South of the country) with a South-North increase gradient. The months of November, December and January will become warmer (+1.93°C on average) in the southern and western part of the country. While in the North-West it is the month of June that will be the warmest (+2.45°C).

The monthly minimum temperatures would tend to rise more and more quickly. This means that it will be warmer than before between 2am and 10am UT.

HAENSLER et al 2013, using an ultra-modern multi-model and multi-scenario ensemble, applied to global and regional climate change predictions that RCP4.5 predicts an average temperature increase of between +1.5°C to +3°C by 2100 over the Central African territory. According to the A2 and B1 scenarios used by DOUKPOLO (2014), the West of the Central African Republic will experience an average temperature increase of between 2°C and 6°C by 2100.

With regard to rainfall, the RCP4.5 scenario predicts an increase in rainfall during the dry season (D.J.F) and a decrease in rainfall during the wet season, albeit in a surplus context (+3.65% on average). The work of HAENSLER et al 2013 and IPCC 2015, draw the same conclusion by attesting an increase in average rainfall at latitudes near the Equator. Similarly, it is projected under the A2 scenarios that the most pronounced rainfall increases (8-15% wetter) will occur in the southwestern regions of CAR by 2075. Precipitation increases are likely to be between 1 and 11% more, relative to the baseline period (1971-2000). Scenario B2 predicts similar trends, of greater magnitude over 20%(DOUKPOLO 2014). The occurrence of dry and wet episodes are not excluded.

Despite the great uncertainty in the estimation of rainfall, adaptation options can be identified based on the future climate trend, which correlates well with observed data, particularly temperatures.

#### **4.4. Vulnerability to climate change in CAR**

Knowledge of the level of vulnerability allows for sustainable adaptation policies and strategies. The study of vulnerability in the Second National Communication was not based on case studies, thus making what was presented as the country's vulnerability to climate change too general. The vulnerability of the selected sectors is assessed qualitatively by highlighting the degree and level of vulnerability of each sector, taking into account its exposure and sensitivity to climate risks and the current capacity for adaptation in the sector.

##### **4.4.1. Vulnerability of the agriculture and food security sector**

The Central African economy is essentially rural and based on the primary sector, particularly low-value agriculture. Approximately 75% of working Central Africans work the land, which has an estimated potential of 15 million hectares. In 2014, agriculture and forestry contributed 58% of GDP. Paradoxically, living conditions have deteriorated considerably. The Human Development Index (HDI) of 0.315 in 2010 is one of the lowest in the world. More than 73% of rural households, the workforce of the agricultural sector, live below the poverty line compared to 68.3% of urban households. Recurrently, nearly 60.4% of rural households and 51.1% of urban households are unable to obtain the minimum food basket required, i.e. 2400k/cal per day of the adult equivalent. From this alarming observation, the climate affects and will affect negatively the agricultural activities. Hence the need to seek sustainable adaptation strategies.

##### **4.4.1.1. Physical, socio-economic and institutional contexts of the agriculture and food security sector in CAR**

Thanks to the spatial variation in rainfall, the Central African Republic has a very rich ecological diversity, grouped into five agro-ecological zones (Guinea-Forest; Sudano-Auban; Sudano-Guinean; Sudan-Sahelian and Sahelian). These zones give the CAR the natural possibility of cultivating all tropical plants on its less rugged territory. Unfortunately, this immense natural potential is little exploited. Rainfed food crops are

grown on small family fields (0.5 to 1.5 hectares) with very rudimentary means and without access to external markets. With 0.7 million hectares of land cultivated annually out of 15 million hectares available, i.e., 09%, cassava is the main food crop, along with millet, maize, groundnuts, etc. Coffee and cotton are the main crops. Coffee and cotton are the main export crops. Technical support for farmers and access to agricultural credit remain problematic, resulting in low production and yields. Consequently, a very low level of income does not allow for the emergence of agricultural production. Crop production in CAR is still far from being associated with animal production. This lack of integration constitutes a shortfall.

This shortfall in yield has been amplified by the military-political crises that have destabilized the Central African agricultural world. However, the peace agreements signed with the politico-military movements, setting in motion the DDR program, the adoption of a priority plan for the consolidation of peace based mainly on the reform of the security sector (SSR) as well as the prioritization of the revival of agriculture by the Head of State, Prof. F A TOUADERA, project a favorable horizon for the development of agriculture in CAR.

#### 4.4.1.2. Impacts of the observed climate on the agriculture and food security sector

Central African agriculture is exposed to climatic risks such as pockets of agricultural drought/drought, excess rainfall, prolonged rainy season and early onset of the rainy season. Pockets of drought occur, depending on the year, between the months of May and April, after the deceptive rains of February and March, as was the case in the prefectures of Lobaye, Kemo and others this year (2018). They occur at the heart of the rainy season. Excessive rainfall, characterized by regular rainfall over several consecutive days, occurs during the harvest and drying period between June and September. The extension of the rainy season is the shift of rainy days to November and December, which are dry months.

These climatic risks identified by the grassroots communities have a negative impact on agricultural yields and production (Table 4.2). The crop most affected is maize, where its loss is total if a pocket of drought/agricultural dryness occurs. For example, this year's first maize season in the Lobaye and Kemo prefectures was a total failure due to the total absence of rainfall during the entire month of April and part of May (until mid-May) (photo BC). Excessive rainfall caused rotting of cassava tubers, which is a staple food, and problems with drying and preserving agricultural products (Table 4.2). The extension of the rainy season degrades the quality of cotton fibers and causes rotting and molding of sesame seeds.



Photo 5: Yellowing and drying of maize leaves during the flowering period following the agricultural drought of April - May 2018. PK 10 of Sibut, route de Bangui (Photo: CNC Field Mission, June 2018)

Current endogenous strategies based on reseeded and replanting lack pragmatism. The sensitivity and exposure of Central African agriculture to climatic hazards is thus high, but with little capacity to adapt. This makes the sector highly vulnerable to climate change.

In the livestock sector, drought is the most formidable climatic risk for cattle breeding. The long dry periods lead to the proliferation of diseases such as rickettsiosis (pimoplasma), Wadahoude, Carbon, foot-and-mouth disease, streptotricosis, brucellosis... which can decimate herds to more than 60% of their size if they do not receive care. African swine fever, which occurred last year in the areas surveyed and which could not be linked to climate change, deserves special attention given the very high level (80 to 100% loss of livestock) of its damage.

Table 34: Impact of climatic hazards on food and cash crop production and yield

CULTURES	IMPACTS	CONSEQUENCES	CURRENT ADAPTATION MEASURES
<b>DROUGHT POCKET</b>			
<b>Manioc</b>	Drying out of cuttings. Attack (cuttings) by termites. Yellowing of leaves.	Drop in yield and production. Loss of earnings/revenue.	Replanting of cuttings when the rains resume.
<b>Arachide</b>	Dwarfism. Difficulty of lifting. Abortion of gausses. Yellowing of leaves. Grain attack by insects and rodents.	Drop in yield and production. Lack of seed. Loss of income. Loss of financial and physical investment.	Re-seed. Replace groundnuts with cassava.
<b>Maïs</b>	Dwarfism. Difficulty in emergence. Early flowering. Yellowing of leaves. Rodent attack on stems.	Drop in yield and production. Lack of seed. Loss of income. Loss of financial and physical investment.	Reseed. Replace groundnut maize with cassava.
<b>Courges</b>	Leaf attack by locusts. Poor emergence.	Drop in yield and production. Loss of income/ income decline	NO
<b>Sésame</b>	Yellowing of the leaves.	Drop in yield and production. Loss of income/ income decline	NO
<b>Coton</b>	NO	NO	NO
<b>EXCES PLUVIOMETRIQUES</b>			
<b>Manioc</b>	Tuber rot. Proliferation of diseases. Difficulty in drying (pods). Worming.	Increase in the price of cassava. Fall in yield and production. Shortage of cassava flour on the market. Poor quality and taste of cassava flour.	NO

<b>Arachide</b>	Difficulty in harvesting and storage. Insect attack on pods. Germination in the ground. Difficulty in drying.	Decrease in production. Loss of income. Shortage of seed for the next crop year.	Fire drying.
<b>Maïs</b>	Attacked by insects. Worming. Difficulty of drying and preservation.	Decrease in production. Loss of income. Shortage of seed for the next crop year.	Smothering of the ears. Early harvest.
<b>Courges</b>	Insect attack on leaves. Flower abortion.	Drop in yield and production. Loss of income.	Spreading ash, chilli and soap powder on the leaves.
<b>Sésame</b>	Flower abortion. Leaves curled up.	Drop in yield and production. Loss of income.	Spreading ash and soap powder on the leaves.
<b>Coton</b>	Proliferation of insects. Abortion of flowers.	Decline in production.	NO
<b>EXTENSION OF THE RAINY SEASON</b>			
<b>Manioc</b>	NO	NO	NO
<b>Arachide</b>	NO	NO	NO
<b>Maïs</b>	NO	NO	NO
<b>Courges</b>	NO	NO	NO
<b>Sésame</b>	Grain rot and mould. Change in colour of the grain (black). Change of taste and poor sales.	Drop in yield and production. Loss of income.	NO
<b>Coton</b>	Difficulty in harvesting. Storage problems. Loss of fibre quality.	Poor fibre quality. Fall in price relative to fibre quality Loss of income.	NO
<b>EARLY START OF THE RAINY SEASON</b>			
<b>Manioc</b>	Early sowing with a risk of failure.	Loss of cuttings.	
<b>Arachide</b>	Early sowing with a risk of failure.	Loss of seed. Loss of investment. Loss of income.	Abandonment of the culture. Replacement by other crops.
<b>Maïs</b>	Early sowing with a risk of failure.	Loss of seed. Loss of investment. Loss of income.	Ressemis (ressemer).
<b>Courges</b>	NO	NO	NO
<b>Sésame</b>	NO	NO	NO
<b>Coton</b>	NO	NO	NO
<b>EXTENSION OF THE DRY SEASON/ACUTE DROUGHT</b>			
<b>Elevage de Bovin</b>	Proliferation of diseases (rickettsiosis, Wadahoude, 1 Carbon, foot and mouth)	Animal deaths. Loss of income/decrease in income.	Some care.

	disease, streptotricosis, brucellosis...). Loss of weight.	Change of activity.	
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Source: Field survey, May and June 2018

#### 4.4.1.2.1. Impacts of the projected climate on the agriculture and food security sector

Although there are scientific uncertainties in the rainfall projection, the West Central African region (as well as the country as a whole) could see the length of the agricultural season decrease by more than 20% by 2050 and increase by 2075 to 33%. In this context, crop yields are expected to decrease and thus agricultural production, particularly cereals, is expected to decline (Figure 4.3). We may see an increase in groundnut production, which is better adapted to soil degradation and reduced rainfall. Figure 4.3 shows that "under the dry/A2 scenario, the yield declines for yam, maize, sorghum, and millet would be -22%; -24%; -28.4%; and 19.3%, respectively. Rice yields would fall by -17.8% in the dry/A2 scenario. Cassava would be more vulnerable to the climate context in the wet/B1 scenario with a -4.2% deficit. For the wet/B1 scenario, yam yield will increase by +11%" DOUKPOLO 2014.

However, the increase in dry season rainfall predicted by the RCP4.5 scenario will make it difficult to open new plots in the forest zone. The predicted increase in rainfall could be beneficial for maize cultivation.

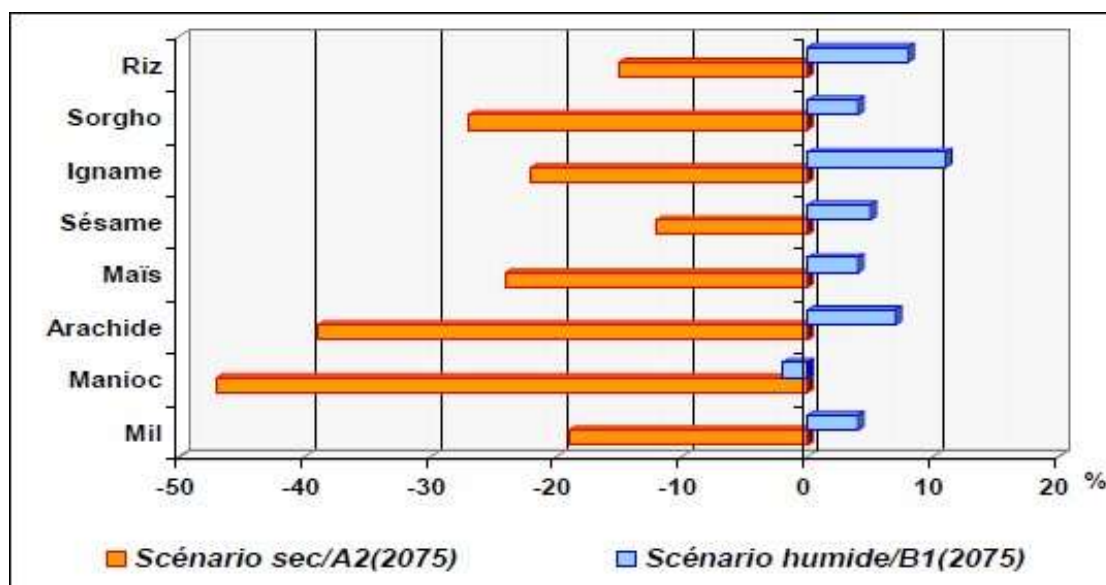


Figure 34: Percentage rate of simulated future average yields of the 8 crops selected under the dry/A2 and wet/B1 scenarios by 2075 in western Central Africa (sources DOUKPOLO 2014)

However, in the case of a warming of the temperature, associated with a decrease in rainfall, there would be drastic drops in yields and production. This would have very negative repercussions on the population, whose poverty would increase, and would make the State deficit and dependent on the outside world. In the livestock sector, a slight increase in the quality of pastures can be expected, which will attract more foreign livestock breeders to the Central African Republic.

These impacts will weigh on people, on the capital of farms and on their results (less productive livestock and crop systems), but also on collective dynamics, all of which will contribute to increasing the vulnerability of poor people.

#### **4.4.1.2.2. Vulnerability linked to extra-climatic factors**

The vulnerability of the agriculture and food security sector will be amplified by extra-climatic problems. The lack of application of seasonal forecasts in agriculture, and the uncertainty about rainfall projections, will make the Central African agricultural sector vulnerable. In addition to these uncontrolled climatic constraints, farmers' practices (land clearing, slash-and-burn, light weeding) do not allow for good water conservation and good weed control. The inadequacy or even absence of technical support for food crops, the lack of phytosanitary protection, the absence of outlets and insecurity will increase the vulnerability of Central African agriculture to climate change. The same applies to socio-cultural constraints, which constitute a real obstacle to progress. Dynamic and enterprising farmers are reluctant to succeed too much for fear of being frowned upon or even bewitched. Farmers who produce a lot are often suspected of fetishistic practices themselves. (OUIKON 2003). Finally, the lack of macro-economic support measures further exposes agriculture to climatic hazards.

#### **4.4.2. Vulnerability of the water resources and sanitation sector**

The CAR's water resources are made up of rainwater, rivers and groundwater characterized by seasonal variations in volume.

##### **4.4.2.1. Hydrological potential of the CAR and the influence of rainfall fluctuations on river flows**

###### **4.4.2.1.1. Hydrological potential of the CAR**

The amount of rain that falls on the Central African territory decreases from south to north (1800 to 800 mm annual average). Based on an average annual rainfall of 1200 mm for the whole country, the country receives 746.4 billion m<sup>3</sup> of water as a volume of rainfall (Global Water Partnership 2010). CAR has a dense hydrographic network, subdivided into four main basins: the Oubangui basin in the south, the Sangha in the southwest, the Logone in the northwest and the Chari in the north. All of them depend on runoff water, and their regimes are based on the rainy season, with floods occurring between September and October and low water from February to March, with a low water period that increases from the south to the north.

Several lakes, ponds and artificial reservoirs can be found in the Central African Republic. The Global Water Partnership (2010) estimated the minimum surface water resources of CAR at 47,130 million m<sup>3</sup>/year. Groundwater resources evaluated from the large hydrogeological units of certain watersheds show that the terminal Precambrian formations (Ouaka watershed) have renewable resources of around 60,000 m<sup>3</sup>/km<sup>2</sup>/year and the overall volume of renewable resources contained in this formation would be around 24 billion m<sup>3</sup>/year.

The renewable resources of the carbonate terminal Precambrian of the Mpoko Basin approach 115,000 m<sup>3</sup>/km<sup>2</sup>/year. The overall volume of renewable resources contained in this formation would be of the order of 6.3 billion m<sup>3</sup>/year. For the Mesozoic sandstones that form the bedrock of the Lobaye basin upstream of Mbata (Carnot sandstone), they are of the order of 50,000 m<sup>3</sup>/km<sup>2</sup>/year. Over several years, fluctuations in regulatory resources can exceed 200,000 m<sup>3</sup>/km<sup>2</sup>/year in these same formations. The global volume of renewable resources of this formation would be of the order of 4.5 billion m<sup>3</sup>/year (Global Water Partnership 2010). Water is

thus available in Central African territory, with a variable volume depending on rainfall fluctuations.

#### 4.4.2.1.2. Vulnerability of surface water to climate change

Rainfall is the main source of water for Central African rivers. Consequently, its decrease impacts river flows. On the Oubangui River, since 1971, decennial flows have decreased overall from 3615 m<sup>3</sup>/s to 2935 m<sup>3</sup>/s, i.e. by 19% (NGUIMALET et al 2012). The rainfall recovery from 1991 to 2006 (1332 to 1530 mm) according to the same source was not necessarily followed by a hydrometric recovery, especially during the period 2001-2006 when the flow was lower (2963 m<sup>3</sup>/s) compared to the previous period (3033 m<sup>3</sup>/s). On the whole, low water levels were more affected, going from February to July or even August instead of February-April as before (LARAQUE et al 2013). In the north of the country, rainfall over the entire region has been affected by the decrease in rainfall since 1967, followed by a significant hydrological deficit of about 47% of the Aouk's runoff volume compared to the wet period of 1953-1977 (KEMBE and GAPIA 2017).

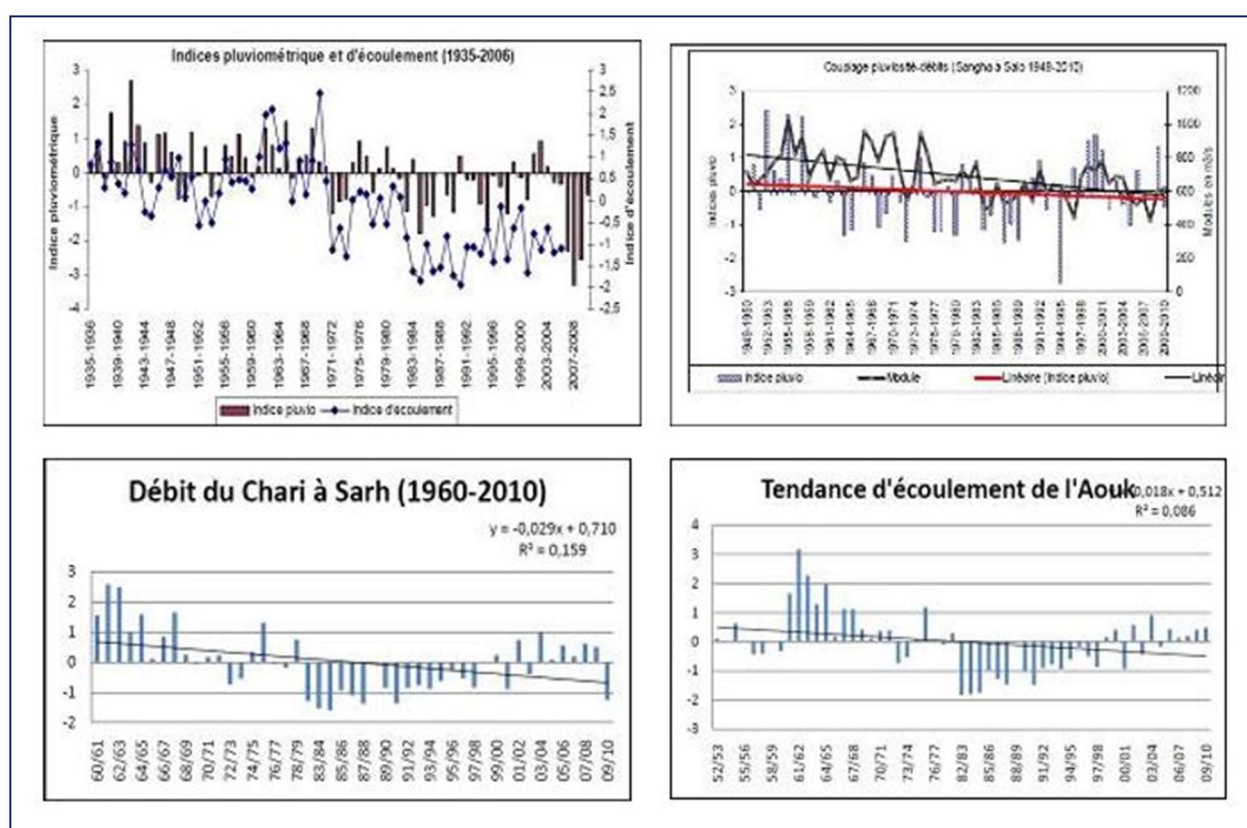


Figure 35: Flow indices of some rivers (from left to right: Oubangui, Sangha to Salo, Sarh and Aouk) draining the Central African territory coupled with rainfall indices (fig. a and b). Sources: NGUIMALET et al 2013 (fig. a), GAPIA et al 2

However, the degree of water vulnerability varies according to the vegetation cover and the nature of the soil. A study conducted on the Sangha basin (GAPIA 2017) attests that the hydrometric stations of the rivers draining the savannah are more affected (about -33% deficit) than those of the forest southwest where their deficit is on average -18%. Streams draining the sandstone (Mambéré at Carnot, Sangha at Salo) have experienced a smaller deficit (-15 and -20.92%) than those flowing on the bedrock (Kadéï at Pana has experienced a decrease of -38%).

However, the predicted warming would have a positive impact on surface waters, although climate change induces an increase in the evaporation rate of between 8 and 10% throughout the Congo Basin. The Central African watersheds belonging to the Congo Basin will experience, on average, by mid-century, an increase in runoff of 27% for the A2 scenario, and 10% for the B1 scenario, (TAZEBE et al 2013). According to these same authors, the ECHAM5 climate model predicts, towards the end of the century, increases in runoff, with a peak of 73% for the A2 scenario. The IPSL model, on the other hand, indicates an increase of up to 18%. These results attest that the CAR should be prepared to manage excess water by the next few decades.

#### **4.4.2.2. Impacts of fluctuating runoff on the Central African economy**

The hydrological deficit recorded between 1980 and 2010 has impacted the Central African economy. Since the 1980s, navigation on the Ubangi has been seasonal, with a total interruption during the months of February, March and April due to long low water periods. On the Sangha, the number of days navigation is interrupted has increased from 5 days in the 1950s to over 110 days in 2010 (GAPIA 2017). This destabilizes the rhythm of trade via the waterway, which is nevertheless crucial for the national economy. The increase in river flow in the coming years would lead to flooding that could negatively impact the living environment of Central Africans as well as the national economy.

#### **4.4.2.3. Problems of access to water in CAR**

Although water is at one time of the year a cumbersome and unpleasant element for Central African city dwellers, it becomes scarce in the dry season. In 2005, the annual domestic water deficit (urban and rural) was 36.9 million m<sup>3</sup> for an annual national demand of 52.4 million m<sup>3</sup> of water (Global Water Partnership 2010). The annual production of domestic water, which is 8,939,885 m<sup>3</sup> in urban areas and 4,403,725 m<sup>3</sup> in rural areas, covers only about 30% of the national population.

Annual water withdrawals per person are very low in the Central African Republic compared to the African average, at 83 m<sup>3</sup> compared to 247 m<sup>3</sup>. Similarly, total withdrawals do not exceed 3 billion m<sup>3</sup> per year and represent only 0.4% of the country's total renewable resources, whereas the continental average is 5.5%. In CAR, water is available all year round and for the entire population; its shortage in the dry season is explained by the deficiency of the management and distribution infrastructure which does not guarantee permanent access to water in urban and rural areas.

#### **4.4.2.4. Sanitation problems in CAR: an aggravating factor in the impacts of global warming in the Central African urban environment**

The sanitation sector in the Central African Republic is still an uncertain sector where climate change continues to have a greater impact on almost the entire territory. It is a sector that is controlled much more by the municipality of each city. The situation is alarming because these cities have been virtually stripped of their responsibilities since the military-political unrest that shook the country. In addition, the city of Bangui, through the Emergency Rehabilitation and Urban Infrastructure and Services Project (PURISU) financed by the World Bank, has proven itself in its time and is now at the end of its project. Can we say that the conditions in which the different cities of the country behave respect the norms established to avoid any danger likely to harm the population? Is the management of waste deposited in the streets, water pipes and drainage canals normal to advocate for a real development that puts the inhabitants in environmental safety? The answer is no, because the non-governmental organizations (ACTED, Red Cross, Oxfam and others) that were working with the government could not bear the impact of painful events that the country has experienced.

The waste is thrown in the garbage and creates obstruction in the water conduits causing recurrent floods, with its processions of problems including the massive destruction of dwellings and others.

At least, many houses are dilapidated and abandoned; the localities are colonized by greenery thus creating a bank of proliferation of microorganisms harmful to human health.

In addition, uncontrolled displacements linked to the crisis have led most of the population to live without latrines, resulting in defecation at will in the wild. Some local populations find it better to defecate in the water, with the consequent risk of gastroenteritis, etc.

Table 35: Climate Change Impacts on Water Resources

<b>Climate Change</b>	<b>Biophysical impacts</b>	<b>Socio-economic impact</b>
Increase in temperature	Increased evaporation and evapotranspiration rates. Increased number of rainy days and intensity of rainfall.	<ul style="list-style-type: none"> <li>• Disruption of the agricultural calendar.</li> <li>• Poor agricultural production.</li> </ul>
Decrease in the average rainfall level	Drought  Decrease in surface water flows. Lowering of groundwater levels. Mechanical soil erosion	<ul style="list-style-type: none"> <li>• Decrease in the rate of aquifer regeneration</li> <li>• Loss of agricultural crops and biodiversity</li> <li>• Rationing of water for certain uses</li> <li>• Investment in tanks and reservoirs</li> <li>• Water scarcity</li> <li>• Increased number of navigation days.</li> <li>• Decrease in fisheries production.</li> </ul>
Increase in rainfall intensity	Soil erosion Flooding	<ul style="list-style-type: none"> <li>• Reduced agricultural production;</li> <li>• Habitat conducive to disease vectors;</li> <li>• Sedimentation of natural water reservoirs;</li> <li>• Blocking of rainwater harvesting wells</li> </ul>

#### 4.4.3. Energy Sector Vulnerability

The Central African Republic (CAR) has significant potential in energy resources (DPNE, 2013). Although it is a factor in socio-economic development, energy is at the heart of the climate change issue, as it is the main sector that emits greenhouse gases. According to the analysis of the potential NAMAs of the CAR (2012), among the six sectors of greenhouse gas emissions in the CAR, energy occupies the first place. Thus, the burning of coal and firewood accounts for the vast majority of emissions (98.7%, 18,716 ktCO<sub>2</sub>eq.), relegating the other sources related to the energy sector to marginal proportions. The second paper did not provide an exhaustive overview of the energy sector in the Central African Republic because some sectors were not considered. The analysis of the impacts was more or less done, but the adaptation measures are not clearly presented. It is therefore essential to assess the impact of climate change on this sector in order to measure its vulnerability and propose adequate adaptation options.

