REPUBLIQUE ISLAMIQUE DE MAURITANIE
Honneur – Fraternité – Justice

MINISTERE DE L'ENVIRONNEMENT ET DU DEVELOPPEMENT DURABLE

CELLULE DE COORDINATION
DU PROGRAMME NATIONAL SUR LE CHANGEMENT CLIMATIQUE

TROISIEME COMMUNICATION NATIONALE SUR LE CHANGEMENT CLIMATIQUE

Juillet 2014

Executive Summary

Chapitre 1. National Context

In this chapter the focus is on the country's macroeconomic data that characterize and properly locate the country's level of development. These data are population figures and demographic indicators, the economy and its main determinants. The sectors considered in the GHG inventory and those most tributary of climate vulnerability and impacts assessment are presented one after the other in their initial status in order to allow good basis for projections and impact assessment as required by the guidelines for national communications. A brief introduction is provided as to describe how the chapter is organized. The Mauritanian economy is presented first. In essence, three sectors are described among which the rural sector (agriculture and livestock), the fisheries and mining. The rural sector is defined as traditional and very poorly integrated into modern economic spheres. Fishing and mining are in turn presented as expansive and providing most of the export earnings while contributing largely to the country's budget revenues. The Mauritanian economy is thus marked by energy dependency and highly sensitive to changes in primary export sectors of iron and fish in particular. Since March 2006, Mauritania joined the club of oil exporters countries, the expected revenue revolve around $ 300 million per year according to estimates. Following this introduction the different sectors (agriculture, livestock, oil, mining, energy, industry, transport, etc.) are successively presented in their typologies and production statistics and indicators. All relevant data in sectors emissions or in vulnerability to climate change assessment and data were collected as to establish a good basis for calculations or reporting. In terms of the country's vulnerability, it is reported that impacts of climate change on (i) water resources are significant and result in an overall decrease of about 10-15%; (ii) on agriculture, natural resources and food security, will result in significant land degradation and erosion trend as well as an extension of the arid zone to the south, significantly affecting the current level already fragile of food insecurity and malnutrition and thus exacerbating the incidence of poverty and disease; (iii) on ecology and climate of the coastline where disasters play a recurrent threat on the country's economic growth, the coastline is both a unique ecosystem and the main country cradle of its economic development.

Chapitre 2. National greenhouse gas inventories

Institutional arrangements for the preparation of the GHGI are summarized as follows:
The Ministry of Environment and Sustainable Development acts as the focal point of the United Nations Framework Convention on Climate Change while the National Program on Climate Change (PNCC) operates as its delegated executive structure through the Coordinating Unit. A mechanism comprising : (i) a steering committee; (ii) the activity data producing partners; (iii) the groups of experts, each led by a thematic leader, was structured as to implement TNC project activities. The methodology for implementing the inventory has been thoroughly described to the experts and the level of emission for each greenhouse gas has been detailed; likewise the quality assurance of the inventory has been trained and published. As a result of all this upfront logistic:

Sectoral contributions to national GHG emissions in latest inventory years 2012 and 2010 are discussed below:

- ***At year 2012:*** *(i) The net anthropogenic GHG emissions has been evaluated in Mauritania to be: 7071 Gg CO_2, or 2.1 tons CO_2 / capita; (ii) Gross GHG emissions are: 9226 Gg CO_2 (or 2,7 tons CO_2 per capita), following an absorption capacity of biomass in the form of organic carbon sink, which amounts to -2155 Gg CO_2 in 2012.*
- ***At year 2010:*** *(i) the adjusted net anthropogenic emissions are estimated at: 6619 Gg CO_2 instead of 7565 Gg CO_2 as announced in the previous inventory (SNC, 2008), or 2,1 tons CO_2 / capita; (ii) Gross GHG emission totaled Gg CO_2 -8849 instead of 9339 Gg CO_2 (2.9 tons CO_2 per capita), following an absorption capacity of biomass in the form of carbon organic sink, which amounts to -2230 Gg CO_2 in 2010;*

The contribution of direct GHG emissions in 2012 is as follows:

- *CH_4 with 68% of direct emissions is 4602 Gg CO_2 or 229 Gg of CH_4 which is 99.7% from Livestock.*
- *CO_2 with 2215 Gg or 31% of the emission. Activities of combustion of fossil fuels are the largest contributors; they account for 90% of the emission of CO_2, followed by land (9%) as a net absorption of -242 Gg.*
- *N_2O represents 0.56% of direct emissions, or 39.370 Gg CO_2 the two main sources are the combustion of fossil fuels with 68.26% and bushfires which in turn cover 31.74%.*
- *The total HFCs is 7 Gg CO_2 representing 0.1% of the direct emissions. The origin of this issue is the use of HFC in refrigeration especially in industrial fishing.*

Categories sources of CO_2 contribution to total CO_2 emissions by source in 2012:

- *Forest land remaining forest land: This is the single source of absorption (-427 Gg CO_2 net emissions equivalent to 14% of the net emission of CO_2). The absolute emission of this source is 1712 Gg ;*
- *The Road Transport: 929 Gg or 30% of total net CO_2;*
- *Energy Industries: 619 Gg, or 20.08% of total net CO_2;*
- *The manufacturing and construction industries: 425 Gg, or 14% of total net CO_2;*