#### 4.4.3.1. Energy sources used in the Central African Republic and level of consumption

The most widely used energy sources in the Central African Republic are: electricity, firewood, and hydrocarbons (oil, gasoil, gas).

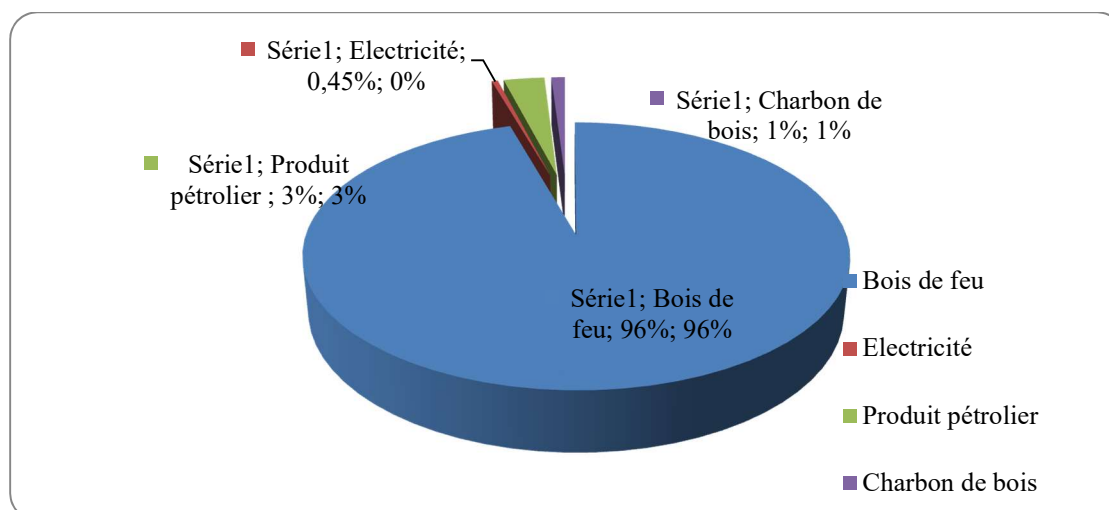


Figure 37: Distribution of national energy consumption in 2016 (Source: National Energy Directorate)

#### 4.4.3.2. Electricity sector

The Central African Republic has a dense hydrographic network and a non-exhaustive hydroelectric potential estimated at 2,000 MW and spread over several sites throughout the country. However, the country's electrification rate is very low, around 4%, with an access rate of 20% for the capital city of Bangui, and virtually zero for the cities in the interior and in rural areas (DPEN, 2010).

The partial inventories carried out have revealed around 40 hydroelectric sites with capacities ranging from 5 to 180 MW. The country's electricity production system includes: a set of hydroelectric facilities built on the Mbali River, which includes a dam and two hydroelectric plants with an installed capacity of 18 MW. Along with a thermal power plant with a capacity of 22 MW, hydroelectric power is transmitted to Bangui via two transmission lines with a capacity of 17.5 MVA and 35 MVA respectively. With the supply of electricity falling short of demand, the utility is forced to implement a load shedding program in Bangui while in the provincial towns, the plants are purely shut down ( ENERCA Investment Program, 2016).

#### 4.4.3.3. Hydrocarbon sector

Overall imports of oil and gas products for consumption reached 77.25 Mtoe at the end of November 2016. The volume of oil and gas products actually delivered for consumption is 76.37 Mtoe for an average of 8.49 toe/year. The consumption of oil products reached 76.32 Mtoe in 2016, or about 15 kg per capita. The country imports an average of 5.22 tons/year of gas products, this import reached 47 tons in 2016, or about 9.2 g per capita confirming that gas is practically not among the energy sources used by the Central African populations (UNDP, 2016).

#### 4.4.3.4. Wood energy sector

In 2016, total consumption of fuelwood and charcoal in CAR amounted to 2.65 Mtoe or 0.52 toe per capita. This sharp increase in consumption can be explained by the galloping demography of the capital, accentuated by the massive displacement of people from the interior to Bangui due to

numerous pockets of armed clashes and the resulting insecurity (KOMODE, 2015). Agricultural clearing, for food crops, but also certain cash crops such as cotton or coffee, would release between 400,000 and 800,000 tons of wood annually. A farming family would consume about 3 tons of firewood per year and clear about half a hectare, which provides it with between 5 tons (poor shrub savannah) and 150 tons (dense forest) of wood (Direction Générale de l'Energie, 2016).

#### **4.4.3.5. Solar energy sector**

Although the CAR, has a potential for solar energy (solar irradiation of 5 kWh/m<sup>2</sup>/d on average distributed throughout the territory), its use is still at an embryonic stage: water pumping in rural areas, health centers, lighting etc. (Direction Générale de l'Energie, 2016).

#### **4.4.4. Vulnerability of the energy sector to climate change**

The assessment of the degree of sensitivity and vulnerability of CAR's energy sub-sector is carried out using likely scenarios of increased temperature and rainfall variation as well as the perception of climate change by the populations.

##### **4.4.4.1. Vulnerability of the electricity sub-sector**

The potential for hydropower is highly dependent on rainfall, evaporation and temperature, and is therefore closely linked to variations in one or more characteristic climate parameters. In the Central African Republic, the electricity produced is of hydroelectric origin and the Mbali dam is the main supplier. An increase in rainfall will result in the possibility of increasing the potential of existing hydroelectric dams as well as the possibility of building other dams. In addition, with the increase in temperature, line losses in the power transmission networks will become relatively important.

This increase is likely to cause technical losses to ENERCA during the transport of electric current on the Boali-Bangui section, which is made up of bare cables, and will also cause wear and tear on the electrical equipment (transformers, etc.). The local populations who have settled in an anarchic manner on the High Voltage electrical transport corridor will be exposed to carcinogenic electromagnetic radiation.

There is a risk of fire due to the emission of flammable hydrocarbons during deposition and the drying out of plant material, as well as the destruction of electrical network components by storms and the poor combustion of wet woody energy products (wood and charcoal). Low rainfall in the Central African Republic would cause a decrease in electricity production by the Boali power plants.

##### **4.4.4.2. Vulnerability of the Biomass Energy Sub-sector**

Increased rainfall due to future climate change will have a beneficial effect on biomass energy. However, this positive effect will be quickly neutralized by the increase in temperature due to heat stress and an increased risk of uncontrolled bush fires. The increase in temperature will also increase evapotranspiration, which can lead to a deficit in the water balance of plants and therefore reduce their productivity, which increases the vulnerability of the wood energy sub-sector to climate change. Increased precipitation will cause flooding of agricultural fields, natural vegetation and forest formations with the risk of compromising the source of energy which is biomass.

##### **4.4.4.3. Vulnerability of the Hydrocarbon sub-sector**

Hydrocarbons are sources of GHG emissions responsible for climate variations. The vulnerability of the biomass and hydroelectricity sub-sectors will lead to a de facto decrease in energy supply

in relation to demand. The decrease in energy supply in biomass and hydroelectricity should increase the consumption of hydrocarbons. In addition, the forecast increase in rainfall will cause alterations to the road network, which consists mainly of dirt roads used for fuel distribution in the provinces. A drop in rainfall would cause difficulties in supplying hydrocarbons by river, with a drop in the hydrometric regime of the Sangha River limiting the supply of oil to the Nola oil depot by road and even to the Oubangui River, which would not allow SOCATRAF barges to transport petroleum products directly to Bangui.

#### 4.4.4.4. Vulnerability of the renewable energy sub-sector

Future climate change scenarios indicate an increase in temperatures that could be due to sunshine. This would increase the yield of photovoltaic installations, which would have a de facto positive impact on the solar energy potential. By 2050, a significant increase in temperature levels could lead to a decrease in the yield of solar equipment. Although the energy sector in the Central African Republic is vulnerable to climate change, it also offers opportunities. An increase in rainfall would favor the promotion of hydroelectric technologies and an increase in temperature would also favor the promotion of photovoltaic energy, as well as the availability of good quality fuels (less humid) reducing, during combustion, the massive formation of carbon monoxide, one of the causes of cardiovascular disease in women. The various adaptation options proposed are unavoidable in order to mitigate the adverse effects of climate change in CAR.

Table 36: Impacts of CC on energy resources

Energy source	Impacts	Consequences	Current adaptive responses
<b>Increased temperature/acute drought</b>			
<b>Firewood</b>	<b>no</b>	<b>no</b>	<b>no</b>
<b>Charcoal</b>	Increased production of charcoal	Anarchic cutting of wood for the production of coal.	Promotion of improved stoves
<b>Hydro electricity</b>	Exposure of the local population to carcinogenic electromagnetic radiation	- Technical loss at ENERCA -Difficulty of electricity supply	Raising awareness among the local population about the danger of approaching electrical installations along the Boali-Bangui axis
<b>Fossil energy</b>	Risk of fires	Emissions of flammable hydrocarbons during dumping.	Implementation of fire protection measures
<b>Increase in rainfall</b>			
<b>Firewood</b>	- Poor combustion of wood products - Flooding of plant and forest formations - Dieback of plants in flooded areas	- Shortage of firewood and increase in market price - Destruction of animal habitat - Human stress - Worsening of poverty	- Important use of fossil fuel as an alternative - Collection and conservation of wood for rational use in periods of increased rainfall
<b>Charcoal</b>	Poor carbonization of wood	-Reduced access to good quality charcoal	Reduced use of charcoal

		- Increased poverty	
<b>Hydro electricity</b>	Destruction of electrical network components by storms	Power outage (load shedding)	Reinforcement of electrical installations at roadside
<b>Fossil energy</b>	Alteration of the road network	Fuel shortage and price increase in some localities of the country	Use of firewood and coal
<b>Baisse de la pluviométrie</b>			
<b>Firewood</b>	NO	NO	NO
<b>Charcoal</b>	NO	NO	NO
<b>Hydro electricity</b>	Decrease in water level (low water)	-Decrease in electricity production by the Boali power plant - Difficulty in supplying hydrocarbons	Load shedding, use of solar panels, energy converters
<b>Fossil energy</b>	Alteration of the road network	-Difficulty of supply of hydrocarbons -Increase in the price of fuel on the market	Use of wood energy as a substitute

#### 4.4.5. Vulnerability of the forestry sector and land use

The Central African Republic has considerable forest cover of about 28,300,000 hectares (ha), or 45.6% of the national territory, and is very rich in biodiversity. The wetlands cover 5,400,000 ha, or nearly 9% of the national territory. The emblematic and/or fully protected species that are often found there are gorillas, chimpanzees, elephants and bongos. In the north of the country, one can find lions, derby elks, giraffes, wild dogs, cobs, hippotragues, kudus, Thomson's gazelles, damalisques and also a particularly varied avifauna (FAO), 485 species of birds, 15% of which are migratory and 85% are resident according to a 1998 study (PSEF, 2010) In addition, there are medicinal plants, nutritional plants, service plants, and a wide variety of non-timber forest products (NTFPs) spread throughout the country, which are used by half of the population for food, health care and to generate significant income.

However, the savannah occupies 90% of the territory. However, there is a high level of fuelwood harvesting, land use, land use change and forestry or LULUCF (COMIFAC, 2008), in the sense that areas of forest are being converted into cultivated areas (LDN-TSP, 2017). The land use sector includes land use, land use change and forestry (LULUCF) and agriculture, sometimes collectively referred to as Agriculture, Forestry and Other Land Use (AFOLU) according to "Understanding Land Use in the UNFCCC, 2014." Therefore, the term: land use, without forest or LULUCF and with forest LULUCF is retained in this work.

In CAR, land is owned by the state. LULUCF differs from the emissions from the energy sector, industrial processes, waste and agriculture reported under the UNFCCC. These differences explain the complexity of LULUCF, and highlight why the UNFCCC continues to treat LULUCF separately in its reporting. It includes both CO<sub>2</sub> emissions and removals and can serve as a carbon sink or source. For many developed countries, forest land is a net sink, although for a few it is a net source. Thus, there are several ways to categorize land. These may vary from country to country depending on how the land is used. Despite the existence of some old texts that still guide

the LULUCF sector today, CAR has a lot to do in this sector. Even the Land Code, which is currently under revision, has not yet been positively received by all stakeholders.

The question that can be asked is the following: what impacts do the country's forest and biodiversity and land use have on climate change in order to propose means of adaptation?

#### **4.4.5.1. Physical and institutional contexts and socio-economic development of the forest sector**

#### **4.4.5.2. Physical and institutional contexts**

The 54,000 km<sup>2</sup> of dense Central African forests are divided into two blocks: the Southwestern massif with an area of 3,787,777 ha, including 2,608,700 ha of forests considered productive with an overall potential of approximately 866 million m<sup>3</sup>, all species and types of wood combined, and the Southeastern massif (Bangassou Forest) with an area of 1,600,000 ha, which is reserved for conservation but is illegally exploited in an artisanal manner for the benefit of the local and border populations. Among the species present (flora and fauna), there are about 300 species of exploitable trees for a volume of nearly 241 million m<sup>3</sup>, of which 66 species constitute a marketable volume of 93 million m<sup>3</sup>, 20 species of primates, including gorillas and chimpanzees, the 2 species of African elephants, buffaloes, leopards, hippos, bongos, sitatungas and various duikers.

The Central African forest, very rich and varied in flora and fauna, and land use and land-use change deserve to be managed sustainably and also to realize what vulnerabilities it is exposed to. This has always been the basic concern of the Government. That is why in 2003, the *Etats Généraux des Eaux et Forêts* discussed it thoroughly.

For good management of its forests, CAR has an institutional framework for the implementation of its forestry policy: the Ministry of Water, Forests, Hunting and Fishing (MEFCP), whose main missions are to regulate, promote and control all socio-economic activities in the area of water, forests, hunting and fishing and also to promote the conservation and sustainable management of forest, wildlife and fishery resources and other secondary products of the forest. Several ministries involved and organizations and/or technical and financial partners concerned participate directly or indirectly in the management of these forests and land use, land use change. In particular, we have the Ministry of Urbanism, City and Housing.

The State has set up the Agency for Sustainable Management of Forest Resources, formerly the Support Project for the Implementation of Management Plans (PARPAF), which deals with all forest development and management issues in CAR. And to ensure the security of forestry export taxes, CAR has set up an independent mechanism to control the export of timber at its borders. This mechanism is managed by a private international control organization (BIVAC RCA) which transfers, after deduction of its remuneration, the amounts of export duties collected to the customs services. In addition, CAR has signed a Voluntary Partnership Agreement with the European Union for the flow of its forest products and derivatives. In the meantime, through PARPAF, the Ministry in charge of forests had elaborated and validated three (3) documents (Nomes) of forest management:

- *National Standards for the elaboration of Management Plans (2006), Tome-1;*
- *National Standards for the elaboration and approval of the Management Scenario (2009), Tome-2;*
- *National Forest Management Standards (2012), Tome-3.*

In addition to these three national standards, CAR has a number of texts or instruments that are appropriate for forest management: (i) Law No. 07.018 of December 27, 2007, on the

Environmental Code of the Central African Republic; (ii) the National Environment Fund (FNE), created by Law No. 07.018 of December 27, 2007, on the Environmental Code; (iii) Law No. 08.22 of October 17, 2008 on the Forestry Code of the Central African Republic, (iv) the National Environmental Action Plan (PNAE) of 2000-2020, (v) the Forestry Development Fund (FDF) in 2017, (vi) the two codes: Fisheries and Aquaculture (developed) and Wildlife Protection (revised) are at the level of the National Assembly (2017) for adoption.

As for non-timber forest products (NTFPs), to date they do not have a legal text worthy of the name, apart from the National NTFP Strategies that have been developed. However, NTFPs are widespread throughout the country. The main one is *Gnetum africanum* or "koko", which is prized by more than half of the Central African population for its food all year round. The circuit, from harvesting to market, remains informal but generates significant income. Caterpillars, mushrooms and some NTFPs are seasonal. However, others are used for various treatments.

And, despite the multiple military-political crises that have shaken the CAR in general and the forestry sector in particular, the sector continues to support the efforts of the Government's policy in its fight against poverty. It is also necessary to emphasize that during the *Etats Généraux des Eaux et Forêts* in 2003, questions on the environment and forestry were seriously addressed.

#### **4.4.5.3. Forests and socio-economic development in the Central African Republic**

The forest contributes to 10% of GDP before the numerous politico-military crises of 2008 and 2013. As assets, CAR has a low deforestation rate, around 0.1% in dense forest (FAO, 2016); resource availability (flora, fauna, fishery resources, etc.); a homogeneous forest block of a single block and a limited area; 241 million m<sup>3</sup> of exploitable wood, of which 93 million m<sup>3</sup> are marketable; a management process that is globally advanced; about fifteen protected areas, including an ecological reserve of about 70 Hectare overall; and a low human population density.

However, its weaknesses are the lack of knowledge of ecosystems, species, populations, genetic resources and derivatives; the lack of knowledge of the dynamics of ecosystems, the self-ecology of species and populations; the lack of monitoring systems for the evolution of the forest cover and forest resources; the lack of knowledge of the carbon storage capacities of forests and savannahs; and finally the lack of a directory and mapping of traditional knowledge and skills (TKS) related to genetic resources.

#### **4.4.5.4. Land Use (LULUCF): Difference with other sectors and socio-economic development**

##### **4.4.5.5. Why the land use sector is different from other sectors**

Below we present some characteristics in which LULUCF differs from emissions from the energy, industrial processes, waste and agriculture sectors reported under the UNFCCC. These differences explain the complexity of LULUCF, and highlight why the UNFCCC continues to treat LULUCF separately in its reporting.

- Land use can be a sink or a source

Unlike other sectors, land use includes both CO<sub>2</sub> emissions and removals. For many developed countries, forest land is a net sink, although for a few it is a net source.

- Stocks versus flows

In some cases, to estimate emissions and removals from land use, the difference in carbon stocks is measured (called the stock difference method) instead of looking directly at fluxes (i.e., measurements of emissions over a given period of time), as in other sectors. Each type of land use has different carbon stocks; when converting from one land use to another, it is assumed that the carbon stocks after a certain time will reach the average of the carbon stocks of this new land use, so CO<sub>2</sub> emissions and removals can be estimated on this basis.

- Natural effects can be relatively large

The impact of droughts, floods, storms, and wildfires on the net balance of emissions and removals from the land-use sector can be large and in some years exceed the impacts of management practices on the same ecosystems. Some extreme natural events have low predictability and variable frequency and magnitude, and their management is quite limited (Canaveira Paulo 2014).

#### 4.4.5.6. Land use, land use change and socio-economic development

In the Central African Republic, as in the Congo Basin, the sectors directly involved in land use are governed by rules that frame inconsistent or conflicting sectoral practices (*OYONO et al. 2014*).

The main sectors involved or in competition are generally the mining sector, the forestry sector, the agricultural sector, infrastructure construction and the energy sector, all of which are subject to more or less different and inappropriate land tenure regimes, regardless of the country

In the Central African Republic, for land use, there is *Law n°63-441 on the National Domain, promulgated by Decree n°64-003 of 9 January 1964*.

It is important that the practices (agriculture, mining, logging, etc.) carried out by human societies for various socio-economic activities be planned. For land use planning is a process that will bring stakeholders (local community members, traditional authorities, private sectors, government representatives, scientists, etc.) together to discuss how to manage the natural resources of a given geographical area for the benefit of present and future generations. And if this land use planning process is done in a participatory manner, the zoning will be excellent.

All these sectors bring added value that should be well managed to generate more, but some misgovernments and the numerous military-political crises have affected many of these sectors. New assignments, well studied beforehand, would be possible and advantageous with the new Code currently being revised. It is good if all this is done within a regulatory framework. However, during our missions in the interior of the country, in addition to the impacts of climatic hazards, we noted that third parties were making and continue to make land allocations at their level or through their actions (bush fires, overgrown crops ...) in the impacts of climate change.

Sectoral policies governing the different sectors mentioned above are available, but these policies are not consistent with each other, which is the cause of conflicts between land uses and overlapping forestry, mining and other permits.

#### 4.4.5.7. Vulnerability of forest ecosystems to climate change

Forests and multiple-use lands are sources of GHG emissions and removals, and thus responsible for climate change. Thus, changes in forest cover can be related to long-term climate variations in general. The space-time variability of climate depends mainly on the interaction between surface conditions (temperature, albedo and humidity) and the atmosphere: a relationship materialized by

air flows and sensible and latent heat fluxes. Regarding the impact of climate variation on forest ecosystems, two key types should be noted, namely:

#### **Direct impacts:**

Climate change is expected to have a range of impacts on Central African forest ecosystems. However, the effects of CO<sub>2</sub> and temperature on forest growth are not yet fully understood. It appears that higher atmospheric CO<sub>2</sub> can increase tree (forest) growth and carbon fixation. But higher temperatures can have negative impacts on forest growth and therefore reduce the amount of carbon in the forest. So, the question arises whether climate change can affect forest reproduction and cause their decline?

There are possible future trends in forest response to climate change: impact analyses show that it is unlikely that the Central African forest will experience a decline in forest growth as a result of climate change. Conversely, there may be a moderate increase in ecosystem carbon, including vegetation and soil carbon. Depending on climate change, there could also be land use conversions, particularly between forest and savanna ecosystems. Thus, the most likely future scenario includes a moderate expansion of evergreen forests at the expense of savannas and steppes north and south of the current savanna-forest transition zones.

There remains a large range of uncertainty in the model assessments, highlighting the importance of collecting new data in order to improve predictions (e.g., biomass in the central Congo Basin and forest responses to changing climate and CO<sub>2</sub> concentrations).

#### **Indirect (external) impacts:**

The effects of climate change are often indirect, such as affecting the frequency and magnitude of fires or diseases, or altering the behaviors of pest species. The effects of climate change can accelerate the loss of ecosystems through the loss of species or by inducing resistance in severely disturbed ecosystems.

Climate can have immediate and long-lasting effects on hydrology (LI et al., 2007), which in turn can impact vegetation. This is what we observed in the field in Berberati (Mambéré-Kadéï Prefecture in the west) and Sibut (Kemo Prefecture in the center-east) during our surveys. This is the case for the vegetation in the northeast towards Lake Chad. Before the sharp drop in the water level of Lake Chad, the vegetation in the north of the country was mainly composed of Phragmites, *Cyperus papyrus*, *Vossia*, *Typha*, *Potamogeton* and *Ceratophyllum*. But the lowering of the water level of the rivers induced important changes in the vegetation in 1976, and the main part of the vegetation consisted only of *Vossia* and *Aeschynomenes* (Olivry, 1986).

Finally, before discussing the projected impacts, it should be noted that there is also the risk that some species or plant communities will be threatened with extinction by climate change. However, there is no evidence that these animal or plant species will become extinct as a result of climate change. Animals are generally at less risk because they are able to disperse to more favorable habitats. As for plants, they are fixed, but by means of seeds could disperse in unfavorable areas to new ones progressively outside their natural ranges.

#### **4.4.5.8. Possible future trends of the forest to climate change (projection).**

The change in average temperature due to conversion of forests to other land uses for the period 2041 to 2060 will result directly from changes in water and energy balance, and indirectly from increased forcing of greenhouse gases; and also combined.

- The conversion of forests to agricultural plots or other forms of land use in the Central African Republic as well as in the Congo Basin from 2041 to 2060 will result in changes in cloud base density and rainfall according to Akkermans et al.
- Impact analyses show that it is unlikely that the Central African forest will experience a decline in forest growth as is sometimes predicted for the Amazon Basin as a consequence of climate change. Conversely, there may be a moderate increase in ecosystem carbon, including vegetation and soil carbon.

Depending on climate change, there could also be land use conversions, especially between forest and savanna ecosystems. Based on the analyses, the most likely future scenario includes a moderate expansion of evergreen forests at the expense of savannas and steppes to the north and south of the current savanna-forest transition zones. There remains a large range of uncertainty in the model assessments, highlighting the importance of collecting new data in order to improve predictions (e.g., the Congo Basin Biomass Allometric Equation Project (PREREDD) at the SEFCA in CAR) and forest responses to changing climate and CO<sub>2</sub> concentrations.

Tableau 8: Climate change impacts on forests

<b>Resources</b>	<b>IMPACTS</b>	<b>CONSEQUENCES</b>	<b>CURRENT ADAPTATION STRATEGIES</b>
<b>DRYING</b>			
<b>Tree</b>	Drying of the tree. Loss of leaves.	Wilting. Difficulty of growth.	Reforestation
<b>Caterpillars</b>	Rareté	Drop in yield and production. Loss of income. Loss of financial and physical investment.	Reforestation with caterpillar species
<b>Mushrooms</b>	Rareté	Fall in yield and production. Increase in the market price of game Loss of financial and physical investment. Loss of income	Mushroom cultivation
<b>Snail</b>	rareté	Fall in yield and production. Increase in market price of game Loss of income	aucun
<b>Wildlife</b>	Frequent bush fires. Destruction of habitats. Drying up of watercourses causing animals to go everywhere (exposure)	Displacement of animals to new habitats and spaces. Fall in hunting yields Increase in market price of game Loss of income	Setting aside of certain areas. Restoration of landscapes. Creation of salt pans.
<b>RAINFALL DATA</b>			
<b>Tree</b>	Immersion/asphyxiation of trees. Proliferation of diseases.	Tree fall and/or tree death.	aucune
<b>Caterpillars</b>	Falling and death of caterpillars	Fall in yield and production. Increase in market price Loss of income	aucune
<b>Mushrooms</b>	Proliferation of adapted fungi in general	Good yield and production. Falling market price.	aucune

		High financial and physical investment. Income gain/increase	
<b>Snail</b>	Proliferation of adapted species	Good production possible but difficult to collect. Some fall and die in places	aucune
<b>Wildlife</b>	Flooding of habitats. Submerged grass	Roaming in the wild for survival or new habitats. Difficulty in feeding. Death of some animals by drowning. Destruction of habitats.	Provision of possible first aid from managers. Creation or extension of new areas. Transport support
<b>TEMPERATURE RISE</b>			
<b>Tree</b>	Evapotranspiration	Growth problem	NO
<b>Caterpillars</b>	-	-	-
<b>Mushrooms</b>	Difficulty of many mushrooms to grow	Drop in yield and production. Price increase in some places. Loss of income.	NO
<b>Snail</b>	-	-	-
<b>Wildlife</b>		Breathing problems	NO

#### 4.4.6. Vulnerability of the infrastructure sector

Economic infrastructure (roads, engineering structures), social infrastructure (water and electricity distribution network, school buildings, health facilities, administrative buildings, private buildings) and human habitat are essential elements of the economic and social well-being of the population. Characterized by their long life span, infrastructures are particularly vulnerable to climate change, i.e. have limited capacity to cope with the adverse effects of climate change. As a result, they will suffer physically and financially most directly from the impacts of climate change in the coming decades (HOLM et al 2010).

In this third initial communication, the vulnerability of road infrastructure, human habitat and social vulnerability are studied. Through a two (2) dimensional approach, vulnerability is addressed from both physical and behavioral perspectives.

##### 4.4.6.1. Characteristics of road infrastructure in the Central African Republic

In CAR, the overall road network totals 24,946 kilometers, including 738 kms of paved roads, 5,398 kms of unpaved national roads, 3,900 kms of regional roads and 15,000 kms of rural tracks (Ministry of Public Works 2009). This network is of uneven quality and has deteriorated significantly. There are two types of housing in the Central African Republic: urban and rural.

In urban areas, the traditional simple or improved adobe brick house with an earthen base and a straw, bamboo or tin roof is the most common (58%). The materials used for construction are less resistant to meteorological and hydrological phenomena. Semi-hard and hard houses account for 17% and 25% of urban housing respectively (MOSSOUA 2009).

In the countryside, the simple house built with local materials dominates (77.7%). Their floors are made of rammed earth and the walls are made of earthen blocks (72.6%). The roofs are mainly made of straw (69.7%), followed by bamboo leaves (15.9%) and rarely corrugated iron sheets (6.9%). Whether we are in

the village or in the city, the choice of building materials is determined by geographical constraints and the level of income and standard of living of the household. This choice is less protective of climatic impacts given the impoverishment of Central Africans.

#### 4.4.6.2. Climate impacts on road infrastructure and housing in the Central African Republic

Like other countries in the world, in CAR the road infrastructure and the human habitat, by virtue of their characteristics, are influenced by the seasonal variation of the climate and climate change. Unpaved roads and rural tracks, for example, are almost impassable during the rainy season (July, August, September and October) because of their degradation by runoff. This situation makes it difficult, if not impossible (as in the north and east of the country), to reach certain localities in the country by vehicle, the primary means of transport in CAR. The consequences are soaring food prices in urban centers due to a drop in supply and soaring prices of manufactured goods in remote villages. In urban areas, the road network is dusty in the dry season and muddy in the rainy season, causing inconvenience and illness.

Every year, cases of collapsed houses are recorded following the flooding of spontaneous neighborhoods located in the major river beds. Unfortunately, simple or improved houses are the most common in CAR. In Bangui, the damage from the 2009 floods amounted to 2.8 billion CFA francs (USD 6.0 million) and the losses to 1.2 billion CFA francs (USD 2.6 million). The 2009 floods left 14,500 people homeless. According to UNDP 2010, the average annual damage and losses caused by recurrent floods are estimated at CFAF 3.1 billion (USD 7 million). The 2018 floods in Bangui particularly in the 6th arrondissement resulted in hundreds of victims. In Baoro, the torrential rain of May 07, 2018, affected more than 500 people who were left homeless. As well as the floods, there are fires in the huts in the villages during the dry season.

Tableau 9: Impacts of climate risks on road infrastructure and human settlements

INFRASTRUCTURE	IMPACTS	CONSEQUENCES	CURRENT REACTIONS
<b>Increase in temperature</b>			
Paved road	Increased cracking rates. Softening of the pavement. Formation of ruts	Progressive deterioration	NO
Laterite road	NO	Progressive deterioration	NO
Engineering structures	Fissures	Progressive deterioration	NO
<b>Excess rainfall leading to flooding</b>			
Paved road	Dégradation	Poor condition of the road surface. Rapid depreciation of vehicles. Additional cost of vehicle maintenance. Additional cost of transport. Additional cost of road maintenance. Increased product prices.	Colmatage et reconstruction.
Laterite road	Erosion of the causeway. Creation of gullies on the road surface. Total degradation of the road.	Poor condition of the road surface. Rapid depreciation of vehicles. Additional cost of vehicle maintenance. Additional cost of transport.	Reconstruction.

		Additional cost of road maintenance. Price increase of manufactured and agricultural products in consumption centres. Lower prices of agricultural products in production areas. Enclavement of certain localities.	
Engineering structures	Cracks Abrupt fractures	Enclavement and its consequences. Additional investment.	Reconstruction.
<b>Acute drought/sunstroke</b>			
Paved road	Increased cracking rates. Softening of the pavement. Formation of ruts	Progressive deterioration	NO
Laterite road	Mechanical alteration of laterite.	Dust Spread of diseases (cough, meningitis and others)	Construction of speed bumps by the population. Watering (city).
Engineering structures	Fissures	Progressive deterioration	NO
Human settlements	Fissures Incendies des cases	Progressive deterioration Material damage. Additional cost for reconstruction.	Firewalls around the huts.

No sustainable strategies for adaptation to these climatic hazards are available. Spontaneous reactions of road users and the population to flooding are only temporary and unsustainable solutions. Therefore, assessing the vulnerability of road infrastructure and human settlements to climate change is a key step in improving the resilience of the transport and housing sector in the Central African Republic.

#### 4.4.6.3. Climate risks and infrastructure vulnerability in the Central African Republic

Climate projections for the Central African Republic predict a rise in temperature and an increase in the frequency and intensity of rainfall leading to flooding. These climate hazards will be the main climate risks to which the transport and housing sectors will be exposed. The vulnerability of road infrastructure and housing will be exacerbated depending on the nature of the soil in each region, the topography of the sites, the land use pattern and the poor management of engineering structures.

##### 4.4.6.3.1. Physical vulnerability of road infrastructure and human settlements

The predicted increase in temperature could cause problems for the 738 km of paved roads, accelerating their degradation through increased cracking rates, pavement softening and rutting. This will require additional costs for their maintenance. Unpaved roads, rural tracks and engineering structures will be more vulnerable to the increased frequency and intensity of rainfall. Heavy rainfall events result in high flowing runoff that erodes the road surface creating gullies on the road. Roads on clay soil, especially rural tracks and part of the national and regional roads will be muddy during the regularity of the rains.

Engineering structures (bridges, culverts, gutters, etc.) in Bangui, for example, will give way under the pressure of runoff water, where flows are increased by compacted and impermeable surfaces.

The most formidable climatic risk for the habitat in CAR will be the increase in the frequency and intensity of rainfall that leads to flooding. Flooding causes the erosion of house bases made of adobe bricks. The house collapses under the weight of the wall and frame. This vulnerability will be accentuated by the topographical characteristics of the sites and the nature of the soils. The sites where the weakness of the slope and the hydromorphic character of their clay soils lead to poor drainage of runoff water and their stagnation will be the most affected. This is the case, for example, in the southwestern districts of Bangui, the southwestern cities of Bangassous, Mogouba, Mobaye, Kouango, etc. The town of Berberati, on the other hand, given the nature of its soil (sandy), will experience severe erosion, which will destroy unpaved roads and housing (Photo E and F).



Photo 6: Erosion of a road in Berberati by run-off water, leading to its abandonment and the creation of another road. (TNC field mission, May 2018)

#### 4.4.6.3.2. Vulnerability due to human factors

The vulnerability of road and housing infrastructure to climate risks will increase because of human factors. In fact, the way space is occupied and built in the Central African Republic's urban areas hardly obeys the current urban development plan. In areas unsuitable for housing, particularly swamps, alluvial plains and valleys, spontaneous settlements are developing as a result of population growth (75.5% for the city of Bangui between 2003 and 2015). The layout of the houses, which does not take into account the wind directions, as well as their density, prevents the wind from circulating. Consequently, they contribute to the increase in temperature in these suburbs. In addition, *"the confinement of the river beds by the houses forces the water to wander through the neighborhoods through tracks, roads or streets; they even circulate in fenced or unfenced concessions. (NGUIMALET, 2004).*

In these neighborhoods, sewage works and riverbeds serve as dumping grounds for domestic waste, even in the downtown area. These deposits mixed with sediments favor the vegetation colonization of river channels, which obstruct the passage of runoff water by increasing the waiting time that leads to overflow. The anarchic development of a large part of Central African cities, particularly Bangui, does not allow for retention basins and green spaces. The predominantly impermeable surfaces prevent the recharging of the water table, creating an increase in the volume of runoff water. The "surge of this water on an urban scale often creates flooding" (NGUIMALET, 2004), which is an element of dilapidation of unpaved streets and habitat. In sum, the vulnerability related to the flood hazard will undoubtedly be accentuated by human factors.

In sum, the current inability of the road network and habitat to cope with climate change is amplified by human and institutional factors. The expected high rainfall will cause more damage to unpaved roads and

rural tracks. Houses built on low slope sites and on clay soil will be more affected by flooding. Erosion will increase on sites with sandy soils. To this end, adaptation requires an assessment of the costs of climate change in this sector. This will encourage the involvement of climate change in all phases of road management (planning, design, construction, maintenance and operation). Soil drainage of neighborhoods created on low slope sites is a must to reduce their vulnerability to flooding.

#### **4.4.6.3.3. Vulnerability of the Human Settlement and Health Sector**

The study of vulnerability and impacts in the human settlement and health sector was carried out on the basis of the climate scenarios and the analysis of the sub-sectors.

#### **4.4.6.4. Human settlements sub-sector**

Increased temperatures and rainfall could lead to flooding, drought, rising water levels in rivers and the Ubangi River, and high winds. This could lead to the weakening or even collapse of housing and shelters. The most vulnerable homes are those built of precarious materials (earthen bars, racks, sheets, straw). These events may be accompanied by the dislodging of houses.

There will also be a deterioration of road, electricity and basic telecommunications equipment and infrastructure, and an increase in the demand for electricity in households.

#### **4.4.6.5. Health sub-sector**

The high heat and increased rainfall will result in the proliferation of vector-borne diseases such as malaria, diarrhea, water-borne diseases such as cholera, respiratory ailments such as rhinitis and sinusitis, and infectious diseases.

#### **4.4.6.5.1. Impacts**

The proliferation of diseases will have economic and social impacts on the lives of the population. Floods and strong winds will cause economic and human losses and increase the rural exodus and the number of displaced persons.

Several areas will be cut off from the rest of the country, with traffic difficulties due to congestion, and the disruption or even cessation of economic activities. The most vulnerable groups are children under 5 years old, pregnant women and the elderly, the disabled and people living with HIV-AIDS. The proliferation of diseases and the increase in the mortality rate of the population will have an impact on the poverty rate and will reduce the country's economic growth. Acceleration and increase of the pandemic COVID - 19.

## **4.5. CLIMATE CHANGE ADAPTATION MEASURES**

A range of adaptation options for each sector studied was proposed by the communities surveyed and the resource persons interviewed. These options were sifted by the team using as an output channel, the objectives of the SDGs and those of the RCPA. Strategies that are in synergy with the visions of these policy documents are thus retained. Thus, these adaptation options take into account both vulnerability related to climate factors and that generated by the challenges of development and good governance.

Table 39: Criteria for the selection of options

N°	Criteria	Justifications
01	Timing/emergency	Urgency/priority of the option in relation to the current climate and economic context.
02	Socio-environmental benefits	The option has a positive impact on the environment with an improvement in the social and economic conditions of the population. The option does not affect terrestrial and aquatic ecosystems.
03	Participates in mitigation/ODD/CCPD and donor requirements	Consideration of the option in the objectives of the SDGs/CCPDs. Synergy of the option with multilateral environmental and CC agreements.
04	Feasibility	The option is easy to implement.
05	Cost-effectiveness and Efficiency	The cost of implementing the option is lower than its benefits. The option improves living conditions by addressing CC impacts while contributing to the reduction of greenhouse gas emissions.

To prioritize the criteria, a multi-criteria approach was used. For each sector, five criteria were selected and scored on scales ranging from 1 to 5 and 1 to 10. For the initial ranking of options, standardized scores on a scale of 1 to 5 were subjectively assigned to each. In order to select the immediate and urgent options, the criteria were weighted on a scale of 1 to 3. This matrix was used to identify and prioritize the options in each sector using the formula below.

$$ST = \sum (nS_1 \times P_1) + (nS_2 \times P_2) + (nS_3 \times P_3) + (nS_4 \times P_4) + (nS_5 \times P_5) / N \text{ avec}$$

**ST**= Score Total.

**nS** = Notes standardisées.

**P**= Valeur (critère) pondérée.

**N**= Nombre des critères retenus.

Therefore, the characteristics (objectives, indicators, target groups and institutions, stakeholders) of the high priority options are proposed.

#### 4.5.1. Options for adapting the agriculture and food security sector to climate change

In order to reduce the vulnerability of agriculture to climate change and maximize positive impacts, adaptation options are also defined according to the objectives of the RCPCA and the National Development Plan of the Central African Republic. For the national development objectives, agriculture is one of the 4 main priorities of the Vision 2035 of Adaptation which aims

at the country becoming an emerging economy by 2035. The Vision 2035 is broken down into five-year development plans that include five axes, including "Ensuring food security by 2020 and developing agricultural value chains". Three specific objectives are defined for the agricultural sector: (i) to increase agricultural production by expanding irrigated areas by 10,000 ha per year, (ii) to increase net exports of rice and corn by 20%, and (iii) to increase livestock production by 25%. The proposed adaptation strategies are based on these objectives.

Table 40: Adaptation options for the agriculture sector

<b><i>Policy areas</i></b>	<b><i>Options</i></b>
<b><i>Government Programmes and Insurance</i></b>	Resume technical supervision of agricultural producers in order to carry out food crop and cash crop work in good conditions
	Set up a transhumance corridor management mechanism to prevent farmer-herder conflicts
	Establish a national system for the dissemination of seasonal forecasts at community level in real time and for warning in order to reduce vulnerability linked to the false start of the cropping season and to agricultural drought
	Improve farm performance (technical support, agricultural credit) by integrating livestock into agriculture;
	Encourage research in the field of simulation of future agricultural yields in relation to climate change
<b><i>Technological developments</i></b>	Introduce short-cycle seed varieties adapted to current climatic conditions
<b><i>Agricultural production practices</i></b>	Rehabilitate and make operational the seed multiplication centres
<b><i>Farm financial management</i></b>	Improve conditions and tools for farming in CAR
	Rehabilitate and make operational veterinary pharmacies
	Solve the problem of the outlet by creating the possibility of exporting agricultural products (foodstuffs and others) to neighbouring countries and elsewhere. Open up certain localities in the country in order to facilitate the sale of agricultural products.

Table 41: Synergy between the options for the agriculture sector and the objectives of the SDGs and the RCPCA

<b>Aléas Climatiques</b>	<b>Options</b>	<b>Justification</b>	<b>Objective of the processed RCPCA</b>
<p><b>POCKET OF DRYNESS IN THE RAINY SEASON. PROLONGATION OF THE DRY SEASON AND ACUTE DROUGHT.</b></p> <p><b>DROUGHT POCKET. RAINFALL DATA. PROLONGATION OF RAINY SEASON. EARLY ONSET OF RAINY SEASON.</b></p>	Resume the technical supervision of agricultural producers in order to carry out food crop and cash crop work in good conditions.	The lack of technical assistance deplored by agricultural producers negatively influences their yield and production.	Relaunch and develop the productive sectors in a sustainable manner: agriculture and livestock, extractive industries and forestry (Pillar 3).
	Establish a transhumance corridor management mechanism to prevent farmer-herder conflicts.	The damage caused by herds to crops and agrarian landscapes is a source of inter-community conflict and ecosystem degradation.	Supporting peace, security and reconciliation (Pillar 1 and its four objectives).
	Establish a national, community-wide, real-time seasonal forecasting and warning system to reduce vulnerability to false starts to the cropping season and agricultural drought	Farmers' ignorance of seasonal forecasts increases the risk of crop exposure to the false start of the cropping season.	Strengthening agriculture (Pillars 2 and 3 and their objectives)
	Improve the performance of farms (technical support, agricultural tools, agricultural credits,) by integrating livestock into agriculture;	Central African agriculture is still not very productive and must be transformed into agribusiness.	Ensure the conditions for private sector development and employment: improve business support and financial services, vocational training, entrepreneurship and employment (Pillar 3).
	Encourage research into the simulation of future agricultural yields in relation to climate change.	Little scientific knowledge exists about the reactions of different cultures to the projected climate. This will lead to maladaptation.	Strengthen agriculture (Pillars 2 and 3).
	Introduce seeds of short-cycle varieties adapted to current climatic conditions.	Improved seeds can maximise production and	Ensuring food security and resilience (Pillar 2).

		yield, thereby reducing vulnerability.	Capacity building for the implementation of the RCPCA (Pillar 4)
	Rehabilitate and make operational the seed multiplication centres.	Improved seed can only be produced by a qualified centre.	Rehabilitate and build infrastructure: transport, electricity and communication networks (Pillar 3).

The options selected to reduce the vulnerability of agriculture to CC are cross-cutting with regard to the climate risks identified and their impacts. They are based on the objectives of the four pillars of the RCPCA

Table 42: Assessment of criteria for each proposed adaptation option for the agriculture sector

N°	OPTIONS	CRITERIA				
		Participate in mitigation/ODD/CC PD to donor requirements	Socio-environmental benefits	Feasibility	Cost-effectiveness and Efficiency	Timing/emergency
	Units	Echelle de 1 à 10	Echelle de 1 à 10	Echelle de 1 à 5	Echelle de 1 à 5	Echelle de 1 à 5
1	To improve the performance of farms (resumption of technical supervision, agricultural tools, agricultural credits,) by integrating livestock into agriculture.	10	4	3	4	4
2	Establish a transhumance corridor management mechanism to prevent farmer-herder conflicts	10	5	1	2	1
3	Establish a national, community-wide, real-time seasonal forecasting and warning system to reduce vulnerability to false starts to the cropping season and agricultural drought	2	2	5	4	5
4	Encourage research into the simulation of future agricultural yields in relation to climate change.	3	6	5	2	5
5	Introduce seeds of short-cycle varieties adapted to current climatic conditions.	10	4	5	4	5
6	Rehabilitate and make operational the seed multiplication centres.	10	5	4	5	5

The criteria «*Fulfils mitigation/ODD/CCPD and donor requirement* » and «*Socio-environmental benefits*» are more important than the other three. Options that meet these criteria have a high probability of being implemented because they fit into existing or planned lines of intervention of the state and its partners.

Table 43: Standardised scores and ranking 1 of options

N° Options		Standardised Option/Criteria scores						
		All criteria are scored on a scale of 0 to 5						
		Participates in mitigation/ODD/RC PCA	Socio-environmental benefits	Feasibility	Cost-effectiveness and Efficiency	Timing/urgence	Average CMA score	Ranking
<b>1</b>	Improve the performance of farms (resumption of technical supervision, agricultural tools, agricultural credits,) by integrating livestock into agriculture.	3	0.35	0.5	1	3	<b>1.57</b>	<b>5<sup>ème</sup></b>
<b>2</b>	Set up a transhumance corridor management mechanism to prevent farmer-herder conflicts	3	2	0.25	0.5	1	<b>1.35</b>	<b>6<sup>ème</sup></b>
<b>3</b>	Establish a national system for the dissemination of real-time seasonal forecasts at the community level and warnings in order to reduce vulnerability linked to the false start of the cropping season and agricultural drought	2	2.50	2.75	3	3	<b>2.65</b>	<b>1<sup>er</sup></b>
<b>4</b>	Encourage research in the area of simulation of future crop yields in relation to climate change.	1.75	1.50	2.75	1	3	<b>2</b>	<b>4<sup>ème</sup></b>
<b>5</b>	Introduce short-cycle seed varieties adapted to current climatic conditions.	3	1	2.85	2.50	2.6	<b>2.39</b>	<b>2<sup>ème</sup></b>
<b>6</b>	Rehabilitate and make operational the seed multiplication centres.	3	1.25	2	1.75	2.65	<b>2.13</b>	<b>3<sup>ème</sup></b>

Table 44: Weighting of criteria on a scale of 1 to 3

Number of criteria	Criteria	Proposed weighting	Justification
01	Participates in mitigation/ODD/RCPCA	3	Options in synergy with OOD/RCPA are more likely to be implemented.
02	Socio-environmental benefits	1.50	The probability that an agricultural sector option will negatively affect the environment is always high.
03	Feasibility	1.75	The current security situation in the country and the problem of finance make it difficult to implement the options in some regions and localities.
04	Cost-effectiveness and efficiency	1.5	The consensus around the development of climate policy documents and project ideas will, on average, make the options economically, socially and environmentally profitable.
05	Timing/urgency	2.5	The impacts of CC are already here, there is an imperative for intervention and concrete action.

Table 45: Selection of priority and urgent options

Adaptation option	Standardised criteria scores multiplied by the weighting value of each criteria divided by five to find the Total score					Total Score	Ranking
	Critère 1	Critère 2	Critère 3	Critère 4	Critère 5		
Improve the performance of farms (resumption of technical supervision, agricultural tools, agricultural credits,) by integrating livestock into agriculture.	3	0.35	0.5	1	3	3,88	5 <sup>ème</sup>
Set up a transhumance corridor management mechanism to prevent farmer-herder conflicts	3	2	0.25	0.5	1	3,14	6 <sup>ème</sup>
Establish a national system for the dissemination of real-time seasonal forecasts at the community level and warnings in order to reduce vulnerability linked to the false start of the cropping season and agricultural drought	2	2.50	2.75	3	3	5,31	1 <sup>er</sup>

Encourage research in the area of simulation of future crop yields in relation to climate change.	1.75	1.50	2.75	1	3	4,26	4 <sup>ème</sup>
Introduce and select short-cycle seed varieties adapted to current climatic conditions.	3	1	2.85	2.50	2.6	5,15	2 <sup>ème</sup>
Rehabilitate and make operational the seed multiplication centres.	3	1.25	2	1.75	2.65	4,73	3 <sup>ème</sup>

The options "Establish a national system for the extension of real-time seasonal forecasts at the community level and alert in order to reduce vulnerability linked to the false start of the cropping season and agricultural drought", "Introduce and select short-cycle variety seeds adapted to current climatic conditions", and "Rehabilitate and make operational the seed multiplication centres" are of high priority in relation to the other three. Project fiches will have to be elaborated for each option in order to seek funding for their effective implementation.

Table 46: Characteristics of the proposed options

<b>Adaptation option</b>	<b>Objectives</b>	<b>Indicators</b>	<b>Targets</b>
Establish a national system of community-wide real-time seasonal forecasting and warning to reduce vulnerability to false start of the cropping season and agricultural drought	Provide farmers with real-time seasonal weather information. Reduce exposure to the risks of extreme weather events and climate disasters.	Number of real time alerts on false start of the cropping season and agricultural droughts and excess rainfall. Farmers take into account meteorological information.	Producers Small-scale producers Ministry of Rural Development Ministry of Livestock
Introduce short-cycle variety seeds adapted to current climatic conditions.	Provide farmers with crops adapted to a short rainy period in order to improve the adaptive capacity of farmers.	Number of short-cycle variety seeds certified and disseminated.	Central African Institute for Agricultural Research (ICRA) and the Central African Agency for Agricultural Development (ACDA) Producers Small-scale producers
Rehabilitate and make operational the seed multiplication centres.	Guarantee the production, availability and access of farmers to seeds.	Number of centres rehabilitated/created Availability of good quality seed	Government and Development Partners.
Encourage research into the simulation of future agricultural yields in relation to predicted climate change.	Controlling the impacts of projected climate parameters on Central African agriculture.	Number of scientific articles published on future agricultural production in relation to climate. Number of symposiums and workshops organised on the subject.	Central African Institute for Agricultural Research (ICRA) and University of Bangui.

<p>Improve the performance of farms (resumption of technical supervision, agricultural tools, agricultural credits,) by integrating livestock into agriculture.</p>	<p>Minimise greenhouse gas emissions from agricultural activities (deforestation). Encourage intensive agriculture. Encourage agro-sylvo-pastoral systems adapted to each region. Create outlets and facilitate the export of agricultural products.</p>	<p>Growth in yield and agricultural production Export of agricultural products Try to settle down agriculture and cattle breeding.</p>	<p>Producers Small-scale producers Ministry of Rural Development Ministry of Livestock Central African Institute for Agricultural Research (ICRA) Central African Agency for Agricultural Development (ACDA)</p>
<p>Set up a transhumance corridor management mechanism to prevent farmer-herder conflicts</p>	<p>Seek to sedentarise agriculture and livestock while encouraging farmers to combine their occupation with livestock and vice versa. Review and revise the agropastoral code by mapping livestock communes and transhumance routes.</p>	<p>Reduction in the number of farmer/pastoralist conflicts. Cohabitation of farmers and herders.</p>	<p>The ministries concerned (Livestock, Rural Development, Interior, Defence and Territorial Administration) The producers. Customary authorities.</p>

Options are established according to their importance and translated into sectoral actions with indicators and targets.

#### 4.5.2. Water resources and sanitation sector adaptation options

They are proposed in line with the main visions of the SDGs, notably that of ensuring access to water supply and sanitation services for all and ensuring sustainable management of water services. More specifically, the SDGs call for

- Ensure universal and equitable access to affordable drinking water by 2030;
- Ensure equitable access to adequate sanitation and hygiene for all and end open defecation, with particular attention to the needs of women and girls and people in vulnerable situations by 2030;
- Improve water quality by reducing pollution, eliminating dumping and minimising emissions of chemicals and hazardous materials, halving the proportion of untreated wastewater and significantly increasing the safe recycling and reuse of water globally by 2030;
- significantly increase the efficient use of water resources in all sectors and ensure the sustainability of withdrawals and freshwater supplies to address water scarcity and significantly reduce the number of people suffering from water scarcity by 2030
- Implement integrated water resources management at all levels, including through transboundary cooperation as appropriate by 2030;
- Protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes by 2020.

From these objectives, the Government in its National Recovery and Peacebuilding Plan envisages the following strategic outcomes:

- Access to drinking water and sanitation for rural and urban populations is improved;
- Government structures (DGH and SODECA, ANEA) are strengthened to provide better water and sanitation services;
- The water and sanitation sector has institutional, legal and regulatory instruments and effective tools for better knowledge, monitoring and evaluation of the sector;
- A social and community communication strategy for changing desired norms and behaviours is implemented to support the sustainability of WASH interventions.

Table 47: Adaptation options for the Water and Sanitation sector

<i>Policy areas</i>	<i>Options</i>
<b>Improving access to drinking water for rural populations. Improving access to water for urban populations (Bangui and secondary centres).</b>	Strengthen the management and distribution infrastructure of drinking water by creating water towers in the major cities and human-powered boreholes in the villages.
<b>Implementing a social and community communication strategy to change desired norms and behaviours in support of the sustainability of WASH interventions</b>	Inform and educate the urban and rural population on the observance of hygiene rules and the need for better waste management.
<b>Improving access to sanitation</b>	Set up a programme to support the construction and use of latrines in rural areas.
	Strengthen the institutional capacity of municipalities in terms of materials and human resources qualified in waste collection, management and recycling.
	Make the deconcentrated sanitation service operational.
<b>Strengthening government structures (DGH, SODECA and ANEA) to provide better water and sanitation services</b>	Strengthen the capacity of the institutional framework of the water sector in terms of materials and human resources.
<b>Review of institutional, legal and regulatory instruments and efficient tools for better knowledge, monitoring and evaluation of the water and sanitation sector</b>	Review and develop policy documents and management tools for the water and sanitation sector.

Table 48: Synergy between proposed water and sanitation sector options and SDG and RCPCA targets

<b>Aléas Climatiques</b>	<b>Options</b>	<b>Justification</b>	<b>Objectif du RCPCA traité</b>
<b>Excess rainfall leading to flooding</b>	Strengthen water management and distribution infrastructure by creating water towers in major cities and human-powered boreholes in villages.	Drinking water shortages in CAR are generally due to insufficient water infrastructure.	Implement a priority water infrastructure investment programme for Bangui and secondary centres. Rehabilitate 1,500 old boreholes Build 3,000 new boreholes Ensure the management and maintenance of water works in rural areas.
<b>Acute drought/high insolation</b>	Inform and educate the urban and rural population on the observance of hygiene rules and the need for better waste management.	Changing behaviour involves raising awareness.	Implement a communication and social mobilisation strategy in support of Water Supply and Sanitation (WSS) interventions
<b>Increased temperature</b>			

<b>Excess rainfall leading to flooding</b>	Set up a programme to support the construction and use of latrines in rural areas.	La construction des latrine en milieu rural n'est toujours pas prioritaire dans les ménages.	Construction of 10,000 hygienic latrines Establishment of 450 community structures for the management and maintenance of latrines.
	Strengthen the institutional capacity of municipalities in materials and skilled human resources in waste collection, management and recycling.	Municipalities do not have the equipment to collect waste, build sanitation facilities and lack expertise in waste management and recycling.	Developing administrative capacity.
	Make the deconcentrated sanitation service operational.	Local awareness and monitoring by sanitation workers motivate behaviour change.	Development and implementation of a national programme for the redeployment of public services.
	Strengthen the capacity of the institutional framework of the water sector in materials and human resources.	The water and sanitation sector lacks infrastructure, equipment and staff, which limits its performance.	Construction of a building for SODECA and ten others for ANEA antenna.
	Review and develop policy documents and management tools for the water and sanitation sector.	Policy and legal documents facilitate better knowledge, management, monitoring and evaluation of the water and sanitation sector.	Strengthen capacity in policy governance, data collection and knowledge management through the revision of the two national water and sanitation policy and strategy documents in line with sustainable development objectives and the development of their action plans. Revision of the Water Code. Elaboration of the Sanitation Code and its application texts. Definition of a new institutional framework for the urban sanitation sub-sector.

Table 49: Assessment of criteria for each proposed adaptation option for the Water and Sanitation sector

N°	OPTIONS	CRITERIA				
		Participate in mitigation/ODD/RCPCA to donor requirements	Socio-environmental benefits	Feasibility	Cost-effectiveness and Efficiency	Timing/emergency
		Echelle de 1 à 10	Echelle de 1 à 10	Echelle de 1 à 5	Echelle de 1 à 5	Echelle de 1 à 5

<b>1</b>	Strengthen the management and distribution infrastructure of drinking water by creating water towers in the major cities and human-powered boreholes in the villages.	<b>8</b>	<b>10</b>	<b>4</b>	<b>2</b>	<b>4</b>
<b>2</b>	Inform and educate the urban and rural population on the observance of hygiene rules and the need for better waste management.	<b>9</b>	<b>10</b>	<b>5</b>	<b>4</b>	<b>4</b>
<b>3</b>	Set up a support programme for the construction and use of latrines in rural areas.	<b>7</b>	<b>10</b>	<b>4</b>	<b>2</b>	<b>3</b>
<b>4</b>	Strengthen the institutional capacity of municipalities in terms of materials and qualified human resources in waste collection, management and recycling.	<b>10</b>	<b>8</b>	<b>4</b>	<b>3</b>	<b>4</b>
<b>5</b>	Make the deconcentrated sanitation service operational.	<b>10</b>	<b>10</b>	<b>2</b>	<b>3</b>	<b>1</b>
<b>6</b>	Strengthen the capacity of the institutional framework of the water sector in materials and human resources.	<b>7</b>	<b>5</b>	<b>1</b>	<b>3</b>	<b>1</b>
<b>7</b>	Review and develop policy documents and management tools for the water and sanitation sector.	<b>10</b>	<b>10</b>	<b>4</b>	<b>4</b>	<b>4</b>

Table 50: Standardised scores and ranking 1 of the Water and Sanitation sector options

N° Options		Standardised Option/Criteria Scores						
		All criteria are scored on a scale of 0 to 5						
		Participates in mitigation/ODD/RC PCA	Socio-environmental benefits	Feasibility	Cost-effectiveness and Efficiency	Timing/urgence	Average CMA score	Ranking
1	Strengthen the management and distribution infrastructure of drinking water by creating water towers in the major cities and human-powered boreholes in the villages.	5	5	4	3	3	4	3 <sup>er</sup>
2	Inform and educate the urban and rural population on the observance of hygiene rules and the need for better waste management.	5	5	4	4	4	4,4	1 <sup>ème</sup>
3	Set up a support programme for the construction and use of latrines in rural areas.	4	5	2	3	3	3,4	5 <sup>ème</sup>
4	Strengthen the institutional capacity of municipalities in terms of materials and human resources qualified in waste collection, management and recycling.	1	5	1	2	2	2,2	7 <sup>ème</sup>
5	Make the deconcentrated sanitation service operational.	4	5	3	3	3	3,6	4 <sup>ème</sup>
6	Strengthen the capacity of the institutional framework of the water sector in materials and human resources.	3	5	3	2	2	3	6 <sup>ème</sup>
7	Review and develop policy documents and management tools for the water and sanitation sector.	4	5	4	4	4	4,2	2 <sup>ème</sup>

Table 51: Weighting of criteria on a scale of 1 to 3

Number of criteria	Criteria	Proposed weighting	Justification
01	Participates in mitigation/ODD/RCPCA	2,5	The suggested options are in line with the objectives of the SDGs and the RCPCA.
02	Socio-environmental benefits	3	The proposed options are beneficial for the environment and the living environment.
03	Feasibility	2	The proposed options are part of the initiatives of development partners, notably the European Union and the World Bank, and of the Government.
04	Cost-effectiveness and efficiency	1,5	. Their financial difficulties will delay the implementation of some adaptation strategies.
05	Timing/urgency	2	Some options can only be implemented in the medium term.

Table 52: Selection of priority and urgent options for the Water and Sanitation sector

Adaptation option	Standardised criteria scores multiplied by the weighting value of each criteria divided by five to find the Total score					Total Score	Ranking
	Critère 1	Critère 2	Critère 3	Critère 4	Critère 5		
Strengthen the management and distribution infrastructure of drinking water by creating water towers in the major cities and human-powered boreholes in the villages.	5	5	4	3	3	9,2	3 <sup>ème</sup>
Inform and educate the urban and rural population on the observance of hygiene rules and the need for better waste management.	5	5	4	4	4	9,9	1 <sup>ème</sup>
Set up a support programme for the construction and use of latrines in rural areas.	4	5	2	3	3	7,9	5 <sup>ème</sup>
Strengthen the institutional capacity of municipalities in terms of materials and qualified human resources in waste collection, management and recycling.	1	5	1	2	2	5,3	7 <sup>ème</sup>

Make the deconcentrated sanitation service operational.	4	5	3	3	3	8,3	4 <sup>ème</sup>
Strengthen the capacity of the institutional framework of the water sector in terms of materials and human resources.	3	5	3	2	2	7,1	6 <sup>ème</sup>
Review and develop policy documents and management tools for the water and sanitation sector.	4	5	4	4	4	9,4	2 <sup>ème</sup>

The weighting of the criteria did not change the order of the first ranking. Thus, the strategies of (i) informing and educating the urban and rural population on the observance of hygiene rules and the need for better waste management; (ii) reviewing and developing policy documents and management tools for the water and sanitation sector; and (iii) strengthening the management and distribution infrastructure of drinking water by creating water towers in the major cities and human-powered boreholes in the villages are high priorities for the water resources and sanitation sector.

Table 53: Characteristics of the proposed options for the Water and Sanitation sector

Options d'adaptation	Objectifs	Indicateurs	Cibles
Inform and educate the urban and rural population on the observance of hygiene rules and the need for better waste management.	Warn people about the dangers of an unhealthy environment.	Number of people informed and educated. Number of initiatives addressing the issue of sanitation	Urban and rural population CSOs (civil society organisations)
Review and develop policy documents and management tools for the water and sanitation sector.	Update policy documents and tools for the management of the water and sanitation sector according to current needs.	Drafting and validation of the sanitation code. Updating and validation of the water code.	SODECA ANEA Directorate General of Hydraulics OGN Ministry of Environment and Sustainable Development. Development Partners.
Strengthen the management and distribution infrastructure of drinking water by creating water towers in the major cities and human-powered boreholes in the villages.	Improve the technical capacity of water supply networks and boreholes to ensure permanent access to drinking water.	Number of boreholes constructed and repaired. Length of water supply network created or repaired. Number of water towers created in secondary towns.	SODECA ANEA Directorate General of Hydraulics OGN Ministry of Environment and Sustainable Development.

			Development Partners.
Make the deconcentrated sanitation service operational.	Resume the activities of the sanitation technicians with the population to ensure hygiene control.	Number of technicians deployed to the population.	Government.
Set up a support programme for the construction and use of latrines in rural areas.	Create a coordination and monitoring body for latrine construction projects	Stop the creation of the body.	OGN. Ministry of Environment and Sustainable Development.
Strengthen the capacity of the institutional framework of the water sector in terms of equipment and human resources.	Strengthen the operational capacity of SODECA and ANEA.	Number of managers and agents recruited. Number of materials provided to SODECA and ANEA	Government. Development Partners.
Strengthen the institutional capacity of municipalities in terms of materials and human resources qualified in the collection, management and recycling of waste.	Make municipalities operational in the construction and management of sanitation facilities.	Nombre des municipalités dotées en engins et autres matériels de construction des ouvrages d'assainissement.	Gouvernement. Partenaires au Développement.

### 4.5.3. Energy sector adaptation options

To reduce the energy sector's vulnerability to climate change and maximise positive impacts, adaptation options are defined, as for other sectors, according to the objectives of the RCPCA, the National Development Plan of the Central African Republic and the Sustainable Development Goals (SDGs). The energy sector occupies a prominent place with the general objective of investing massively in production and distribution capacity, giving priority to decentralised solutions allowing for rural electrification, in particular to allow the development of processing industries in the interior of the country. This results in the following priorities

- access to reliable electricity
- improving the performance of ENERCA

Strengthening the political, regulatory and institutional framework for both urban electricity networks and rural electrification projects.

Table 54: Adaptation options for the energy sector

<i>Axes politiques</i>	<b>Options</b>
Access to reliable electricity	Improving electricity distribution and opening up populations through rural electrification
	Develop hydroelectric installations (including micro-dams)
	Promote the use of wood waste from forestry companies as fuel
Improving ENERCA's performance	Development of all existing hydro sites to ensure an availability of 500MW, i.e. 15 times the power installed in Boali, and an annual production of electrical energy of 2,800 GW, i.e. 40 times the current production of Boali
	Ensure the protection of people, property and the environment against risks related to energy activities
Encouraging investment in energy infrastructure and clean energy technologies (SDGs)	Promote the use of improved stoves to reduce wood energy consumption
	Promote reforestation of degraded areas with fast-growing plants for use as wood energy
Preparation and operationalisation of a new strategic framework for the energy sector, with particular attention to the issue of rural electrification, including through the use of renewable energy.	Promote research on renewable energy and forestry of fast growing plants for use as wood energy
Investment in renewable energy.	Promote renewable energy such as biofuels, solar and wind
Strengthening the policy, regulatory and institutional framework for urban electricity networks and rural electrification projects	Improve institutional capacity for strategic management of the energy sector

Table 55: Synergy between the proposed options for the energy sector and the objectives of the SDGs and the RCPCA

N°	<b>Impacts/ Risques traités</b>	<b>Options</b>	<b>Justification</b>	<b>Objectif du RCPCA/ODD traité</b>
1	Exposure of the surrounding population to carcinogenic electromagnetic radiation	To ensure the protection of people, property and the environment in the vicinity of ENERCA's facilities	The exposure of the local population to carcinogenic electromagnetic radiation is a real health hazard.	Rehabilitation of the Boali 1 and 2 hydroelectric power stations to increase production and reliability of electricity supply, and reduce costs. (RCPCA)
2	Poor combustion of wood products	Promote renewable energies such as biofuels, solar and wind power	The use of renewable energy reduces the increased consumption of firewood and poverty in rural areas	Ensure access to reliable, modern and affordable energy services for all (SDGS)

4	Poor charring of wood	Promote the use of wood waste from forestry companies as fuel	Wood waste is generally little used although it can be a source of fuel. Their recovery reduces the use of fossil energy	Significantly increase the share of renewable energy in the energy mix (SDGs)
5	Destruction of electricity network components by storms	Reinforcement and revitalisation of ENERCA's electrical installations	ENERCA's electrical installations are very vulnerable to high winds and torrential rains because of their vesting.	Access to reliable electricity is extended. The rehabilitation and strengthening of generation capacity in provincial towns, as well as the development of rural electrification projects based on solar and mini-hydro, will increase the rate of access to electricity outside Bangui (RCPCA).
6	Alteration of the road network	Improvement of the road network for the transport of hydrocarbons	The road network used to transport hydrocarbons is very deteriorated, which constitutes a real danger in periods of increased rainfall.	Rehabilitation of interconnected energy transmission and distribution networks to reduce losses and improve the quality of services provided (RCPCA)
7	Decreased wood productivity	Promouvoir la recherche sur les énergies renouvelables et la sylviculture de plantes à croissance rapide en vue de leur utilisation comme bois-énergie.	Very little research is being conducted on renewable energy in CAR. Better use can be made of research that will make it possible to highlight the country's energy assets	Encourage investment in energy infrastructure and clean energy technologies (SDGs)
8	Lower water levels (low water) and lower electricity production	Development of all existing hydro-energy sites in order to ensure an availability of 500MW, i.e. 15 times the power installed in Boali10 and an annual production of electrical energy of 2,800 GW, i.e. 40 times the current production in Boali - Improving electricity distribution and opening up the population through rural electrification	The country has immense potential in terms of hydro sites that can facilitate the supply of electricity throughout the country.	Rehabilitation of the Boali 1 and 2 hydroelectric power stations to increase production and reliability of electricity supply and reduce costs (RCPCA)

9	Draught and navigation difficulties on the Oubangui River	Improvement of navigation on the Ubangi River	Navigation on the Oubangui River, which is the country's main hydrocarbon supply route, is difficult during low water periods. This constitutes a major difficulty in supplying the country with petroleum products.	Rehabilitation of interconnected energy transmission and distribution networks to reduce losses and improve the quality of services provided (RCPCA)
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The options selected to reduce the energy sector's vulnerability to CC are in line with the objectives of pillar three of the RCPCA and the SDGs.

Table 56: Assessment of criteria for each proposed adaptation option for the energy sector

N°	OPTIONS	CRITERES				
		Participate in mitigation/ODD/RCPCA to donor requirements	Socio-environmental benefits	Feasibility	Cost-effectiveness and Efficiency	Timing/emergency
	Unités	Echelle de 1 à 10	Echelle de 1 à 10	Echelle de 1 à 5	Echelle de 1 à 5	Echelle de 1 à 5
1	To ensure the protection of people, property and the environment around ENERCA's electrical installations.	10	5	3	3	3
2	Promote renewable energies such as biofuels, solar and wind power	10	8	2	5	3
3	Promote reforestation of degraded areas with fast growing plants for use as wood energy	8	8	5	4	4
4	Promote the use of wood waste from forestry companies as fuel	5	5	5	2	5
5	Promote the use of improved stoves to reduce wood energy consumption	4	3	2	2	3
5	Strengthening and revitalising the electrical installations of ENERCA	10	10	5	4	5
6	Improve the road network for the transport of hydrocarbons	10	10	4	3	4
7	Promote research on renewable energies and the forestry of fast-growing plants for use as wood energy	5	8	2	2	2
8	Improving electricity distribution and opening up the population through rural electrification	10	10	4	4	5
9	Improve navigation on the Ubangi River	10	8	4	3	2

The criteria « *Fulfils mitigation/ODD/CCPD and donor requirements*» and «*Socio-environmental benefits*» are more important than the other three. Options that meet these criteria have a high probability of being implemented because they fit into the existing or planned lines of intervention of the state and its partners.

Table 57: Standardised scores and ranking 1 of options

N° Options		Standardised Option/Criteria Scores						
		All criteria are scored on a scale of 0 to 5						
		Participates in mitigation/ODD/RC PCA	Socio-environmental benefits	Feasibility	Cost-effectiveness and Efficiency	Timing/urgence	Average CMA score	Ranking
<b>1</b>	To ensure the protection of people, property and the environment around ENERCA's electrical installations.	2,5	2	3	2	3	<b>2,5</b>	5 <sup>ème</sup>
<b>2</b>	Promote renewable energies such as biofuels, solar and wind power	3	3	2	3	2	<b>2,6</b>	4 <sup>ème</sup>
<b>3</b>	Promote the reforestation of degraded areas with fast-growing plants for use as wood energy	2	3	3	2	2	<b>2,4</b>	6 <sup>ème</sup>
<b>4</b>	Promote the use of wood waste from forestry companies as fuel	2	2	3	2	2	<b>2,2</b>	8 <sup>ème</sup>
<b>5</b>	Promote the use of improved stoves to reduce wood energy consumption	3	2	3	2	2	<b>2,4</b>	6 <sup>ème</sup>
<b>6</b>	Strengthen and revitalise ENERCA's electrical facilities	4	3	2	3	2,5	<b>2,9</b>	1 <sup>ier</sup>
<b>7</b>	Improve the road network for the transport of hydrocarbons	3	2	2,5	3	3	<b>2,7</b>	3 <sup>ème</sup>
<b>8</b>	Promote research on renewable energy and the forestry of fast-growing plants for use as wood energy	2	3	2	2	2	<b>2,2</b>	7 <sup>ème</sup>
<b>9</b>	Improve the distribution of electricity and the opening up of the population through rural electrification	4	3	2	2	3	<b>2,8</b>	2 <sup>ème</sup>
<b>10</b>	Improve navigation on the Ubangi River	2	2	2	2	2	<b>2</b>	8 <sup>ème</sup>

Table 58: Weighting of criteria on a scale of 1 to 3

Numéro des critères	Critère	Proposed weighting	Justification
01	Participates in mitigation/ODD/CPRC	3	Options that are in synergy with the SDGs/RCPAs are more likely to be implemented in the short term.
02	Socio-environmental benefits	3	The proposed options will be overall beneficial for the environment and are pillars of development.
03	Feasibility	2	Several project ideas and government initiatives are in line with the selected options. This shows their feasibility.
04	Cost-effectiveness and efficiency	1.5	While the options will contribute to the reduction of greenhouse gas emissions, by improving the living environment, the dependence of their financing on external funding minimises their chance of implementation.
05	Timing/urgency	2.5	Access to clean energy remains a development issue in CAR, hence the urgency to implement the proposed strategies.

Table 59: Selection of priority and urgent options for the energy sector

Adaptation option	Standardized criteria scores multiplied by the weighting value of each criterion divided by five					Total score	Ranking
	Critère 1	Critère 2	Critère 3	Critère 4	Critère 5		
To ensure the protection of people, property and the environment around ENERCA's electrical installations.	7,5	6	6	3	7,5	6	5 <sup>ème</sup>
Promote renewable energies such as biofuels, solar and wind power	9	9	4	4,5	5	6,3	4 <sup>ème</sup>
Promote the reforestation of degraded areas with fast-growing plants for use as wood energy	6	9	6	3	5	5,8	6 <sup>ème</sup>
Promote the use of improved stoves to reduce wood energy consumption	6	6	6	3	5	5,2	8 <sup>ème</sup>
Promote the use of wood waste from forestry companies as fuel	9	6	6	3	5	5,8	6 <sup>ème</sup>

Strengthen and revitalise ENERCA's electrical facilities	12	9	4	4,5	6,25	7,15	1 <sup>er</sup>
Improve the road network for the transport of hydrocarbons	9	6	5	4,5	7,5	6,4	3 <sup>ème</sup>
Promote research on renewable energy and the forestry of fast-growing plants for use as wood energy	6	9	4	3	5	5,4	7 <sup>ème</sup>
Improving electricity distribution and opening up the population through rural electrification	12	9	4	3	7,5	7,1	2 <sup>ème</sup>
Improve navigation on the Ubangi River	6	6	4	3	5	4,8	9 <sup>ème</sup>

The options «Strengthen and revitalise ENERCA's electrical installations », « Improve the distribution of electricity and the opening up of the population through rural electrification », «Improve the road network for the transport of hydrocarbons » and « Promote renewable energy such as biofuels, solar and wind power » are given high priority over the others. Project fiches will have to be developed for each option in order to seek funding for their effective implementation.

Table 60: Characteristics of the proposed options for the energy sector

<b>Adaptation option</b>	<b>Objectives</b>	<b>Indicators</b>	<b>Targets</b>
Strengthen and revitalise ENERCA's electrical installations	Improve ENERCA's production to serve the population with electricity	Number of households with access to electricity Reduced number of cases of damage caused by ENERCA's electrical installations	Populations of Bangui and the provinces Ministry of Energy ENERCA
Improve the distribution of electricity and the opening up of the population through rural electrification	Make electricity available to people throughout CAR	Number of ENERCA subscribers and households with access to electricity	Populations of Bangui and the provinces Ministry of Energy ENERCA
Improve the road network for the transport of hydrocarbons	Facilitate the transport of hydrocarbons and reduce the number of road accidents	Number of road accidents reduced	Population living near road networks Companies responsible for transporting hydrocarbons
Promote renewable energies such as biofuels, solar and wind power	Making clean, low-cost energy available, but also fighting poverty in rural areas	Number of households with access to renewable energy	Population of the different towns and villages in the country The companies The Ministry of Energy

			Research centres University of Bangui
Ensure the protection of people, property and the environment around ENERCA's electrical installations.	To secure the local population against the dangers of high voltage power cables	Number of electricity-related accidents reduced	Population living in the vicinity of ENERCA's high-voltage electricity installations
Promote the reforestation of degraded areas with fast-growing plants for use as wood energy	Reduce deforestation and pressure on firewood to limit the release of greenhouse gases	Number of degraded areas planted with fast-growing trees and used as energy wood	Population living near degraded areas Ministry of Water and Forests Timber traders and operators
Promote the use of wood waste from forestry companies as fuel	Valorise wood residues from forestry operations	Number of forestry companies using wood waste as an energy source	Forestry companies Population living near forestry companies
Promote research on renewable energy and forestry of fast growing plants for use as wood energy	Highlighting the country's energy assets with a view to valorising them	Number of publications on renewable energy Number of conferences and workshops organised on the subject.	University of Bangui Research centre Churches
Promote the use of improved stoves to reduce wood energy consumption	Reduce the consumption of wood energy and charcoal	Number of households using improved stoves	Population using wood energy and charcoal
Improve navigation on the Ubangi River	Ensure the supply of hydrocarbons on the Ubangi River throughout the year	Number of trips on the Ubangi River	SOCATRAF Ministry of Transport

Options are established according to their importance and translated into sectoral actions with indicators and targets.

#### 4.5.4. Forestry sector adaptation options

The options suggested for reducing the vulnerability of forests to CC take into account the overall objective of the SDG which is to « *Conserve and restore terrestrial ecosystems, ensuring their sustainable use, manage forests sustainably, combat desertification, halt and reverse land degradation and halt biodiversity loss* ». These adaptation strategies also incorporate three of the nine (9) actions proposed by the SDGs which are:

« *By 2020, ensure the conservation, restoration and sustainable use of terrestrial and freshwater ecosystems and related services, in particular forests, wetlands, mountains and drylands, consistent with obligations under international agreements* ».

« *By 2020, promote sustainable management of all types of forests, halt deforestation, restore degraded forests and significantly increase afforestation and reforestation globally*»

« *By 2020, integrate the protection of ecosystems and biodiversity into national planning, development mechanisms, poverty reduction strategies and accounting* ».

At the national level, and according to the RCPCA, the government sets the following priorities for the forestry sector: (i) cleaning up the sector, through the effective application of the Forestry Code adopted in 2008, and the implementation of a system of traceability of the timber sector; (ii) the inventory of non-timber forest products (NTFPs); (iii) the cleaning up of forestry exploitation and management permits and (iv) the promotion of the reforestation and climate change policy, through the increase of carbon sequestration capacity in order to benefit from the spin-offs of innovative mechanisms for mobilising international resources.

Table 61: Adaptation options for the forestry sector

<i>Axes Politiques</i>	<i>Options</i>
Government programmes and land-use planning	Restore deforested landscapes through reforestation.
	Regulate the artisanal exploitation of forests and energy wood.
	Draw up a participatory management plan for forest, savannah and dry forest areas.
	Create a body to reflect on the possibilities of sedentarising agriculture and livestock.
	Evaluate the rate of CO2 sequestration by wooded savannah landscapes.
	Encourage and incite the practice of agroforestry.
	Support and formalise the NTFP and savannah chain and circuit.
Participatory Forest Management (RCPCA Technical Document)	Study the impacts of climate change on Central African forests.
	Establish a land management mechanism to avoid conflicts between protected area managers, herders and farmers.
	Set up a participatory and inclusive consultation framework where key actors must be consulted and involved at all stages of the process up to the promulgation and popularisation of the Land Code.

Table 62: Synergy between forest sector options and the objectives of the SDGs and the RCPCA

<b>Aléas Climatiques</b>	<b>Options</b>	<b>Justification</b>	<b>Objectif du RCPCA traité</b>
<b>DRYNESS</b>  <b>RAINFALL EXTREMES</b>	Establish a land management mechanism to avoid conflicts between protected area managers, herders and farmers.	The damage caused by herds to protected areas, crops and agrarian landscapes is a source of inter-community conflict and ecosystem degradation.	Supporting peace, security and reconciliation (Pillar 1 and its four objectives).

<b>TEMPERATURE RISE</b>	Establish a framework for participatory consultation and take into account, as necessary and appropriate, the change and new land allocations in the Land Code.	Each actor would find a place, and many conflicts would be avoided in favour of peace.	Support peace, security and reconciliation (Pillar 1 and its four objectives); Renew the social contract between the state and the population <sup>3</sup> (Pillar 2);
	Support and formalise the NTFP and savannah value chain and circuit.	The circuit exists but it is informal. Adequate support will be needed to formalise them.	Assurer la sécurité alimentaire et la résilience et Assurer le relèvement économique et la relance des secteurs productifs (Piliers 2 et 3)
	Restore deforested landscapes through reforestation with local species.	Maintain/increase forest cover to contribute to CO2 sequestration.	Support the national REDD+ strategy framework.
	Evaluate the rate of CO2 sequestration by the savannah wooded landscapes and those of the dry forests.	Carry out a biomass and carbon storage inventory for the REDD+ mechanism.	Support the national REDD+ strategy framework.
	Encourage and promote the practice of agroforestry.	Reduce deforestation linked to agricultural activities through semi-automatic reforestation.	Support the national REDD+ strategy framework.
	Study the impacts of climate change on Central African forests.	Identify forest responses to CC in order to assess their vulnerability by proposing sustainable adaptation strategies.	Build resilience and adaptive capacity to climate-related hazards and natural disasters in all countries (SDGs). Incorporate climate change measures into national policies, strategies and planning (SDGs). Improve education, awareness and individual and institutional capacity for climate change adaptation, mitigation and impact reduction and early warning systems (SDGs).
	Create a body to reflect on the possibilities of sedentarising agriculture and livestock.	Prepare the country and development actors for the sedentarisation of agriculture and livestock.	Strengthening agriculture (Pillars 2 and 3 and their objectives).
	Regulate the artisanal exploitation of forests and energy wood.	Limit the degradation of forests linked to artisanal exploitation and wood energy.	Clarify the legal framework for community forest activities and artisanal logging permits.

			Implement measures to clean up the artisanal timber and energy wood exploitation sector.
	Draw up a participatory management plan for forest, savannah and dry forest areas.	Facilitate rational and participatory management of vegetated landscapes (forests, wooded savannah and dry forests).	Draw up a Master Plan for the management of savannah territories. To carry out a Master Plan for the development of forest areas.

Table 63: Assessment of criteria for each proposed adaptation option for the forestry sector

N°	OPTIONS	CRITERES				
		Participate in mitigation/O DD/RCPCA to donor requirements	Socio-environmental benefits	Feasibility	Cost-effectiveness and Efficiency	Timing/emergency
	Units	Echelle de 1 à 10	Echelle de 1 à 10	Echelle de 1 à 5	Echelle de 1 à 5	Echelle de 1 à 5
1	Establish a land management mechanism to avoid conflicts between protected area managers, herders and farmers.	8	9	3	4	3
2	Establish a framework for participatory consultation and take into account, as necessary and appropriate, the change and new land allocations in the Land Code.	9	10	3	4	3
3	Support and formalise the NTFP and savannah value chain and circuit.	8	8	2	2	2
4	Restore deforested landscapes through reforestation with local species.	10	10	5	4	4
5	Evaluate the rate of CO2 sequestration by the savannah wooded landscapes and those of the dry forests.	10	8	3	4	4
6	Encourage and promote the practice of agroforestry.	10	10	3	3	3
7	Study the impacts of climate change on Central African forests.	10	10	1	1	3
8	Create a body to reflect on the possibilities of sedentarising agriculture and livestock.	10	10	2	2	2
9	Regulate the artisanal exploitation of forests and energy wood.	8	10	3	3	4
10	Draw up a participatory management plan for forest, savannah and dry forest areas.	8	10	2	2	2

Table 64: Adaptation options for the forestry sector

<i>Axes Politiques</i>	<i>Options</i>
Government programmes and land-use planning	Restore deforested landscapes through reforestation.
	Regulate the artisanal exploitation of forests and energy wood.
	Draw up a participatory management plan for forest, savannah and dry forest areas.
	Create a body to reflect on the possibilities of sedentarising agriculture and livestock.
	Evaluate the rate of CO2 sequestration by wooded savannah landscapes
	Encourage and incite the practice of agroforestry.
	Support and formalise the NTFP and savannah chain and circuit.
Participatory Forest Management (RCPCA Technical Document)	Study the impacts of climate change on Central African forests.
	Establish a land management mechanism to avoid conflicts between protected area managers, herders and farmers.
	Set up a participatory and inclusive consultation framework where key actors must be consulted and involved at all stages of the process up to the promulgation and popularisation of the Land Code.

Table 65: Synergy between forest sector options and the objectives of the SDGs and the RCPCA

<b>Aléas Climatiques</b>	<b>Options</b>	<b>Justification</b>	<b>Objectif du RCPCA traité</b>
<b>DRYNESS</b>	Establish a land management mechanism to avoid conflicts between protected area managers, herders and farmers.	The damage caused by herds to protected areas, crops and agrarian landscapes is a source of inter-community conflict and ecosystem degradation.	Supporting peace, security and reconciliation (Pillar 1 and its four objectives).
<b>RAINFALL EXTREMES</b>			
<b>TEMPERATURE RISE</b>	Establish a framework for participatory consultation and take into account, as necessary and appropriate, the change and new allocation of land in the Land Code.	Each actor would find a place, and many conflicts would be avoided in favour of peace.	Supporting peace, security and reconciliation (Pillar 1 and its four objectives); Renewing the social contract between the state and the population <sup>3</sup> (Pillar 2);
	Supporting and formalising the NTFP and savannah value chains and channels.	The circuit exists but it is informal. Adequate support is needed to formalise it.	Ensuring food security and resilience and Ensuring economic recovery and the revival of productive sectors (Pillars 2 and 3)

Restore deforested landscapes through reforestation with local species.	Maintain/increase forest cover to contribute to CO2 sequestration.	Support the national REDD+ strategy framework.
Evaluate the rate of CO2 sequestration by savannah woodland and dry forest landscapes.	Carry out a biomass and carbon storage inventory for the REDD+ mechanism.	Support the national REDD+ strategy framework.
Encourage and promote the practice of agroforestry.	Reduce deforestation linked to agricultural activities through semi-automatic reforestation.	Support the national REDD+ strategy framework.
Study the impacts of climate change on Central African forests.	Identify forest responses to CC in order to assess their vulnerability by proposing sustainable adaptation strategies.	Build resilience and adaptive capacity to climate-related hazards and natural disasters in all countries (SDGs). Incorporate climate change measures into national policies, strategies and planning (SDGs). Improve education, awareness and individual and institutional capacity for climate change adaptation, mitigation and impact reduction and early warning systems (SDGs).
Create a body to reflect on the possibilities of sedentarising agriculture and livestock.	Prepare the country and development actors for the sedentarisation of agriculture and livestock.	Strengthening agriculture (Pillars 2 and 3 and their objectives).
Regulate the artisanal exploitation of forests and energy wood.	Limit the degradation of forests linked to artisanal exploitation and wood energy.	Clarify the legal framework for community forest activities and artisanal logging permits. Implement measures to clean up the artisanal timber and energy wood exploitation sector.
Draw up a participatory management plan for forest, savannah and dry forest areas.	Facilitate rational and participatory management of vegetated landscapes (forests, wooded savannah and dry forests).	Draw up a Master Plan for the management of savannah territories. To carry out a Master Plan for the development of forest areas.

Table 66: Assessment of criteria for each proposed adaptation option for the sector

N°	OPTIONS	CRITERES				
		Participate in mitigation/O DD/RCPCA to donor requirements	Socio-environmental benefits	Feasibility	Cost-effectiveness and Efficiency	Timing /emergency
	Unités	Echelle de 1 à 10	Echelle de 1 à 10	Echelle de 1 à 5	Echelle de 1 à 5	Echelle de 1 à 5
1	Establish a land management mechanism to avoid conflicts between protected area managers, herders and farmers.	8	9	3	4	3
2	Establish a framework for participatory consultation and take into account, as necessary and appropriate, the change and new land allocations in the Land Code.	9	10	3	4	3
3	Support and formalise the NTFP and savannah value chain and circuit.	8	8	2	2	2
4	Restore deforested landscapes through reforestation with local species.	10	10	5	4	4
5	Evaluate the rate of CO2 sequestration by savannah and dry forest landscapes.	10	8	3	4	4
6	Encourage and promote the practice of agroforestry.	10	10	3	3	3
7	Study the impacts of climate change on Central African forests.	10	10	1	1	3
8	Create a body to reflect on the possibilities of sedentarising agriculture and livestock.	10	10	2	2	2
9	Regulate the artisanal exploitation of forests and energy wood.	8	10	3	3	4
10	Draw up a participatory management plan for forest, savannah and dry forest areas.	8	10	2	2	2

Table 67: Standardised scores and ranking 1 of options

N° Options		Notes Standardisées des Options/Critères						
		Tous les critères sont notés sur une échelle de 0 à 5						
		Participates in mitigation/ODD/RCPA	Socio-environmental benefits	Feasibility	Cost-effectiveness and Efficiency	Timing/urgence	Average CMA score	Ranking
1	Establish a land management mechanism to avoid conflicts between protected area managers, herders and farmers.	2	4	2	3	2	2,6	6 <sup>ème</sup>
2	Establish a framework for participatory consultation and take into account, as necessary and appropriate, the change and new land allocations in the Land Code.	2	4	2	3	2	2,6	6 <sup>ème</sup>
3	Support and formalise the NTFP and savannah value chain and circuit.	2	5	1,5	2	1,5	2,4	7 <sup>ème</sup>
4	Restore deforested landscapes through reforestation with local species.	4	5	5	4	5	4,6	1 <sup>er</sup>
5	Evaluate the rate of CO2 sequestration by the savannah wooded landscapes and those of the dry forests.	3	5	4	2	5	3,8	2 <sup>ème</sup>
6	Encourage and promote the practice of agroforestry.	3	4	4	3	3	3,4	4 <sup>ème</sup>
7	Study the impacts of climate change on Central African forests.	2	3,5	2,5	2	5	3	5 <sup>ème</sup>
8	Create a body to reflect on the possibilities of sedentarising agriculture and livestock.	3	3,5	2	2	2	2,5	7 <sup>ème</sup>
9	Regulate the artisanal exploitation of forests and energy wood.	3	4	4	3	4	3,6	3 <sup>ème</sup>
10	Draw up a participatory management plan for forest, savannah and dry forest areas.	2,5	5	1,5	1	2	2,4	8 <sup>ème</sup>

Table 68: Weighting of criteria on a scale of 1 to 3

Number of criteria	Critère	Proposed weighting	Justification
01	Contributes to mitigation/ODD/CPDR	2,75	Options in synergy with the SDGs and the RCPA in addition to change to be implemented.
02	Socio-environmental benefits	3	The proposed options will contribute to ecosystem conservation and restoration.
03	Feasibility	2,5	Many of the suggested strategies are being implemented by the Government and forest resource management partners. This will promote the conversion of the options into activity.

<b>04</b>	Cost-effectiveness and efficiency	2	The country has expertise in the proposed options, therefore they will be economically, socially and environmentally profitable.
<b>05</b>	Timing/urgency	2,5	All strategies will contribute to the REDD+ mechanism, one of the priority actions of the CC in the country.

Table 69: Selection of priority and urgent options

Option d'adaptation	Standardised criteria scores multiplied by the weighting value of each criteria divided by five to find the Total score					Score Total	Classement
	Critère 1	Critère 2	Critère 3	Critère 4	Critère 5		
Establish a land management mechanism to avoid conflicts between protected area managers, herders and farmers.	2	4	2	3	2	6,7	6 <sup>ème</sup>
Establish a framework for participatory consultation and take into account, as necessary and appropriate, the change and new land allocations in the Land Code.	2	4	2	3	2	6,7	6 <sup>ème</sup>
Support and formalise the NTFP and savannah value chain and circuit.	2	5	1,5	2	1,5	6,4	9 <sup>ème</sup>
Restore deforested landscapes through reforestation with local species.	4	5	5	4	5	11,8	1 <sup>er</sup>
Evaluate the rate of CO2 sequestration by the savannah wooded landscapes and those of the dry forests.	3	5	4	2	5	9,95	2 <sup>ème</sup>
Encourage and promote the practice of agroforestry.	3	4	4	3	3	8,75	4 <sup>ème</sup>
Study the impacts of climate change on Central African forests.	2	3,5	2,5	2	5	7,75	5 <sup>ème</sup>
Create a body to reflect on the possibilities of sedentarising agriculture and livestock.	3	3,5	2	2	2	6,55	7 <sup>ème</sup>
Regulate the artisanal exploitation of forests and energy wood.	3	4	4	3	4	9,25	3 <sup>ème</sup>
Draw up a participatory management plan for forest, savannah and dry forest areas.	2,5	5	1,5	1	2	6,53	8 <sup>ème</sup>

Table 70: Characteristics of the proposed options

<b>Option d'adaptation</b>	<b>Objectifs</b>	<b>Indicateurs</b>	<b>Cibles</b>
Restore deforested landscapes through reforestation with local species.	Increase the area of carbon sinks by restoring lost ecosystems.	Number of hectares reforested	Population ONG Gouvernement Partenaires de la conservation
Evaluate the rate of CO2 sequestration by savannah woodland and dry forest landscapes.	Expand carbon credit on savannah woodland and dry forest landscapes.	Number of studies and scientific results attesting to the rate of CO2 sequestration by savannah and dry forest trees.	Université. CNC. ICRA
Regulate the artisanal exploitation of forests and energy wood.	Reduce the rate of forest degradation linked to artisanal logging and wood energy while enhancing the sector.	Documents regulating the artisanal exploitation of forest resources.	Ministry of Water, Forests, Hunting and Fishing. Ministry of Environment and Sustainable Development.
Encourage and incentivise the practice of agroforestry.	Combat agricultural land depletion and erosion while contributing to increased carbon sinks and restoration of terrestrial ecosystems.	Number of pilot projects for the implementation of agroforestry.	ACDA ICRA Université. Ministère du Développement Rural
Study the impacts of climate change on Central African forests.	Identify the impacts of CC on forests in order to propose sustainable adaptation strategies.	Number of scientific articles published on the vulnerability of Central African forests to CC.	Université ICRA CNC
Establish a land management mechanism to avoid conflicts between protected area managers, herders and farmers.	Prepare each stakeholder for the integrated management of an area subdivided for various and specific activities in order to avoid possible conflicts.	Establishment of a platform/consensus-building committee for land management	Ministry of Rural Development Ministry of Water, Forests, Fisheries and Hunting Ministry of Livestock Population
Establish a framework for participatory consultation and take into account, as necessary and appropriate, the change and new allocation of land in the Land Code.	Inform, involve and prepare each stakeholder for the rights and obligations of occupying and managing the territory affected or to be affected according to the cases and needs in the Land Code (in progress).	Establishment of a coordination/management body for the land affected or to be affected according to the possible changes.	Government (through relevant ministries). Population Technical and financial partners.

Create a body to reflect on the possibilities of sedentarising agriculture and livestock.	Prepare rural development actors for the sedentarisation of their activity in order to reduce deforestation linked to slash and burn agriculture.	Establishment of the body/agency. Initiation of pilot projects relating to the sedentarisation of agriculture and livestock.	Ministry of Rural Development Ministry of Water, Forests, Fisheries and Hunting. Ministry of Livestock.
Develop a participatory management plan for forest, savannah and dry forest areas.	Improve the legal and policy framework for participatory forest resource management in line with that of the sub-region. According to the RCPCA <i>"a comprehensive land use plan facilitates the management of natural resource exploitation by the administration, but also by private companies. This is the basis for the support provided under the national REDD+ strategy.</i>	Elaboration of Master Plans for savannah, forest and dry forest landscapes. Elaboration of a land use plan.	Ministry of Rural Development Ministry of Water, Forests, Fisheries and Hunting. Minister of the Environment and Sustainable Development.
Support and formalise the NTFP and savannah sector and circuit.	Organise and set up a legal framework for the management of the NTFP exploitation chain and those of the savannah.	Documents regulating the exploitation of the NTFP sector and those of the savannah.	Ministry of Water, Forests, Hunting and Fishing. Ministry in charge of Trade NGO Population

#### 4.5.5. Options d'adaptation du secteur infrastructure

CAR currently benefits from donor support for the maintenance of the road network and the rehabilitation of urban infrastructure. For the next five years, the rehabilitation of the national road network - national and regional roads and particularly rural tracks - is the Government's absolute priority. This is to open up the interior in order to facilitate the movement of people and goods. According to the RCPCA, « *in order to perpetuate the rehabilitation of the national network and secure its regular maintenance, it will be imperative to rapidly reform the Road Maintenance Fund (RMF), by better defining its missions and functioning, by clearing the debts between the RMF and the National Equipment Office, and then by sustainably increasing its revenues* ». Consequently, the government intends to review the institutional and political framework of transport to ensure good management and development of the sector. Other institutional measures, such as a new road and transport scheme, will also be necessary in the medium term according to the RCPCA.

Table 71: Adaptation options for the infrastructure and habitat sector

<i>Axes Politiques</i>	<i>Options</i>
Internal and external opening up programmes.	Assessment of the costs of climate change impacts on the road network and housing in CAR.
	Strengthening the flood resilience of neighbourhoods facing storm water drainage problems.
	Construction of green spaces and retention basins.
Revision of the institutional and policy framework for transport.	Integration of future climate change into the different phases of road construction (from planning to operation) and other infrastructure.

Table 72: Synergy between the proposed options and the objectives of the SDGs and the RCPCA

<b>Aléas Climatiques</b>	<b>Options</b>	<b>Justification</b>	<b>Objectif du RCPCA traité</b>
<b>Excess rainfall leading to flooding</b>	Building flood resilience in neighbourhoods with storm water drainage problems.	Neighbourhoods built on alluvial plains and in low-lying areas are at risk of flooding, hence the need to organise a campaign for the construction of drainage works.	Rehabilitate national and regional roads. Develop a master plan for road infrastructure and transport routes.
<b>Acute drought/high insolation Increased temperature Excess rainfall leading to flooding</b>	Assessment of the costs of climate change impacts on the road network and housing in CAR.	So far, the monetary weight of CC in the construction and maintenance of roads and buildings is unknown.	Develop a new road infrastructure maintenance policy. Build resilience and adaptive capacity to climate-related hazards and natural disasters in all countries (SDGs). Incorporate climate change measures into national policies, strategies and planning (SDGs). Improve education, awareness and individual and institutional capacity for climate change adaptation, mitigation and impact reduction and early warning systems (SDGs).
	Integration of future climate change into the different phases of road construction (from planning to operation) and other infrastructure.	Advocacy with partners and the government for the integration of future climate characteristics into the construction phases can reduce the vulnerability of roads and buildings.	Develop a new road infrastructure maintenance policy. Incorporate climate change measures into national policies, strategies and planning (SDGs).

	Construction of green areas and retention basins.	The introduction of green spaces and retention basins in the land use plan can reduce the increase in temperature in environments with high human concentration and the recharging of the water table by run-off water.	Develop a master plan for road and transport infrastructure.

Table 73: Assessment of criteria for each proposed adaptation option

N°	OPTIONS	CRITERES				
		Participate in mitigation/ODD/RCP CA to donor requirements	Socio-environmental benefits	Feasibility	Cost-effectiveness and Efficiency	Timing/emergency
	Unités	Echelle de 1 à 10	Echelle de 1 à 10	Echelle de 1 à 5	Echelle de 1 à 5	Echelle de 1 à 5
1	Building flood resilience in neighbourhoods with storm water drainage problems.	8	9	4	3	5
2	Assessing the costs of climate change impacts on the road network and housing in CAR.	4	10	3	1	3
3	Integration of future climate change into the different phases of road construction (from planning to operation) and other infrastructure.	7	10	4	4	5
4	Construction of green spaces and retention basins.	4	10	3	2	2

Table 74: Standardised scores and ranking 1 of options

N° Options		Standardised Option/Criteria scores						
		All criteria are scored on a scale of 0 to 5						
		Participates in mitigation/ODD/RC PCA	Socio-environmental benefits	Feasibility	Cost-effectiveness and Efficiency	Timing/urgency	Average CMA score	Ranking
1	Building flood resilience in neighbourhoods with storm water drainage problems.	3	5	4	3	5	4	1 <sup>er</sup>
2	Assessing the costs of climate change impacts on the road network and housing in CAR.	2	5	3.5	2	5	2,8	3 <sup>ème</sup>
3	Integration of future climate change into the different phases of road construction (from planning to operation) and other infrastructure.	4	5	4	3	4	4	1 <sup>er</sup>
4	Construction of green spaces and retention basins.	1	5	4	2	1	2,6	4 <sup>ème</sup>

Tableau 10: Pondération des critères sur une échelle de 1 à 3

Numéro des critères	Critère	Pondération proposée	Justification
01	Contributes to mitigation/ODD/CPDR	1.5	While the SDGs have reserved a place for opening up, the government does not specifically define in the RCPA the targets to be achieved by 2021 for road infrastructure and housing.
02	Socio-environmental benefits	3	Since every road and housing project must develop its own environmental and social management plan, the implementation of the options will not be detrimental to the environment.
03	Feasibility	3	The proposed options are part of the initiatives of the development partners, notably the European Union and the World Bank, and the Government of the NCC.
04	Cost-effectiveness and efficiency	1	The lack of experience of Central African institutions in assessing the costs of CC, the chronic urbanisation problem of Central African cities, will cast doubt on the efficiency and effectiveness of the options.
05	Timing/urgency	3	Given the current flood damage, it is imperative to implement the proposed options in order to reduce vulnerability.

Tableau 11: Sélection des options prioritaires et urgentes

Option d'adaptation	Standardised criteria scores multiplied by the weighting value of each criteria divided by five to find the Total score					Score Total	Classement
	Critère 1	Critère 2	Critère 3	Critère 4	Critère 5		
Building flood resilience in neighbourhoods with storm water drainage problems.	3	5	4	3	5	<b>9,9</b>	<b>1<sup>ème</sup></b>
Assessing the costs of climate change impacts on the road network and housing in CAR.	2	5	3.5	2	5	<b>9,1</b>	<b>3<sup>ème</sup></b>
Integration of future climate change into the different phases of road construction (from planning to operation) and other infrastructure.	4	5	4	3	4	<b>9,6</b>	<b>2<sup>er</sup></b>
Construction of green spaces and retention basins.	1	5	4	2	1	<b>6,7</b>	<b>4<sup>ème</sup></b>

Table 77: Characteristics of the proposed options for the Infrastructure sector

Options d'adaptation	Objectifs	Indicateurs	Cibles
Strengthening the flood resilience of neighbourhoods with stormwater drainage problems.	Make drainage ditches or collectors to facilitate run-off. Share with the population simple and less costly techniques for protecting the bases of adobe brick houses.	Number of sanitation facilities built in vulnerable towns and neighbourhoods. Reduction of flooding cases. Number of people assisted to protect the foundations of their houses.	Town halls. Populations. Ministry of Urban Planning. Ministry of Public Works. Civil society organisations and NGOs.
Integration of future climate change into the different phases of road construction (from planning to operation).	Encourage development partners and the government to integrate the cost of climate change into the financing and maintenance of the Central African road network.	Number of projects integrating the cost of CC. Number of policy documents and programmes integrating the cost of CC.	CNC. Ministry of Urban Planning. Ministry of Public Works. Design offices.
Assessing the costs of climate change impacts on the road network and habitat in CAR.	Study the monetary damage of climate on road infrastructure in order to build a case for the future.	Number of reports, scientific papers, dissertations and theses dealing with the cost of CC on road and housing infrastructure.	CNC. Université.
Construction of green areas and retention basins.	Depending on the site, future development plans must include green spaces and retention basins. Green spaces are not only found in the city centre, they are also important in the informal settlements.	Consideration of green spaces in the land use plan. Number of green spaces created.	Town halls. Ministry of Urban Planning.



#### 4.5.6. Adaptation options for the Human Settlement and Health sector

Les programmes d'adaptation dans le secteur établissement humain et santé s'articulent autour de trois axes prioritaires à savoir: (i) Révision du cadre réglementaire et politique; (ii) Promotion de la gestion rationnelle des établissements humains; (iii) Promotion de la santé dans un environnement favorable à la santé.

The adaptation programmes in the human settlements and health sector are structured around three priority areas, namely: (i) Revision of the regulatory and policy framework; (ii) Promotion of sound human settlements management; and (iii) Promotion of health in an enabling environment.

##### **Axis 1: Revision of the regulatory and policy framework**

- adoption of a new land code to improve access to land for all
- revision of the national strategy for adequate housing
- effective integration of the climate change issue into the policies of the ministerial departments in charge of health, housing, water and sanitation
- decentralisation of the structures and directorates of the ministries in charge of water and housing;
- development of regional and prefectural plans for adaptation to climate change
- contextualities for the human settlements and health sector;
- Strengthening and implementing current risk and disaster management plans by creating early warning systems in each administrative region, based on the one set up by the Red Cross as part of the integrated disaster and land management programme.

##### **Axis 2: Promotion of rational management of human settlements**

- promotion of local materials in construction and climate change resilient buildings ;
- promoting the installation of underground electricity and telephone lines;
- promoting the use of renewable energy and evacuation and rapid response circuits in case of extreme winds;
- adoption and implementation of the framework law on spatial planning;
- implementation of the national housing strategy.

##### **Axis 3: Promote health in a health-friendly environment**

- Improving the population's access to health care and developing emergency medical services;
- Development and implementation of a national health surveillance plan and strengthening of the use of impregnated mosquito nets throughout the country;
- improving access to clean water and basic sanitation infrastructure;
- development of wastewater disposal infrastructure.

#### 4.6. Conclusion and recommendations

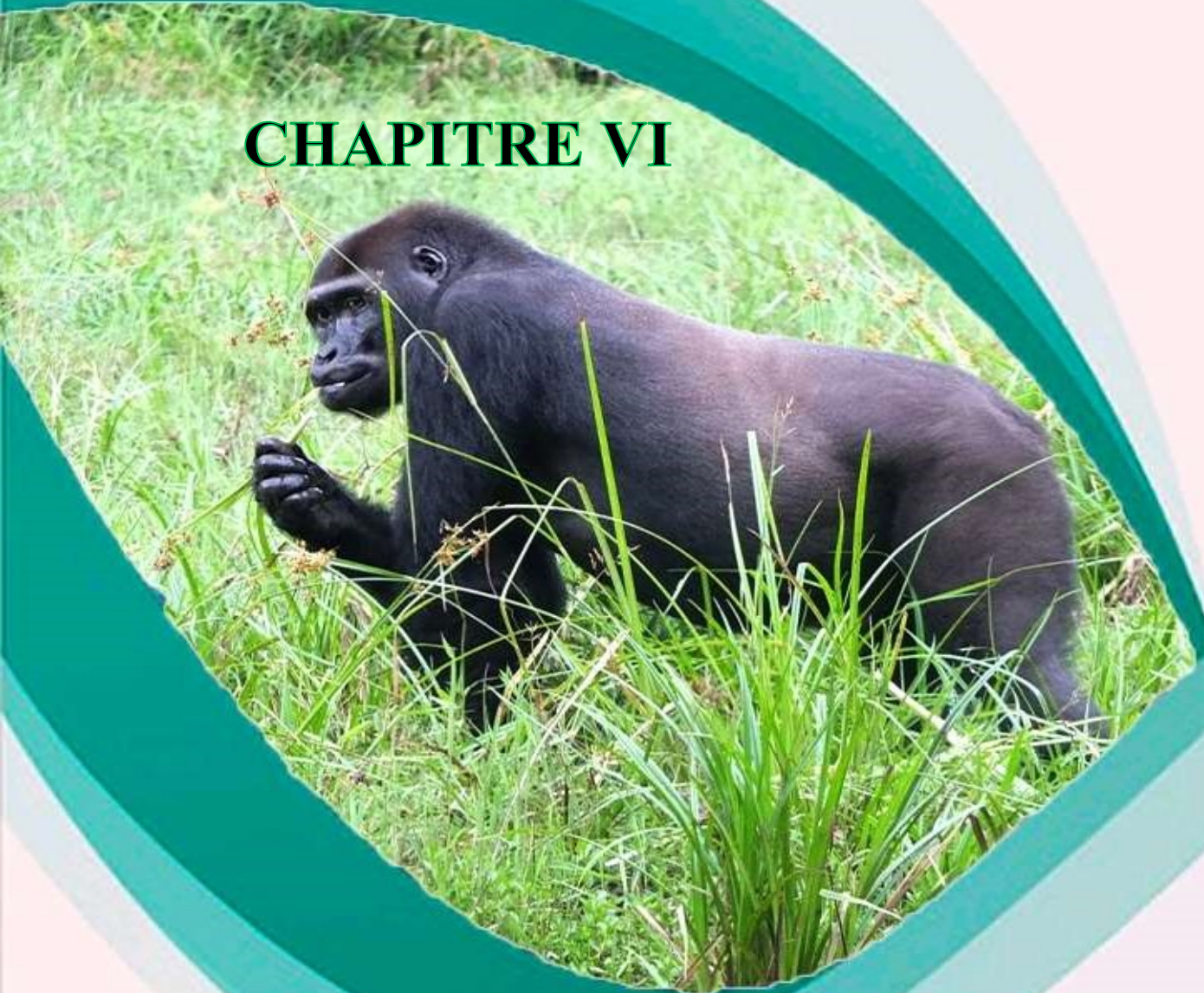
All the sectors studied are, on the whole, highly sensitive to climate change, with a high exposure to its effects. Their low adaptive capacity makes them very vulnerable (Table 4.4).

Table 78: Level of vulnerability of the surveyed areas

Sectors	CC sensitivity	Exposure to CCs	Adaptability	Level of Vulnerability
Agriculture and Food Security	Strong	Strong	Low	Strong
Water Resources and Sanitation	Strong	Strong	Low	Strong
Forestry	Medium to strong	Strong	Low	Medium to high
Energy	Medium to strong	Medium	Low	Medium to High
Infrastructure and habitats	Strong	Strong	Low	Strong

The agriculture and food security, water resources and infrastructure sectors are the most exposed, sensitive and vulnerable to the projected climate changes. This vulnerability is accentuated by the development challenges, the inadequacies of the institutional framework of each sector and the impoverishment of the main actors. As a result, climate change issues are embedded in the problems of socio-economic development. A scientific knowledge of the costs/impacts of climate change in all sectors will allow the incorporation of strategies likely to reduce vulnerability and take advantage of positive impacts into the national development policy in a decentralized framework integrating all actors.

## CHAPITRE VI



## 5. CAPACITY BUILDING, TECHNOLOGY TRANSFER AND PROJECT FINANCING NEEDS

The CAR's development vision is defined in the National Plan for Recovery and Peacebuilding in the Central African Republic (RCPCA 2017-2021) and in the sectoral development strategies in line with the SDGs. The RCPCA is the reference framework for promoting recovery and peacebuilding in order to increase the well-being and prosperity of the Central African population. It is structured around the following 3 pillars:

- Pillar 1: Supporting peace, security and reconciliation;
- Pillar 2: Renew the social contract between the State and the population;
- Pillar 3: Ensure economic recovery and the revival of productive sectors.

In the framework of the implementation of the Multilateral Environmental Agreements, measures to fight against climate change have been taken in the following policy and strategy documents

- The National Gender Adaptation Plan, adopted in 2022;
- The National Drought Plan, adopted in 2022;
- The National Policy Letter on the Environment, adopted in 2021;
- The National Strategy for Sustainable Development, adopted in 2021;
- The National REDD+ Strategy (Reduction of Emissions from Deforestation and Forest Degradation), adopted in 2021;
- The Initial National Climate Change Adaptation Plan, adopted in 2021;
- The Nationally Determined Contribution, adopted in 2021;
- The National REDD+ Investment Framework, adopted in 2020;
- The Strategy Document on Voluntary Targets for Land Degradation Neutrality;
- The Strategic and Operational Policy Document on responses to climate change, adopted in 2017;
- The National Action Plan to Combat Desertification;
- The National Strategy and Action Plan on Biodiversity, adopted in 2000;

According to CAR's initial National Adaptation Plan, the following sectoral documents could be entry points for integrating climate change adaptation into development planning in the Central African Republic

- **Agriculture and Livestock:** Draft Agricultural Orientation Law in the Central African Republic (under development) and the National Agricultural Policy Document (under development) Livestock Roadmap (2017-2021);
- **Water and sanitation:** National Water Policy (2020-2030) adopted by Decree No. 21.167 of July 28, 2021. The National Water Policy is broken down at the operational level into four (04) structural programs: (i) the National Drinking Water Supply and Sanitation Program (PNAEPA); (ii) the National Integrated Water Resources Management Program (PNGIRE); (iii) the National Structural Hydraulic Infrastructure Program (PNIHS); and (iv) the National Water and Sanitation Sector Governance Program (PNGSEA). Standards and guidelines for the construction,

management and maintenance of drinking water and sanitation facilities in rural and semi-urban areas (under review).

- **Forestry:** Forestry Policy of the Central African Republic 2019-2035 (pending approval by the National Strategy for Participatory Forestry; National Policy for Wildlife Management and Protected Areas.
- **Energy:** Decentralized energy policy
- **Health:** National Health Development Plan and National Health Policy (2019-2030) (under development)
- **Education:** Education Sector Plan (2020-2029) and the associated climate change adaptation program
- **Meteorology:** Meteorology Strategic Plan 2017-2020 (pending adoption)
- **Gender issues:** Equality and Equity Policy, Women's Empowerment Policy and the Gender Equity Act

In this context, the information considered useful for the implementation of the Convention and developed under this third national communication includes:

- **Integration of climate change ;**
- **Technology transfer needs;**
- **Research and systematic observation;**
- **Education, training and public awareness;**
- **Identification of challenges and gaps and the financial resources, technical means and capacities needed to address them.**

## 5.1. Climate Change Mainstreaming

The integration of CC into sectoral policies is one of the major challenges facing the Ministry of Environment and Sustainable Development. To succeed in this integration, environmental policies should involve all public authorities at all levels of decision-making.

In order to fully integrate the issue of climate change into its sustainable development policy, the Central African Republic must have specific management capacities: the capacity to analyze and formulate response policies, the capacity to choose between technological alternatives under conditions of great uncertainty, the capacity to opt for certain actions and to reconcile them with the country's socio-economic and political realities, etc. It must also have the financial means to implement response policies. This is why CAR pays particular attention to capacity building and technology transfer, which is the keystone of a true implementation of the UNFCCC and, in general, of all the United Nations conventions and protocols.

### 5.1.1. Technology transfer needs

A focal point has been appointed at the Ministry in charge of Environment and Development in charge of the Needs Assessment and Technology Transfer. At the level of the Presidency of the Republic, a Minister in charge of New Technologies has been appointed by the Head of State. The CAR also has a Ministry in charge of Scientific Research and Technological Innovation.

In order to create an appropriate framework for the transfer of identified technologies, it is necessary to take into account the impact of human, institutional, financial and technological factors, which may hinder their implementation. In order to achieve sustainable development,

it will be necessary to closely link adaptation integrated into development plans with a strategy to intensify technology transfer. It therefore follows that technology transfer for both climate change mitigation and adaptation must take into account the economic and social development priorities as defined by the strategic frameworks such as the PSO-CC RCA 2020, the NDCs, the environmental policy letter, the NAPA, the RCPCA and other strategic sub-regional integration documents. The strategic development options set out in the documents of these programs display fairly ambitious and possible quantitative objectives.

In the Central African Republic, all of the sectors addressed in the third paper are, to varying degrees, vulnerable to climate variability and change. To this end, it is advisable that adaptation/mitigation policies and measures be anticipated through the introduction of adapted technologies in order to lay the foundations for sustainable economic development and fight against poverty in accordance with Pillar 3 of the RCPCA. Within this framework, three sectors have been covered for the identification and assessment of needs for the transfer of environmentally sound technologies, both for the adaptation and mitigation components of climate change. These are :

- Agro-pastoral sector in adaptation;
- Energy sector through the sub-sector of energy industries;
- Agriculture, Forestry and Other Land Use Sector (AFAT), through the forestry sub-sector.

For the assessment of each sector, the analysis adopted included the following steps:

- A review of options and resources;
- Identification of assessment criteria;
- Selection of key technologies;
- Identification of barriers;
- Definition and selection of actions.

### **Evaluation Criteria**

The criteria for evaluating the actions and technologies are based on the following factors:

- Contribution to the Millennium Development Goals,
- Social acceptability and sustainability for post-crisis conditions in CAR,
- Market potential,
- Contribution to climate change for the mitigation/adaptation component

### **Selection of key mitigation/adaptation technologies**

The selection of key technologies was developed using the information compiled on alternative technologies for the priority sectors and sub-sectors. Based on the ranking of alternative technologies, we considered the top 4-5 key technologies for each sector according to the assessment criteria.

A price benefit analysis of technology options/measures was performed for the different GHG emitting sectors.

### 5.1.1.1. Technologies for the Agro-pastoral sector

#### 5.1.1.2. Agricultural sub-sector

- **Resilient varieties and accompanying technology packages.**

#### **Introduction and promotion of adapted species and varieties**

The selection and dissemination of improved varieties/species adapted to climate variability and change is a major axis of adaptation measures in order to meet the orientations and objectives of the food security policy.

#### **Integrated Pest Management**

Integrated pest management is a cost-effective and environmentally sound intervention strategy that uses a combination of cultural, biological and chemical pest control techniques and methods, in as compatible a manner as possible, to maintain pest populations at levels that do not cause economic damage

- **Water control and saving**

#### **Construction of micro-hydro dams and lowland development.**

The degradation of water reservoirs resulting from climatic and anthropic factors, leads to the severe impoverishment of agro-sylvo- pastoral lands. In order to mitigate the adverse effects of these constraints, which will increase with climate change, it is necessary to design and implement programs that aim to develop micro retention dams and rehabilitation of basins to improve the capture of runoff.

- Sustainable land management (SLM) techniques.

Sustainable land management (SLM) strategies and practices can enable farmers and their communities to become more resilient to climate change by increasing food production, conserving soil and water, enhancing food security and restoring their natural productive resources.

- Integrated soil fertility management (ISFM)

It aims at the optimal and sustainable use of soil nutrient reserves, mineral fertilizers and soil amendments.

#### **CES/DRS and Agroforestry techniques.**

CES/DRS and Agroforestry techniques are all aimed at controlling erosion, maintaining organic matter and physical properties of the soil, reducing evaporative demand and thus responding in part to major stresses that will result from climate change.

- **Contouring of fields**

This is a climate change adaptation technology that conserves soil moisture and combats erosion. It opens up the possibility of planting for a long time after a heavy rain.

#### **Forecasting and mitigating crises Grain banks.**

The great vulnerability of agriculture to climate change and variability results in seasonal alternations of good and bad production. The development of cereal banks will enable vulnerable populations to cope with the production deficit linked to climatic risks and contribute to the improvement of the living conditions of populations facing food insecurity.

#### **The improvement of agro-meteorological monitoring and early warning.**

The mechanisms for linking agricultural management to agrometeorological monitoring and seasonal climate predictions make it possible, on the one hand, to provide the rural community with agrometeorological advice and guidance to enable them to better plan agricultural activities in order to improve production and, on the other hand, to provide decision-makers with indicators to feed the early warning system. Induced rainfall Difficulties in water supply due to persistent drought have led many countries around the world to resort to induced rainfall by cloud seeding.

#### **5.1.1.3. Livestock sub-sector**

##### **Improving the quality and quantity of livestock feed.**

Seeding of natural pastures The restoration of pastoral areas through tree planting and seeding of adapted forage species in arid areas will improve livestock feeding with the provision of shrubby and herbaceous pastures of high nutritional value by direct seeding.

Development of fodder crops through the introduction and use of appropriate fodder species (cowpea, pigeonpea and cowpea fodder), and by adopting suitable cultivation and farming practices, the agro-pastoralist can improve the feed intake of livestock.

Controlling grazing: The strategy of improving the availability of surface water through the sinking of ponds and the drilling of pastoral wells, particularly in under-exploited pastoral areas, deserves to be consolidated in the current context of climate change. Indeed, better storage of rainwater can help populations, particularly pastoralists, for optimal management of pasture resources by making new pastoral areas viable and thus optimizing the management of the animal load. Genetic improvement of local breeds and promotion of family poultry farming

##### **Artificial insemination techniques**

One of the measures for the profitability of livestock farming will be to improve the zootechnical performance of livestock through the improvement of the genetic potential of animal breeds. In this context, the livestock services have set up a bovine genetic improvement program with an open nucleus. In view of the relevance of this technology and the response to future climatic impacts, it is proposed to support this program and extend it to improve the productivity of the herd.

Promotion of family poultry farming: The introduction and development of family poultry farming constitutes an important niche in improving the living conditions of low-income households affected by climate change. In addition, it allows to reach rural women through concerted improvement actions and can thus constitute a gateway to the integration of women in the development of small-scale livestock in general.

#### 5.1.1.4. Technologies for the energy sector

Generation of electrical energy from renewable natural resources: The Central African Republic has considerable potential for the generation of electricity from natural resources. These include wind, solar and hydroelectric potential. Despite this, the Environmentally Rational Technologies (ERT) installed 22 MW for hydroelectricity-Bouali which occupy a very small share of the national electricity supply). To this end, it is proposed to accompany the ongoing momentum for the development of renewable energy, through a fruitful public-private partnership and the sanitation of the production-commercialization environment through, among other things, public subsidies to mitigate investment costs that are still high compared to conventional energy from fossil resources.

Electricity generation from cleaner fossil fuels and energy efficiency

Energy efficiency (industrial and residential sectors): Energy efficiency or effectiveness consists of reducing energy consumption, with the same service rendered.

#### 5.1.1.5. Technologies for the AFAT sector/ forestry sub-sector

Given the seriousness of the current situation of forests and forest lands and the important place that these forest formations occupy in the supply of the national market in woody fuel (coverage of the national need up to 70%) and in the national economy.

**Forest management for carbon conservation. The conservation technologies include options such as :**

- Controlling deforestation,
- protection of forests located in reserves,
- control of other anthropogenic disturbances (fire, pest infestation, etc.).

Within the framework of this forestry practice, we propose the policy of slowing down deforestation and helping regeneration. Forest management for carbon fixation and storage. Carbon sequestration and storage practices include: enhancing forest ecosystems by increasing the area and/or biomass and soil carbon content in natural forests and plantations, and increasing storage in sustainable wood products.

Within the framework of this forestry practice, the Community Forest Creation policy is proposed. This policy increases the amount of carbon stored in the vegetation. Carbon Substitution Management: This is aimed at increasing the transfer of carbon from forest biomass into various products and thereby curbing the consumption of fossil fuel-based energy and products, cement-based products and other non-wood building materials. As part of this forestry practice, the Carbon Substitution Management Policy is proposed. This policy offers the best long-term prospects for mitigation.

**According to the October 2021 revised NDC Implementation of some adaptation and mitigation actions requires the use of technology.**

Technology transfer in this area will include both capacity building and equipment.

**A- Technology needs in mitigation :**

- Cogeneration technology (Biogas, Wood and derivatives ;
- Bio methanization technologies;
- Solar voltaic technologies;

- Solar field connected to the domestic grid;
- Hydroelectric technologies ;
- large-scale power plant;
- Improvement of the energy efficiency of service equipment (pumps, generators, etc.) and valorization of the energy produced but not consumed;
- Mini and micro power plants
- Carbonization technology based on MAGE improved furnaces
- Metal engineering (improved stove, solar cooker).

#### **B- Mitigation capacity building needs:**

- Use of geo-spatial technologies for ecosystem monitoring;
- Conservation tillage ;
- Agro ecology;
- Management of persistent organic pollutants (POPs);
- Secondary.
- Industry Standards Management;
- Comprehensive baseline definition of adaptation and mitigation measures.

#### **C-Adaptation technology needs:**

- Non-Timber Forest Products (NTFPs):
- Wild pepper processing and conservation technology;
- Meteorological instrumentation devices;
- Simplified no-till technology or Simplified Cultivation Techniques (TCS);
- Drought resistant crops;
- Equipment and tools for monitoring bushfire alerts through remote sensing.

#### **D-Adaptation capacity building needs:**

- Agroforestry;
- Scenario building and climate projection;
- Conducting vulnerability assessments;
- Development of curricula integrating climate change at primary and secondary levels.

### **5.2. Research and systematic observations**

In addition to the Direction Générale de la Météorologie (DGM), which is responsible for generating and providing information on climate forecasts in CAR, there are other research and training structures such as the Laboratoire d'Etude Rurale et de Sécurité Alimentaire (LERSA), The University of Bangui (FASEG), the Center for Studies and Research on Pharmacopoeia and Traditional African Medicine (CERPHAMETA), the CAR Botany Laboratory, the Laboratory of Cartography, Climatology and Geographic Studies (LACCEG)).

CAR has a research agency called ICRA. ICRA is composed of departments that work on forest and savanna agrarian systems. These centers are based in Boukoko, in Lobaye, and Soumbé in Ouham, respectively. Several other structures contribute to forestry research in CAR:

- The ARF project administered by ICRA;
- The Agency for Sustainable Management of Forest Resources (AGDRF);
- the CDF, which receives technical support from WRI;

- the Economic Observatory of the Wood Sector;
- the MEFCP Documentation Center;
- the Dzanga-Sangha protected area management project (Projet Dzanga-Sangha);
- the Chinko Project.

## **5.2.1. Observations systématiques**

### **5.2.1.1. Observation terrestres**

#### **5.2.1.1.1. Réseau des mesures climatiques**

Les réseaux d'observations météorologiques et climatologiques de la DNM sont constitués actuellement de :

- Systematic observations
- Terrestrial observations
- Climate Measurement Network

The meteorological and climatological observation networks of the DNM are currently made up of :

- 7 Meteorological Centers located in different regions and provinces of the country and meeting the standards of the World Meteorological Organization (WMO);
- 30 climatological stations, including 56 automatic stations located in areas with difficult access;
- 2 Doppler weather radars;
- 1 satellite imagery reception system;
- 1 network of 6 lightning detection and monitoring sensors;
- 2 radiosonde stations for the measurement of meteorological parameters at different levels of altitude (from the ground surface to about 15km altitude).

Agro-meteorological stations exist mainly in agricultural research institutes (ICRA, ISDR and ACDA) and in the Regional Directorates of Water and Forests. The DNM also has several pilot agro-meteorological stations, including those in Grimari and Bouar, which, in addition to traditional meteorological observation, measure evaporation, evapotranspiration and monitor the evolution of a crop field in situ.

#### **5.2.1.1.2. Air quality measurement network**

There are currently 3 fixed stations for the monitoring and measurement of Air Quality established in the main agglomerations of the city of Bangui by the University, as well as two laboratories. This program is conducted in collaboration with the Ministry of Environment and Sustainable Development and the Municipality of Bangui.

#### **5.2.1.1.3. Water resources measurement networks**

The CAR has a national network of hydrological and hydrogeological measurements, developed and distributed throughout the country. Efforts are being made to consolidate the achievements and ensure the development of these networks. 15 hydrometric stations, 31 periodic gauging points and 23 rain gauge stations are monitored and treated regularly.

Similarly, the piezometric network has nearly 3 piezometers to ensure continuous monitoring of the levels of more than 15 groundwater tables.

#### **5.2.1.1.4. Water quality monitoring and surveillance networks**

Water quality is monitored by several ministerial departments, including the Ministry of Hydraulics in charge of water, which has a water quality monitoring network consisting of dozens of measuring stations for surface water and for groundwater.

In collaboration with the DGH, the DNM has been collecting rainwater since 1994 to measure its acidity in the city of Bangui. Finally, there are two analysis laboratories that perform an average of 600 analyses per year.

#### **5.2.1.1.5. Drought observation network**

Drought observation is not yet formally established in CAR, but this does not prevent the DNM from developing strategies and tools relevant to drought management within the framework of the national risk and natural disaster program. Among its priority objectives, the strategy document aims to provide decision makers with indicators to regularly monitor drought and prioritize possible responses at different stages of its evolution.

This approach should allow the improvement of decision-making tools to anticipate the effects of drought through risk management instead of suffering them through crisis management.

A crisis management committee has been set up for this purpose, which relies on the scientific and technical skills of training and research institutions under the Ministry of Agriculture, and the skills of its partners at the central and regional levels. This Committee participates in drought risk management through its contribution to the following activities

- Precise knowledge of the different types of drought by region,
- Characterization of drought (frequency, duration, intensity, impacts),
- Regular monitoring of drought occurrence for its early warning,
- Analysis of the vulnerability of populations to drought,
- Consideration of these elements in economic and social planning,
- Preparation of operational plans to fight against the effects of drought.

However, the institutional and human capacity of this observatory needs to be consolidated and strengthened.

### **5.2.2. Oceanographic and Space Observations**

#### **5.2.2.1. Space-based observations**

Satellite images are received at two observation centers: the LACEG Laboratory and the DNM. LACEG uses operational systems for the collection, production and analysis of Earth observation data and develops applications and methodologies in space technology and related disciplines. It also carries out the national program in the field of remote sensing in space in partnership with the various ministerial departments concerned, private operators and universities.

Within this framework, LACEG conducts various projects or studies that have a direct or indirect relationship with climate change. These projects are mainly based on the use of spatial observation in different economic sectors: forest evolution, desertification, fisheries resources management, land use, etc.

LACEG has established partnerships and seeks to complete and update the existing database, to complete the forest and land use mapping, to ensure the observation and monitoring of marine and terrestrial phenomena related to climate change.

#### 5.2.2.2. Oceanography

As CAR is not a coastal country, observations of the Ubangi River are essentially carried out by the Direction Générale de l'Hydraulique and even the SODECA, which monitors the dynamic height of the river (topography of the river surface). Since its creation, the General Directorate of Hydraulics has carried out several actions within the framework of its operational programs related to the tributaries and the river by

- the realization of regular oceanographic campaigns in the fresh waters of the CAR. These oceanographic campaigns collect at different levels of the water column (from the surface to the depth), the physico-chemical parameters of the environment (water temperature, water density, currents, dissolved oxygen, sediments, chlorophyll, currents) as well as certain materials and biological observations (phytoplankton, zooplankton).
- the use of spatial remote sensing (SST, Chlorophyll and derived products) for continuous monitoring and the use of hydrodynamic modeling for a better understanding of the functioning of river ecosystems, rivers and banks for forecasting purposes.

#### 5.2.3. Data banks

The Directorate of Statistics has been collecting and processing data from all sectors of the country's economic activity since the 1960s; it publishes an annual Statistical Yearbook that presents all of these data, including those on climate.

The climate data collected by the various DNM systematic observation stations are stored in a specialized database and processed to be provided in the appropriate form to the user (regular and on-demand bulletins).

A new architecture of the climatological database, organized around a server, has been designed to meet the increasingly precise and demanding needs of users and to accompany the technological development in this field at the Department of Geography at the University of Bangui.

The Direction Générale de l'Hydraulique is building a database containing all the analyses and measurements carried out on water. This data is used to publish information bulletins on water resources and the state of their quality by hydraulic region, as well as to publish the national report on water resources.

The General Directorate of Forestry regularly updates a cartographic and statistical database of land use and forest dynamics, based on satellite data processing. ICRA and other institutions are also building up data banks related to their activities.

#### 5.2.4. Needs for strengthening systematic observation networks

Given the great spatial variability of the CAR's physical environment (topography, geology, desert, etc.), these networks are still insufficient to highlight the spatial variability of the climate at local scales. Given the inadequacy of the traditional network, the observation of the variability of meteorological and climatic parameters at fine scales requires the establishment of a network of measurements adapted to the configuration of the environment and the problems of study of applied climatology.

In this context, the National Directorate of Meteorology has continued the implementation of the program to strengthen meteorological and climatological observations by installing automated measurement systems in areas without and not covered by the conventional network. If we refer to the criteria set by the World Meteorological Organization (WMO) for the establishment of meteorological and climatological networks, the number of measuring stations of the DNM should increase, by 2030,

for the main meteorological stations from 17 currently to at least 40 and from 150 to 300 for the climatological stations. Unfortunately, repeated crises have slowed the CAR's momentum.

The early warning system for extreme weather events (storms, heavy rains) is not yet in place for implementation. Efforts are still needed to equip the DNM with early warning systems.

The monitoring of fire risk and drought risk is not developed in a homogeneous way throughout the territory (no lookouts, no dynamic fire maps, incomplete remote sensing processing).

### 5.2.5. Scientific research

Research works in the field of climate change, both for the mitigation and the vulnerability & adaptation aspects, are carried out by some public institutions under the supervision of different ministerial departments and by universities and engineering schools.

### 5.2.6. Climate

In addition to the DNM, some institutions such as ASECNA, ICRA, and the geography department of the Facultés de lettres et sciences humaines, etc.) are conducting climate research.

In order to respond to national concerns, especially those related to drought and the prevention of extreme phenomena (floods, floods), the DNM works on programs for climate monitoring, scientific and technological watch, study and management of drought, development of immediate forecasting, and assistance to the sectors using meteorological information.

Thus, the National Center for Meteorological Research of the DNM is in charge of providing numerical (calculated) forecasts of short and medium term weather with the best possible accuracy.

In addition to these forecasts, the DNM develops seasonal forecasts, which consist of predicting meteorological parameters such as average temperatures and precipitation totals for the next four months.

In order to meet the requirements of research and development at the national level, the DNM has implemented several programs and projects focused on climate change:

- Modelling and scenarios of climate change, which consist of
- The realization of simulations of climate change scenarios at high resolution with dynamic climate models.
- Analysis and study of climate change scenarios that may affect the whole country in the future (average climate, extreme phenomena, climate change indices).
- Analysis, study and interpretation of climate change scenarios that may affect the country in the future. Future changes are considered both in terms of averages and extreme events.
- Participation in impact studies in collaboration with different organizations and institutions representing socio-economic sectors vulnerable to climate change.
- Participation in studies to assess the vulnerability of socio-economic sectors to climate hazards based on past and present climate.
- The DNM is also involved in several projects on climate change at the national and international levels:
- CC adaptation project Integration of climate risks in agriculture and food security with the MEDD.
- In addition, DNM contributes to various international works on climate and climate change (DNM is the focal point of the Intergovernmental Panel on Climate Change - IPCC).

The DNM, through this program, aims to achieve the following objectives

- To contribute to the reduction of the impact of climatic hazards;

- Contribute to the improvement of the quality and yields of crops;
- To help farmers reduce production costs;
- Preserve agricultural resources from land degradation.

The program aims to strengthen DNM's capacity to cover all aspects of agro-meteorological assistance. Thus, three areas of action have been defined:

- Agro-meteorology for agricultural production:
- Strengthening the warning and monitoring system through the development of the observation network and rapid dissemination.

### 5.2.7. Scientific research

Scientific research is in its infancy in the Central African Republic and some actions and initiatives are still timid at the DNM and Bangui University levels. Also, some activities are carried out within the framework of development projects/programs with the support of technical and financial partners, thus opening up a non-negligible level of research related to climate change.

Among these initiatives, we note: The National Office of Meteorology: - Climate-health project: Started in 2011, this project aims to take stock of diseases sensitive to meteorological parameters such as Rift Valley fever, model the correlation between climate and epidemiological data and thus anticipate the occurrence of these diseases and reduce their impact on public health. < *Climate prospects for the Central African Republic for the period 2050-2100* >. A research project is underway in the field of climatological research

#### a. National Institute of Public Health Research

The initiative "Health and environmental vulnerability in the disadvantaged neighborhoods of Bangui (Central African Republic): analysis of the conditions for the emergence and development of diseases in the Sudanese-Sahelian urban environment

#### b. Other initiatives

Various projects implemented with the support of TFPs have addressed, among other things, climate change considerations and their impact on the country's ecosystems and socio-economic development. These include, in particular

- REDD+
- The project of adaptation to CC Integration of climate risks in agriculture and food security (MEDD/UNDP) etc.

### 5.3. Education, training and public awareness

As part of the implementation of Article 6 of the Convention, the CAR has appointed a Focal Point at the UNFCCC to monitor and report on all activities of the Action for Climate Empowerment. In addition, awareness campaigns to inform the public on key climate change adaptation practices and actions to combat climate change are being organized.

- Campaigns through radio and television studios, the private press, the communication unit of the Ministry in charge of the Environment through radio broadcasts and the publication of the newspaper PENDERE GBAKO which disseminates information related to climate change. Communication tools such as banners and images have been produced for this purpose.
- Documentary films on climate change and REDD+ have been produced;

A communication strategy for the Nationally Determined Contribution for the period 2021-2025 has been developed. The overall objective of the strategy is to support stakeholders/women, youth, grassroots communities, indigenous peoples, local authorities,

relevant ministry officials, CSOs, the private sector, etc. to take ownership of the revised NDC.

More specifically, this communication strategy aims, firstly, to inform and sensitize the general public and stakeholders in particular on the challenges of the NDC and their roles in the fight against climate change. Secondly, it aims to ensure the visibility of the activities carried out within the framework of the NDC.

To achieve these objectives, this communication strategy, which will be implemented under the supervision of the National Climate Coordination, relies on the following six (6) approaches

- the approach called Free, Informed and Prior Consent (FPIC)
- Social mobilization
- Social advocacy
- Interpersonal communication
- Event-based communication
- Mass communication.

The implementation of the present communication strategy will allow to correct this deficit and to include the climate change issue among the themes covered by the local media.

The messages selected for this communication plan focus on the added value of the NDC in reducing greenhouse gas emissions and resilience to the effects of climate change, as well as on the socio-economic opportunities that this process offers for the Central African Republic.

This communication strategy is complemented each year by a detailed implementation plan that specifies the contexts and rationale, the objectives sought, the expected results, the activities, the monitoring indicators, the schedule, the media to be used and the budget details.

In order to achieve the communication objectives, appropriate messages that are likely to produce behavioral change will need to be conveyed to the identified targets through media and communication channels that are appropriate to the international and national contexts.

Following the development of the PNA, sensitization workshops were organized in the prefectures of Ombella M'poko, Lobaye, Mambéré Kadeï and Ouaka.

The objective of these awareness-raising workshops was to sensitize local authorities, representatives of sectors and stakeholders involved in the NAP process about the progress, lessons learned and priorities identified since the launch of the process.

The structures in charge of monitoring the phenomenon of climate change are aware that the education, information and awareness-raising dimension is essential for a better appropriation of the phenomenon of climate change. This dimension acts on the behavior of individuals and public and private operators by raising their awareness, alerting them and giving them the tools to evaluate the problem of climate change and the opportunity to integrate it into their daily lives and in the future.

### **5.3.1. Activities carried out**

In the Central African Republic, since the ratification of the UNFCCC, considerable efforts have been undertaken in this direction through training and awareness raising on the various aspects of CC for the benefit of public and private actors and civil society.

- The Education, Training and Public Awareness component of the Third National Communication aims to provide information on
- the institutional framework for the implementation of Article 6 of the Convention
- the level of awareness and understanding of climate change issues
- initiatives and programs carried out or planned for education, training and public awareness in the field of climate change
- Institutional and legal frameworks for public participation and access to information in the field of climate change;
- Sub-regional, regional and international cooperation to promote climate change education, training and awareness
- Gaps, needs and priorities in climate change education, training and public awareness
- efforts to promote information sharing between and within countries and regions
- participation in and contribution to information networks;
- access to, and use of, information technology to support information exchange.

To this end, this report on the state of education, training and public awareness on climate change is structured around the following points

- Institutional and legal framework for education, training and public awareness;
- existing and planned education, training and awareness initiatives and programs
- frameworks for promoting exchanges and information flow;
- Gaps and needs as well as priorities in education, training and awareness raising;
- Recommendations.
- Assessment of Training and Awareness Activities

A set of activities with short, medium and long term measures have been implemented. These are : Review of past training and outreach activities. Past training and outreach activities were directed at operational teams with immediate study or analysis needs associated with the preparation stages of national communications. (i) As part of the initial national communication (INC), teams of experts were trained in three thematic workshops on the modalities for conducting greenhouse gas (GHG) inventories according to the revised 1996 IPCC guidelines, on mitigation analysis and on vulnerability and adaptation assessment. (ii) Within the framework of the NAPA (National Adaptation Plan of Action), two workshops were organized on the Clean Development Mechanism (CDM) and on vulnerability and adaptation measures. (iii) Within the framework of the Second National Communication (SNC), teams of experts were trained in three thematic workshops on the modalities of carrying out Greenhouse Gas (GHG) inventories according to the revised 1996 IPCC guidelines, on mitigation analysis and on vulnerability and adaptation assessment. (iv) As part of the Phase III Technology Needs Assessment, two additional capacity building workshops were conducted. (v) Within the framework of the involvement of gender in policy and change, a workshop bringing together all the sectors was organized. (vi) Within the framework of the NDC, five (05) activities were organized, dealing respectively with the organization of information and sensitization workshops for the actors of the sectors involved in the NDC revision process and the validation of the 2015 NDC evaluation report. The NDC review process has officially begun. Seven (07) activities were organized plus a national validation workshop. (vii) As part of the development of the CAR's BUR1, the government organized training for the teams of experts recruited on how to conduct greenhouse gas (GHG) inventories in accordance with the 2006 IPCC guidelines, on mitigation analysis and on vulnerability and adaptation assessment.

### 5.3.2. Assessment of training and awareness-raising activities in the medium term

These activities are aimed at decision-makers in charge of elaborating development policies and members of thematic working groups in charge of defining programs and means. In total, the following activities have been carried out: (i) Two national workshops for decision-makers on the issue of climate change; (ii) Nine regional workshops to raise public awareness in each of the main towns of the southwestern and central provinces; (iii) Two consultation workshops on technological needs and choices; (iv) Seven workshops to report the results of the thematic studies; (v) Five consultation workshops on the country's vulnerable sectors and regions; (vi) Three regional workshops on the prioritization of the country's vulnerable sectors (vii) An awareness-raising workshop for teachers working in secondary schools and high schools (viii) An information workshop was organized for state institutions, industrialists and NGOs concerned by this new financing mechanism. During the Second National Communication and following a need expressed by the experts in terms of good practices in GHG inventories and evaluation of uncertainties, the interest in capacity building for the upgrading of the group of experts on the new methods established by decision 17/CP.8 was felt and a training workshop was organized accordingly. Three other thematic workshops were also organized, covering: (i) The new methods of realization of the inventories; (ii) The analysis of the mitigation; (iii) The assessment of the vulnerability and the adaptation, (iv) An additive of training on the guide of good practices of the IPCC in the field of the inventories of the greenhouse gases was provided

With regard to the second National Communication, as many meetings and consultations were organized in order to raise awareness among the public, economic operators on CC issues, but also decision makers on the integration of this theme in national planning policies and strategies. But during this same SNA, the Central African Republic also participated in several sub-regional meetings in Namibi, Zibabouwe, Seschelle and Dakar organized by ENDA, UNITAR, UNFCCC, UNEP and UNDP for capacity building.

### 5.3.3. Perspectives

In order to fulfill the implementation of the Convention and to carry out the technical work in a professional manner: It is requested to present also information on the following aspects

- The level of awareness and understanding of climate change issues and the general policy on education, training and public awareness on climate change;
- Climate change education in primary, secondary and higher education;
- Public information initiatives, campaigns and programs implemented or planned;
- Training programs implemented or planned;
- Climate change information centers;
- The institutional and legal framework for public participation and access to information;
- International cooperation promoting education, training and public awareness on CC.

During TCN, the awareness campaign on climate change will focus on regularly updating the content of the website related to the National Climate Coordination on World Bank funding (REDD+ project) in order to design and add more information on climate change, as needed, as well as to mark, interact, coordinate and mobilize citizens on climate change, speaking with a transparent, consistent, authoritative and credible voice. Scheduled Education, Training and Awareness Activities.

**Short term:** A national awareness-raising workshop on climate change, aimed at decision-makers involved in the national environmental planning process (ministry program directors), NGOs working in the environmental sector, local authorities and the general public.

**Medium term:**

- Undertake awareness campaigns and dissemination of the content of the conventions through regional and national workshops
- Training of workers, scientists, educators, and technical and managerial staff, and continuing education of national experts
- Expanding the geographical scope of the awareness campaign to all municipalities;
- Training of managers and staff in charge of data collection and analysis
- Training of managers and staff in charge of data collection and analysis; - Reduction of the atmospheric pollution by the use of less polluting techniques and ecologically clean energies;
- The translation, in the future, into Sango of all documents to be distributed during the workshops.
- The multiplication by the Ministry of the Environment of meetings and the use of all the means of communication at its disposal to ensure a broad public awareness
- Create a climate change forum composed of communicators, national experts, researchers, teachers of all levels (basic, secondary, original, professional and university)
- The development of a program of education, information and public awareness.
- The sensitization of institutions that hold data and information related to climate change.

**Long term**

They are aimed at young students in schools, high schools and universities. As part of the overall long-term training strategy:

- No introductory educational tool on the issue of climate change has been produced to date. Such a tool could be used to sensitize trainers to the issue of CC for the benefit of teachers in universities, engineering schools and didactic training. This approach is completely new for the Central African Republic and will be taken into consideration in the third National Communication.
- A framework for consultation and formulation of concrete proposals will be created to introduce the climate change dimension in the school curricula. Once set up as a course, this tool will allow for the sustainability of the Education, Training and Awareness activity and will ensure its extension to the general public.
- A research periodical will be edited and published, at least once a year, in order to evaluate the result and/or impact of the training, information and public awareness activities.

An integration and networking of stakeholders and decentralization.

#### **5.4. Capacity Building**

In October 2008, UNDP developed a document entitled "Self Assessment of Capacity Building Needs for National and Global Environmental Management in CAR" (Referenced in Section 4.3 Climate Change Domain).

In the current situation, the Central African Republic did not highlight the need for capacity building in national and global environmental management in the 2008-2010 Poverty Reduction Strategy Paper.

Its vision of poverty reduction is not only very short term, but also does not take into account the need to give pride of place to sustainable management, a concern established over the medium and long term.

This is why the capacity self-assessment exercise revealed the need, in order to strengthen national and global environmental management capacities, to define a sufficiently distant ambition in time, within the framework of a strategic planning process that relies on existing competencies and that enhances them.

In this perspective, the ambition at this time would be, by 2015, to systematically integrate the process of assessing the political, institutional, human, administrative, private sector, and civil society capacities. But already, the most urgent thing was to start taking steps to develop the necessary capacities as part of a strategic process to optimize the use of locally available skills and capacities.

The self-assessment exercise revealed as a priority a critical mass of chronic deficiencies in national and global environmental management capacities. Human, technical, and organizational resources are sorely lacking, but determining them exhaustively according to the various mechanisms provided for in the three conventions was not easy. This is why the exercise does not provide a quantitative and qualitative exhaustive and reliable statement of the existing potential, nor of the exact needs in terms of capacity building for national and global environmental management.

#### **5.4.1. Organization of capacity building workshops for the Sectors involved in the revision of the NDC.**

Other actions were carried out to popularize the knowledge on the development of allometric equations through exchange meetings with the scientific communities of three universities. These meetings were attended by students and teacher-researchers from the University of Bangui, the University of Equatorial Guinea and the University of Kisangani in DRC. At least 250 people were educated on the methodology used for the definition of allometric equations in the Congo Basin countries.

Within the framework of the scientific partnership, two series of capacity building sessions were organized in CAR by the project: the first on the estimation of carbon emission factors and the second on the analysis of biomass data for the development of allometric equations and also capacity building continued.

#### **5.4.2. Information and Networking**

Information sharing workshops organized by COMIFAC, GIZ, and other partners. Establishment of a working group in the COMIFAC zone GTCC, AGN, PMAS group, NAPs EXPO; Peer Learning Summit, which addresses National Adaptation Plan (NAP) processes that address gender issues; Africa Climate Change Week, Conference of Parties, SBI sessions.

There is also the PRE REDD project, which had the objective of "Strengthening the capacities of the Congo Basin countries on issues related to REDD+ and in particular on the measurement of forest carbon stocks", in which the six forest countries of the Congo Basin (Cameroon, Congo, Gabon, Equatorial Guinea, Central African Republic and Democratic

Congo) committed to coordinate their efforts around this project. Overall, the project has helped build the capacity of Congo Basin states to prepare, submit and defend their interests, priorities and positions, which have been incorporated into several UNFCCC decisions, including the Paris Climate Agreement and the rulebook for its implementation. The project has equipped COMIFAC member countries with forest biomass estimation tools and developed sub-regional expertise.

As a first action of the project, a review of scientific work in Central Africa on the measurement and monitoring of forest carbon stocks with a particular focus on allometric equations was conducted. This inventory allowed to specify the needs and gaps on biomass measurement, to orientate the development of allometric equations and to constitute a database of national and international experts;

For ISN and master and doctoral students working on forest biomass estimation in particular, to analyze forest biomass data and to introduce methods for writing scientific papers. Nearly 200 participants identified within national scientific institutions (ISN), universities and administrations (CNREDD+), conservation organizations took part and acquired knowledge on data analysis and manipulation of the free statistical software R. An individual work of these learners would allow to fix the acquired knowledge durably.

During these activities, nearly 300 experts interested in forest biomass were identified. The "carbon scientific platform" containing, among other things, the scientific information produced by the project was created to allow scientific exchanges between these experts whose role as advisors to their administrative and political authorities is recognized. Throughout the development process of the allometric equations, these experts have been actively involved and constitute an internationally recognized pool. 117 have registered on the platform and have contributed to the animation of the forum of exchanges between scientists. The public can also access it by clicking on the link <https://www.pcarbone.comifac.org>

The website of the virtual exchange platform is now separate from the PREREDD+ website and can be accessed at <http://PREREDD+.comifac.org> in order to ensure its continuity beyond PREREDD+.

A discussion group on LinkedIn has been created: <https://www.linkedin.com/groups/12090112> to facilitate exchanges and interconnection between international researchers and those of the sub-region.

The members of the ISNs of each country were trained on the methods of data processing and elaboration of allometric equations during the different national scientific workshops. After processing the data, they contributed to the modeling of the allometric equations which consisted of: (i) testing the predictive quality of the existing local and pantropical equations for aboveground biomass by forest type, (ii) proposing one or more best equations for biomass prediction by forest type, (iii) evaluating their predictive quality of the other forest types, (iv) proposing one or more best regional equations and (v) evaluating their predictive quality.

### **5.4.3. Capacity building and facilitation of exchanges between project proponents and CNREDD+**

An inventory of REDD+ "projects" and "initiatives" in the Central African sub-region was conducted.

#### **Establishment and facilitation of a network of REDD+ project promoters at the sub-regional level**

A list of approximately 700 contacts of specialized REDD+ actors with different profiles (people active in REDD+ projects and initiatives, members of CN-REDD+, international cooperation projects and the donor community, etc.) was produced for the six COMIFAC forest countries.



## CHAPITRE VII

# 6. CHALLENGES AND GAPS

## 6.1. Constraints and difficulties related to the preparation of the national communication

### 6.1.1. At the legal and regulatory level

Several application texts provided for by the Environment Code have not yet been put in place. These texts should explicitly integrate the aspects of climate change and especially the issue of greenhouse gas emissions.

### 6.1.2. At the institutional level

- The National Climate Coordination, which is the national structure in charge of implementing the United Nations Convention on Climate Change, does not have sufficient human, financial and material resources to properly carry out its mission;
- There are no environmental units in all the sectoral departments concerned with the issue of climate change;
- The very young nature of the environment department and its insufficient operating resources.

### 6.1.3. At the technical level

- The weak capacity of the structures producing and holding activity data;
- Insufficient methodologies and acquisition of new technology (software, etc.);
- Technical difficulties in identifying appropriate technologies and estimating costs.
- The emission factors used are default factors;
- The model chosen for the elaboration of the climate change scenarios was considered to be inefficient;
- Insufficient availability of resource persons mandated by the institutions for climate change studies specific to their own sectors;
- The lack of quality data.
- Insufficient national technical expertise in terms of both quantity and quality
- The lack and even the non-existence of a national model constitute a handicap to arrive at a reliable result.
- The archaic character of the systems of collection, treatment and transfer of observations, the lack of automation of the stations.
- The environment and in particular climate change are not yet considered as a discipline in its own right in CAR.

### 6.1.4. At the financial level

The shortcomings at the financial level can be summarized as follows

- Lack of funding for research projects related to climate change;
- Low contribution of the State in the Climate Change projects.
- The studies carried out since the Initial National Communication and within the framework of the NAPA have not resulted in the formulation of bankable priority projects in the field of climate change.

- The financing already granted to the country by the GEF has so far been directed only towards studies and capacity building and not towards the realization of concrete projects on the ground.

### 6.1.5. Capacity Building Needs

Capacity building is a priority in the implementation of the UNFCCC and the other post-Rio Conventions. This priority is also emphasized in national policies and strategies. Despite this political will, there are still many gaps to be filled before we have the national competence and expertise necessary to lead successful and sustainable climate change initiatives.

## 6.2. Constraints and gaps

### 6.2.1. Gaps and constraints related to the realization of GHG inventories

In the area of GHG inventory preparation, significant progress has been made in terms of the level of knowledge and competence of the experts involved. However, difficulties and gaps remain. These relate to activity data and emission factors. They are compiled in Table 79.

Table 79: Gaps and constraints in the IGES framework

<b>METHODOLOGICAL BASIS</b>	<b>CONSTRAINTS AND GAPS</b>
<p><b>Analysis of emissions by gas type and sub-sector.</b> Uncertainty analysis ; Tier 1 baseline approach providing only aggregated estimates of emissions by fuel type; Guidelines for the establishment of national inventory systems developed by the UNFCCC Secretariat; IPCC Technical Guidelines for National GHG Inventories; UNFCCC/UNFCCC software version 1.3.2 for compiling UNFCCC Non Annex I inventory Software (NAIIS) for estimating GHG emissions; Method 1 for identifying total areas for each land use category; Tier 1 sectoral method based on end-use data, fuel types and energy sector specific technology; General IPCC methodology, 1996 revised version for emission estimation.</p> <p><b>Implementation of QA/QC procedures, reviews and audits.</b> Emissions recalculations ; Three carbon pools: living biomass, dead organic matter and soil organic matter;</p>	<p>Lack of specific data and statistics from regular comprehensive forest inventories; Lack of disaggregated activity data in all sectors; Lack of CAR-specific emission factors and conversion factors; Lack of information on appropriate industrial process methodologies for some categories such as artisanal manufacturing; High degree of uncertainty; Default biomass expansion factors for estimating biomass in forests; Unavailability of activity data for some sub-categories; Insufficient financial resources for further data collection. The method for identifying land use areas does not provide detailed information on variations in area between categories, and is only spatially explicit at national or regional level; The data used for the uncertainty assessment are annual but the correction</p>

Use of IPCC default emission factors and correction factors for emission estimation;  Technical checks for QA/QC	factors and emission factors are IPCC default data;  Uncertainties on data collected from institutions are not available;  Lack of specific data on urban forestry;  Lack of specific emission factors for CAR;  Lack of appropriate national statistics for activity data;  Lack of good statistics in some categories on all informality;  Lack of CAR-specific emission factors (EC) and correction factors;  Insufficient statistics on activity data. activity data.
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### 6.2.2. Gaps and constraints related to vulnerability and adaptation studies

Analysis of the reports of the vulnerability and adaptation studies conducted under the TCNCC indicates a need for improved understanding of issues related to vulnerability assessment and mastery of tools and methodologies. The gaps and constraints are summarized in Table 30.

Table 80: Constraints and gaps in the V&A studies

Sectors	Types of analysis	Constraints	Gaps
AFAT	Climate scenarios ; Methodology of the study;  Establishment of the socio-economic scenarios;	Low availability of up-to-date data; non-compliance of the methodology and tools used.	High degree of uncertainty related to data and methodology.
Energy	Environmental scenario building;	low availability of up-to-date	degré élevé d'incertitude lié aux données.
Health and Human Beings	Data quality analysis quality analysis;  choice of model for assessing vulnerability and adaptation to climate change;	low data availability or data or difficult access to up-to-date data; heavy dependence on previous studies (SNA);	high degree of uncertainty in the data and methodology ; lack of scenario on socio-economic data
Water Resources	construction of scenarios;  impact and vulnerability of CAR.	Lack of data for some sub-sectors and poor data availability for others.	high degree of uncertainty high degree of uncertainty in the data; non-exhaustiveness of the study in the area.

### 6.2.3. Gaps and constraints related to the mitigation studies

From the analysis of the results of the mitigation studies, numerous constraints were observed and summarized in the table below.

Table 81: Gaps and constraints in mitigation studies

Secteur	Lacunes et Contraintes
ENERGY	unavailability of data from the structures responsible for collecting them; numerous inconsistencies noted during the analysis of the data; too short a period of time to carry out the study and deepen other aspects of the mission; insufficient capacity building of the experts responsible for carrying out the studies Weak technical and team capacity of the institutions responsible for carrying out the studies.
AGRICULTURE	Lack of capacity to use appropriate software for the types of data available, forcing experts to build scenarios in Excel; data are mostly from estimates and not from actual measurements in the field; unreliable and inconsistent data and sometimes difficult to access; large margin of error; Too little time to carry out the study and to pursue other aspects of the assignment; Insufficient capacity building of the experts in charge of carrying out the studies; weak technical and team capacity of the institutions responsible for carrying out the studies.
LULUCF	Inadequacy of the tools and approaches proposed for the IPCC assessment, in particular the method of carrying out the assessments online (through the internet connection) with the new version of the COMAP software; Poor quality of the internet connection in the country, which means that a lot of time is spent without making progress in the analyses; Inconsistency in most of the data collected from the structures holding the information; Too little time to carry out the study and to pursue other aspects of the assignment; insufficient financial resources to undertake data collection from rural actors; Insufficient capacity building of the experts responsible for carrying out the studies; Weak technical and team capacity of the institutions in charge of carrying out the studies.

### 6.2.4. Gaps and constraints in climate change research

Several constraints and gaps have been identified in the research sector on the issue of climate change. Generally speaking, these are

- The insufficient consideration of the climate change issue in medium and long term development projects;
- the lack of material and financial means for the implementation of research programs
- research programs;
- the weak collaboration between the different institutions and researchers leading to a mismatch between the needs of the institutions and the research results
- poor dissemination of research results.

At the institutional level, these are

- The low involvement of observation and research structures in the development and implementation of urban development and land use policies and plans;
- the absence of a national structure in charge of forestry research
- the weak capacity of observation and research centers in monitoring CC.

In terms of human resources, there is a lack of human capacity in the field of systematic observation and research, particularly in oceanography, oceanology, meteorology, climatology and continental hydrology.

On the systemic level, we note:

- The weak technical and material capacity for observation and research in CC;
- The insufficiency in the development of the climate forecasting mechanism;
- The lack of oceanographic and hydrological forecasting mechanisms.

### 6.2.5. Gaps and constraints related to research on financial resources and technical support

The Central African government has benefited from GEF funds via UNEP for the realization of its National Communications. Provide information on assistance received and pledged to the Central African Republic in these same areas. Information on needs allows donors to better understand these needs and therefore to offer better targeted aid. Information on aid received allows for an understanding of what the country has received in terms of quality and quantity, a key criterion for aligning donor strategies and improving aid transparency. Transparency on aid receipt also allows for comparisons with published donor reports and helps to resolve any inconsistencies.

### 6.3. Project Mapping: Period 2017 - 2022 (RCPCA)

Environnement	Nombre Projet	Financement	Décaissement	Taux décaissé	Reste	Taux Reste
BM	1	2 587 500 000	1 759 500 575	68%	827 999 425	32%
CAFI	1	385 000 000	385 000 000	100%	0	0%
MINUSCA	1	105 900 050	0	0%	105 900 050	100%
RCA	1	122 980 000	122 980 000	100%	0	0%
USA	3	920 821 100	445 642 200	48%	475 178 900	52%
FEM	1	3 278 900 900	819 725 225	25%	2 459 175 675	75%
<b>Total</b>	<b>8</b>	<b>7 401 102 050</b>	<b>3 532 848 000</b>	<b>48%</b>	<b>3 868 254 050</b>	<b>62%</b>

Other projects whose funding is mobilised by the Ministry in charge of the Environment, executed by United Nations agencies and sectoral departments.

Title	Type de financement	Agences de mise en oeuvre	Département de mise en oeuvre	Financement alloué	Statut
Gestion intégrée des ressources naturelles dans le paysage de la forêt de Ngotto et le parc national de Mbaéré-Bodingué	Biodiversité, Climat et Désertification	Banque Mondiale	• Ministère des Eaux et Forêts,	4 183 784 550	En exécution
Amélioration des systèmes agro-écologiques dans les préfectures du Nord de la République Centrafricaine (RCA)	Biodiversité, Climat et Désertification	Banque Africaine de Développement	• Ministère en charge de l'Agriculture	1 406 868 100	En exécution
Intégration des risques climatiques dans l'agriculture et la sécurité alimentaire.	Climat	PNUD	• Ministère en charge de l'Agriculture	1 322 000 000	En attente de signature de l'accord de dons
Promotion de mini-réseaux basés sur la petite hydroélectricité pour un meilleur accès aux services énergétiques modernes en République centrafricaine	Climat	PNUD	• Ministère de l'Energie	1 454 750 000	En exécution
Réduction de la vulnérabilité rurale et urbaine au changement climatique par l'approvisionnement en eau	Climat	BAD	• Ministère de l'hydraulique	3 927 000 000	En exécution
Programme Micro-financement (appui aux populations, OSC et ONG) *	Biodiversité, Climat, Désertification	PNUD	• OSC et ONGs	345 950 000	En exécution
Projet forêt dense de Bangassou.	Biodiversité	PNUD	• Ministère des Eaux, Forêts,	1 375 000 000	Clôturé

### 6.3.1. List of proposed projects

A list of projects proposed for funding under the Third National Communication.

<b>Project title</b>	<b>Sustainable management and recovery of industrial and household waste in the city of Bangui and its surroundings</b>	
<b>Result areas targeted by the project</b>	<u>Reduction of emissions from :</u> <input type="checkbox"/> Energy access and production <input type="checkbox"/> Low-emission transport <input checked="" type="checkbox"/> Buildings, cities, industries and appliances <input type="checkbox"/> Forestry and land use	<u>Increased resilience of:</u> <input type="checkbox"/> More vulnerable people and communities <input checked="" type="checkbox"/> Health & well-being, & food & water security <input type="checkbox"/> Infrastructure and built environment <input type="checkbox"/> Ecosystems and ecosystem services
<b>Justification of the project</b>	<p>The management and recovery of industrial and household waste is one of the greatest challenges facing the populations of Bangui and its surroundings. The unplanned dumping of municipal and industrial waste is a common practice. In the absence of a reliable solid waste collection and management system in the city of Bangui and its surroundings, several spontaneous dumps appear in the open spaces of the neighbourhoods. Only 6% of the household waste produced in the city is managed properly by the municipal services or private operators. The dumping of waste in the drainage channels is a main cause of recurrent seasonal flooding each year in the city of Bangui.</p> <p>In addition, the unsustainable management of household and industrial waste is an equally important source of greenhouse gas (GHG) emissions. According to the Nationally Determined Contribution (2015), waste accounted for 0.09% of total GHG emissions in 2010 and is expected</p>	

	<p>to increase to more than 3.2% in 2050, i.e. three times the 2010 level if no intervention is implemented. To reverse this trend, the NDC recommends a range of interventions including the development of a waste management plan, the establishment of waste management units, and the recovery of waste. It is in line with these recommendations that the present project plans to strengthen waste management and recovery in the city of Bangui and its surroundings.</p> <p>The objective of this project is to strengthen the sustainable management and recovery of waste in the city of Bangui and its surroundings in order to reduce GHG emissions and improve the well-being of the population.</p>		
<b>Expected outcome(s)</b>	<p>The following results are expected from the implementation of the project:</p> <ol style="list-style-type: none"> <li>1. The institutional and regulatory framework for the sustainable management and recovery of household and industrial waste is established</li> <li>2. A plan for sustainable management and recovery of household and industrial waste with a medium and long term financing strategy developed</li> <li>3. Operational (e.g. setting up/expanding waste collection, storage and treatment systems, etc.) and human (e.g. training in modern waste recovery techniques) capacities are strengthened</li> <li>4. Populations and industrial operators are sensitised and trained in sustainable waste management practices and behaviour.</li> </ol>		
<b>Compliance with the relevant investment criteria of several lessors</b>	<p><b>Potential impact:</b> The project will have a significant impact on the reduction of GHG emissions, as well as on strengthening the adaptive capacities of the population. The project will reduce the trend of increasing GHG emissions from household and industrial waste. In addition, sustainable waste management will reduce the vulnerability of at least 300,000 people to flooding due to clogged water channels.</p> <p><b>Sustainable development potential:</b> The project will have significant environmental and socio-economic co-benefits. On the environmental side, the sustainable management of household and industrial waste will reduce pollution risks and improve the quality of life. On the socio-economic level, waste recovery will provide an alternative income-generating activity for disadvantaged populations, particularly women and young people, and improve their livelihoods. For example, the production of compost from waste can be used as fertiliser for the fields, thus increasing agricultural productivity and improving food security.</p> <p><b>Potential for paradigm shift:</b> The project will drive a real paradigm shift as it will drive a new approach to sustainable waste management and recovery based on a robust and coherent regulatory framework, accompanied by appropriate operational measures.</p>		
Project duration/period	5 years		
Potential accredited entity/entities	<b>World Bank</b>		
Financial arrangement(s)	<b>Total cost of the project</b>		<b>Amount requested</b>
	13 millions USD		10 millions USD
Financial instrument(s)	<input checked="" type="checkbox"/> Subvention <input checked="" type="checkbox"/> Prêt <input type="checkbox"/> Garantie      Autre : préciser _____		
Action plan / Next steps	<b>Action</b>	<b>Designated Actors</b>	<b>Time</b>
	Development of a project concept note	Directorate General of Hydraulics / National Agency for Water and Sanitation in rural areas	4 month
	Development of the PPF for the feasibility studies	Directorate General of Hydraulics / National Agency for Water and Sanitation in rural areas	4 month
	Development of the project proposal	Directorate General of Hydraulics / National Agency for Water and Sanitation in rural areas	10 month
<b>Other comments</b>			

<b>Project title</b>	<b>Development of the National Adaptation Plan of the Central African Republic</b>	
<b>Result areas targeted by the project</b>	<u>Reduction of emissions from :</u> <input type="checkbox"/> Energy access and production <input type="checkbox"/> Low-emission transport <input type="checkbox"/> Buildings, cities, industries and appliances <input type="checkbox"/> Forestry and land use	<u>Increased resilience of :</u> <input checked="" type="checkbox"/> More vulnerable people and communities <input checked="" type="checkbox"/> Health & well-being, & food & water security <input type="checkbox"/> Infrastructure and built environment <input checked="" type="checkbox"/> Ecosystems and ecosystem services
<b>Justification of the project</b>	<p>The CAR is very vulnerable to the harmful effects of climate change. Indeed, climate variations and their extremes have and will continue to have a negative impact on key sectors of the Central African economy, such as the agricultural sector, on which more than 80% of the population depends, if measures to reduce vulnerability and strengthen adaptive capacities are not implemented. It is with this in mind that CAR has made adaptation, particularly for the most exposed, poorest and most vulnerable populations, a priority area and an opportunity to promote more equitable and sustainable socio-economic development at the grassroots level that can meet the challenges of peace and stability (CDN 2015).</p> <p>To date, the overall adaptation strategy at the national level is based on the National Adaptation Programme of Action (NAPA 2008) which identified six options translated into ten priority projects to be implemented in order to respond to urgent and immediate climate change adaptation needs. When it was drawn up, the Central African government recognised the NAPA not as the ultimate goal, but rather as a step to be taken in order to be able to respond in a sustainable manner to the needs of adaptation to climate change. The Paris Agreement ratified by the Central African Government recognises the need to combine the unilateral approach to adaptation to climate change as translated by the NAPA with a more integrated approach in the framework of the National Adaptation Plan (NAP). In concrete terms, it is a matter of member countries integrating climate change in general and adaptation to climate change in particular into their development plans. This project intends to support the CAR in this process.</p> <p>The objective of this project is to contribute to the development of a National Adaptation Plan in CAR in order to integrate climate change adaptation into development plans.</p>	
<b>Expected outcome(s)</b>	<p>The following results are expected from the implementation of the project:</p> <ol style="list-style-type: none"> <li>1. Institutional coordination and knowledge management on climate change adaptation are strengthened</li> <li>2. Adaptation priorities in the most vulnerable sectors are identified and the National Adaptation Plan developed</li> <li>3. A medium- and long-term financing plan is developed, including a mechanism for monitoring adaptation investments</li> </ol>	
<b>Compliance with the relevant investment criteria of several lessors</b>	<p><b>Potential impact:</b> The project will have a significant impact on reducing vulnerability and strengthening the adaptive capacities of Central African populations, particularly through the integration of climate change adaptation into national and sectoral development plans. For example, integrating climate change adaptation into the agricultural sectoral plan will increase agricultural production and productivity for the most vulnerable populations.</p> <p><b>Sustainable development potential:</b> The project will have significant socio-economic co-benefits. Indeed, the integration of adaptation to climate change into the national development plan, following the example of the RCPA, will allow CAR to resolutely place its development on the path of resilience to climate change, which will have the effect of reducing future costs and improving the well-being of the population.</p> <p><b>Potential for a paradigm shift:</b> The project will bring about a real paradigm shift insofar as it intends to combine the current unilateral approach to climate change adaptation as embodied in the NAPA with a more robust approach that consists of integrating climate change adaptation into national and sectoral development plans. The combination of these two approaches will allow CAR to more efficiently achieve its sustainable development objectives.</p>	
<b>Project duration/period</b>	2 years	
<b>Potential accredited entity/entities</b>	<b>To be determined</b>	
	<b>Total cost of the project</b>	<b>Amount requested</b>

Financial arrangement(s)	2.5 millions USD	2 millions USD	
Financial instrument(s)	<input checked="" type="checkbox"/> Subvention <input type="checkbox"/> Prêt <input type="checkbox"/> Garantie      Autre : préciser _____		
Action plan / Next steps	<b>Action</b>	<b>Designated Actors</b>	<b>Time</b>
	Development of a project concept note	Ministry of the Environment and Sustainable Development/National Climate Coordination	3 month
	Development of the PPF for the feasibility studies	Ministry of the Environment and Sustainable Development/National Climate Coordination	3 month
	Development of the project proposal	Ministry of the Environment and Sustainable Development/National Climate Coordination	6 month
Other comments			

<b>Project title</b>	<b>Dimoli hydroelectric scheme (sub-prefecture of Sosso-Nakombo) in Central African Republic</b>	
<b>Result areas targeted by the project</b>	<u>Reduction of emissions from :</u> <input checked="" type="checkbox"/> Energy access and production <input type="checkbox"/> Low-emission transport <input type="checkbox"/> Buildings, cities, industries and appliances <input type="checkbox"/> Forestry and land use	<u>Increased resilience of:</u> <input type="checkbox"/> More vulnerable population and communities <input checked="" type="checkbox"/> Health & well-being, & food & water security <input checked="" type="checkbox"/> Infrastructure and built environment <input type="checkbox"/> Ecosystems and ecosystem services
<b>Justification of the project</b>	<p>The CAR has an impressive hydroelectric potential estimated at 2000 MW. However, only 1% of this potential is exploited, resulting in a national electricity access rate of 3.7%, one of the lowest in Africa (16% on average). Because of the low rate of access to electricity, the population relies more on biomass (firewood and charcoal) as the energy source of choice for almost all Central African households, particularly for cooking and lighting. According to the CAR's National Determined Contribution (NDC), energy consumption, particularly biomass, accounted for 5.19% of greenhouse gas (GHG) emissions in 2010 and is expected to rise to 13.4% by 2030. This trend is incompatible with the CAR's commitments to reduce its GHG emissions by at least 5% and 25% respectively from the baseline by 2030 and 2050.</p> <p>In order to reverse this trend, the government has developed an ambitious 2016-2030 Electricity Sector Investment Programme aimed at increasing access to electricity throughout the country, particularly in peri-urban and rural areas. The Dimoli hydroelectric scheme, with a production capacity of 180 MW, has been selected as a strategic element in the implementation of the said investment programme.</p> <p>The objective of this project is to contribute to the Dimoli hydropower scheme in support of the implementation of the 2016-2030 Electricity Sector Investment Programme.</p>	
<b>Expected outcome(s)</b>	<p>The following results are expected from the implementation of the project:</p> <ol style="list-style-type: none"> <li>1. The Dimoli power generation, transmission and distribution network is rehabilitated, expanded and functional;</li> <li>2. Access to electrical energy by households in urban, rural and surrounding areas of Dimoli is facilitated (at least 50% of households have access to electrical energy, i.e. 30,000 people)</li> <li>3. Local capacities (human and institutional) for the maintenance and securing of the Dimoli power generation, transmission and distribution network are strengthened</li> </ol>	
<b>Compliance with the relevant investment criteria of several lessors</b>	<p><b>Potential impact:</b> The project will have a significant positive impact on the reduction of GHG emissions due to the likely reduction in biomass use. By benefiting from easier access to electrical energy, households will reduce their consumption of firewood and/or charcoal for lighting, resulting in a reduction in GHG emissions related to forest degradation.</p> <p><b>Sustainable development potential:</b> The project will have significant environmental and socio-economic co-benefits. Indeed, the reduction in the use of charcoal and/or firewood for lighting by households will result in a reduction in deforestation and forest degradation, which will contribute to the protection of biodiversity. Furthermore, regarding social co-benefits, facilitated access will significantly improve the living conditions of vulnerable populations, including the education of</p>	

	<p>children and the resilience of women and girls who are mainly responsible for collecting wood for lighting.</p> <p><b>Beneficiaries' needs:</b> Limited access to modern energy sources is a major obstacle to sustainable development in CAR. Strengthening access to electrical energy through the project therefore responds to CAR's deep-seated aspirations, notably to become an emerging country by 2030 according to the RCPCA.</p>		
Project duration/period	5 years		
Potential accredited entity/entities	<b>World Bank</b>		
Financial arrangement(s)	<b>Total cost of the project</b>		<b>Amount requested</b>
	50 millions USD		20 millions USD
Financial instrument(s)	<input checked="" type="checkbox"/> Subvention <input checked="" type="checkbox"/> Prêt <input type="checkbox"/> Garantie      Autre : préciser _____		
Action plan / Next steps	<b>Action</b>	<b>Designated Actors</b>	<b>Time</b>
	Development of a project concept note	Agence Autonome d'Electrification Rurale de Centrafrique (ACER)/World Bank	4 month
	Development of the PPF for the feasibility studies	Agence Autonome d'Electrification Rurale de Centrafrique (ACER)/World Bank	4 month
	Development of the project proposal	Agence Autonome d'Electrification Rurale de Centrafrique (ACER)/World Bank	10 month
<b>Autres commentaires</b>	An identification visit was made to the site by ENERCA in 2019.		

<b>Project title</b>	<b>Integrated and joint management of surface and groundwater in the Ubangi-Chari river basins in CAR</b>	
<b>Result areas targeted by the project</b>	<u>Reduction of emissions from :</u> <input type="checkbox"/> Energy access and production <input type="checkbox"/> Low-emission transport <input type="checkbox"/> Buildings, cities, industries and appliances <input type="checkbox"/> Forestry and land use	<u>Increased resilience of :</u> <input checked="" type="checkbox"/> More vulnerable population and communities <input checked="" type="checkbox"/> Health & well-being, & food & water security <input type="checkbox"/> Infrastructure and built environment <input checked="" type="checkbox"/> Ecosystems and ecosystem services
<b>Justification of the project</b>	<p>Climate change is having a significant negative impact on the Central African Republic's water resources, particularly the Ubangi-Chari river basins, which are the country's main water reservoirs. For more than two decades, the increase in temperature and the decrease in rainfall have resulted in the drying up of these river basins, with drastic consequences for the water supply of the population. For example, the decrease in the flow of the Oubangui River, which supplies the drinking water distribution company (SODECA), has repercussions on the quantity of water available to the population. Today, SODECA is unable to cover the country's drinking water needs and the rate of service is estimated at only 34%, which is very low compared to other countries in the sub-region.</p> <p>This project aims to improve access to water for the well-being of the population and their ecosystems through integrated management of surface and groundwater in the Ubangi-Chari river basins.</p>	
<b>Expected outcome(s)</b>	<p>The following results are expected from the implementation of the project:</p> <ol style="list-style-type: none"> <li>1. In-depth knowledge on environmental, socio-economic and cultural components of the basins for an informed and integrated water resources management is established</li> <li>2. The legal and regulatory framework for joint and sustainable management of surface and groundwater is established</li> </ol>	

	3. Institutional and human capacities for participatory and sustainable surface and groundwater basin management are strengthened														
<b>Compliance with the relevant investment criteria of several lessors</b>	<p><b>Potential impact:</b> The project intends to address the adaptation concerns of at least 500,000 direct and indirect beneficiaries by strengthening their adaptive capacity and establishing an enabling regulatory and institutional framework.</p> <p><b>Paradigm shift:</b> The project intends to fundamentally change the current approach to water management by laying the foundation for an innovative integrated and participatory approach to surface and groundwater management.</p> <p><b>Sustainable development potential:</b> The project will have significant environmental and socio-economic co-benefits, including improved sustainable access to water resources in general for economic activities and drinking water in particular for the well-being of the population.</p>														
Project duration/period	5 year														
Potential accredited entity/entities	UNDP														
Financial arrangement(s)	<b>Total cost of the project</b>		<b>Amount requested</b>												
	15 millions USD		10 millions USD												
Financial instrument(s)	<input checked="" type="checkbox"/> Subvention <input type="checkbox"/> Prêt <input type="checkbox"/> Garantie      Autre : préciser _____														
Action plan / Next steps	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 40%;">Action</th> <th style="width: 30%;">Designated Actors</th> <th style="width: 30%;">Time</th> </tr> </thead> <tbody> <tr> <td>Development of a project concept note</td> <td>UNDP/ Ministry in charge of Water</td> <td>3 month</td> </tr> <tr> <td>Development of the PPF for the feasibility studies</td> <td>UNDP/ Ministry in charge of Water</td> <td>3 month</td> </tr> <tr> <td>Development of the project proposal</td> <td>UNDP/ Ministry in charge of Water</td> <td>8 month</td> </tr> </tbody> </table>			Action	Designated Actors	Time	Development of a project concept note	UNDP/ Ministry in charge of Water	3 month	Development of the PPF for the feasibility studies	UNDP/ Ministry in charge of Water	3 month	Development of the project proposal	UNDP/ Ministry in charge of Water	8 month
	Action	Designated Actors	Time												
	Development of a project concept note	UNDP/ Ministry in charge of Water	3 month												
	Development of the PPF for the feasibility studies	UNDP/ Ministry in charge of Water	3 month												
Development of the project proposal	UNDP/ Ministry in charge of Water	8 month													
<b>Autres commentaires</b>															

<b>Project title</b>	<b>Development of renewable energy and energy efficiency in the Central African Republic</b>	
<b>Result areas targeted by the project</b>	<u>Reduction of emissions from :</u> <input checked="" type="checkbox"/> Energy access and production <input type="checkbox"/> Low-emission transport <input type="checkbox"/> Buildings, cities, industries and appliances <input type="checkbox"/> Forestry and land use	<u>Increased resilience of:</u> <input type="checkbox"/> More vulnerable people and communities <input checked="" type="checkbox"/> Health & well-being, & food & water security <input type="checkbox"/> Infrastructure and built environment <input type="checkbox"/> Ecosystems and ecosystem services
<b>Justification of the project</b>	<p>The CAR has immense potential for renewable energy, such as hydroelectricity, biomass and solar energy. Hydroelectricity represents one of the greatest potentials in renewable energy with an estimated capacity of 2000 MW. However, the national access rate remains very low at 3.7%, the lowest in Central Africa. Moreover, the efficiency of the production and distribution circuits is very low due to high technical and non-technical losses of the same order of magnitude as final consumption (78 GWhs in 2011). Biomass is the main source of energy for the population, representing 96% of national energy consumption in 2016. This biomass is essentially made up of firewood and charcoal, whose production and consumption methods are inefficient and unsustainable. Access to modern energy sources for cooking, such as improved stoves and liquefied petroleum gas (LPG), is limited to well-off households and only in the capital. Solar energy is also an important source of renewable energy with an annual global solar radiation of about 6.6 GJ m<sup>2</sup>/year (5 kWh/m<sup>2</sup>/day), corresponding to an average sunshine duration of 2,600 hours per year, or 7.1 hours per day. Despite this potential, the use of solar energy is still at an embryonic and isolated stage (e.g. rural water pumping, health centres, lighting for religious communities and the APDS office in Bayanga). No industrial development has been carried out, with the exception of the Damara experiment several years ago.</p>	

	<p>It therefore appears that, despite its immense natural potential for renewable energy sources, CAR is struggling to take full advantage of this opportunity to resolutely embark on the path of low-carbon development as set out in its international commitments, notably its Nationally Determined Contribution (NDC). Current practices in the development, dissemination and efficient use of renewable energies are still far from realising this potential due to an inappropriate institutional and regulatory framework, the absence of an information and energy planning system as a real decision-making tool, a lack of coordination between the actors concerned, the unsuitability of the technology used, as well as the weakness of human and financial capacities (e.g. high initial capital costs). It is in this context that the present project intends to remedy these constraints with a view to promoting the development and popularisation of renewable energies, as well as strengthening energy efficiency in CAR.</p> <p>The objective of this project is to contribute to the development and popularisation of access to renewable energy, as well as to the strengthening of energy efficiency.</p>		
<b>Expected outcome(s)</b>	<p>The following results are expected from the implementation of the project:</p> <ol style="list-style-type: none"> <li>1. The institutional and regulatory framework for renewable energy development is established</li> <li>2. Research and development (e.g. development of solar thermal technologies for cooking), human and institutional capacities are strengthened</li> <li>3. Minimum standards and good practices in energy efficiency are established and implemented (e.g. substitution of existing thermal power plants by micro or mini solar photovoltaic or hydroelectric power plants; substitution of incandescent lamps by energy saving lamps)</li> <li>4. Fiscal (e.g. reduction of customs duties) and non-fiscal (e.g. multi-faceted advisory support, including financial support to households) incentives for private investment and extension of access to and use of renewable energy and energy efficient technologies are applied.</li> </ol>		
<b>Compliance with the relevant investment criteria of several lessors</b>	<p><b>Potential impact:</b> The project will have a significant impact on the reduction of GHG emissions due to the increase in energy efficiency at the industrial and household level, but also due to the substitution of GHG emitting energy sources by clean energy sources. For example, the substitution of incandescent lamps by solar energy at the household level should be accompanied by a significant decrease in GHG emissions from incandescent lamps.</p> <p><b>Sustainable development potential:</b> The project will have significant environmental, social and economic co-benefits. Indeed, the substitution of charcoal and/or firewood by solar energy for household lighting will result in a reduction of deforestation and forest degradation, which will contribute to the protection of biodiversity. In addition, on the social level, the strengthening of energy efficiency at the industrial, administrative and household levels will generate savings that can be invested in other priority development areas such as health and education. There will also be a reduction in the prevalence of certain diseases, such as lung diseases resulting from the inhalation of smoke from burning wood fuel.</p> <p><b>Potential for a paradigm shift:</b> The project will bring about a real paradigm shift insofar as it will establish an institutional and legal framework for the development of renewable energy in CAR. Secondly, the project will promote the establishment of incentives and invest in research and capacity building for the popularisation of access to, and appropriation of, energy efficient and renewable energy technologies.</p> <p><b>Beneficiary needs:</b> Limited access to modern energy sources is a major obstacle to the sustainable development of CAR. The project's development of renewable energy and energy efficiency therefore responds to CAR's deep-seated aspirations, notably that of putting its development on a resilient, low-carbon path by 2030.</p>		
Project duration/period	6 years		
Potential accredited entity/entities	<b>To be determined</b>		
Financial arrangement(s)	<b>Total cost of the project</b>		<b>Amount requested</b>
	60 millions USD	30 millions USD	
Financial instrument(s)	<input checked="" type="checkbox"/> Subvention <input checked="" type="checkbox"/> Prêt <input type="checkbox"/> Garantie      Autre : préciser _____		
	<b>Action</b>	<b>Designated Actors</b>	<b>Time</b>

Action plan / Next steps	Development of a project concept note	Ministry of Energy, Mines and Hydraulics/Agency Autonome d'Electrification Rurale de Centrafrique (ACER)	4 month
	Development of the PPF for the feasibility studies	Ministry of Energy, Mines and Hydraulics/Agency Autonome d'Electrification Rurale de Centrafrique (ACER)	4 month
	Development of the project proposal	Ministry of Energy, Mines and Hydraulics/Agency Autonome d'Electrification Rurale de Centrafrique (ACER)	10 month
<b>Autres commentaires</b>			

<b>Project title</b>	<b>Strengthening the resilience of the public health system for adaptation to climate change in the Central African Republic</b>		
<b>Result areas targeted by the project</b>	<u>Reduction of emissions from :</u> <input type="checkbox"/> Energy access and production <input type="checkbox"/> Low-emission transport <input type="checkbox"/> Buildings, cities, industries and appliances <input type="checkbox"/> Forestry and land use	<u>Increased resilience of :</u> <input checked="" type="checkbox"/> More vulnerable people and communities <input checked="" type="checkbox"/> Health & well-being, & food & water security <input type="checkbox"/> Infrastructure & built environment <input type="checkbox"/> Ecosystems and ecosystem services	
<b>Justification of the project</b>	<p>The CAR is the most vulnerable country to climate change, with a vulnerability index of 0.01 in 2017 (Verisk Maplecroft 2017). This extreme vulnerability is reflected in most economic and social development sectors, such as the health sector. To date, the effects of climate change on the health of the population have been very poorly documented in CAR. However, research carried out as part of the development of the National Action Plan for Adaptation to Climate Change (NAPA) shows a fairly clear correlation between certain climatic parameters and the incidence rate of certain endemic diseases such as malaria, meningitis, typhoid, measles and seasonal respiratory diseases. In addition to these endemic diseases, extreme variations in climatic parameters such as temperature and intense heat intensify the spread of other diseases such as respiratory diseases, eye irritations, etc.</p> <p>Despite the Central African government's stated intention to guarantee universal health coverage for all its citizens, access to health care remains a real challenge. The politico-military crisis, which lasted more than two decades, led to the collapse of the public health system in all its components. For example, the ratio of health professionals is 3.1 per 10 000 inhabitants for the period 2005-2009. Given this reality, the exposure of populations to health risks (e.g. waterborne diseases and seasonal pathologies) associated with climate change will worsen further given future scenarios predicting an increase in extreme climate variations and events. It is therefore important to strengthen the resilience of CAR's public health system to the risks associated with climate change as an essential element in reducing vulnerability and strengthening the adaptive capacities of populations.</p> <p>The objective of this project is to strengthen the resilience of the CAR public health system to climate risks for effective adaptation to climate change.</p>		
<b>Expected outcome(s)</b>	<p>The following results are expected from the implementation of the project:</p> <ol style="list-style-type: none"> <li>1. The National Health Information System (SNIS) for the collection, analysis and dissemination of information for decision making is restored</li> <li>2. A system for monitoring and managing health risks related to emergencies and climatic disasters is established and operational</li> <li>3. The supply system, accessibility, rational use and quality assurance of medicines, vaccines and other health products are strengthened</li> <li>4. The institutional and infrastructural framework for care, training and research is strengthened and/or restored</li> <li>5. Climate risks, including those impacting on the public health sector, are integrated into national and local development policies, programmes and plans</li> <li>6. National policies, strategies and approaches for the prevention, control and elimination of climate risks to public health are developed</li> </ol>		

<b>Compliance with the relevant investment criteria of several lessors</b>	<p><b>Potential impact:</b> The project will have a significant impact on reducing the vulnerability and strengthening the adaptive capacities of at least 1 million people in CAR, notably through the prevention of diseases linked to climate variability and extremes and facilitated access to affordable health care.</p> <p><b>Sustainable development potential:</b> The project will have significant socio-economic co-benefits. Indeed, the facilitated access to health care will contribute significantly to the well-being of the population, which will now have all the physical and/or mental capacities necessary to engage in income-generating activities or in education.</p> <p><b>Potential for paradigm shift:</b> The project will bring about a real paradigm shift in that it will establish, if not restore, the basic foundations of the CAR's public health system by putting it more on the path to resilience in the face of climate change. From now on, development policies, programmes and plans will integrate the climate change dimension, thus making it possible to anticipate and reduce the costs of future interventions.</p>		
Project duration/period	5 years		
Potential accredited entity/entities	<b>To be determined</b>		
Financial arrangement(s)	<b>Total cost of the project</b>		<b>Amount requested</b>
	25 millions USD		15 millions USD
Financial instrument(s)	<input checked="" type="checkbox"/> Subvention <input checked="" type="checkbox"/> Prêt <input type="checkbox"/> Garantie      Autre : préciser _____		
Action plan / Next steps	<b>Action</b>	<b>Designated Actors</b>	<b>Time</b>
	Development of a project concept note	Ministère de la Santé publique et de la population/Organisation Mondiale de la Santé	3 mois
	Development of the PPF for the feasibility studies	Ministère de la Santé publique et de la population/Organisation Mondiale de la Santé	3 mois
	Development of the project proposal	Ministère de la Santé publique et de la population/Organisation Mondiale de la Santé	10 mois
<b>Autres commentaires</b>			

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Decree No. 18.084 of 10 April 2018, on the organisation and functioning of the Ministry of the Environment and Sustainable Development and establishing the powers of the Minister  
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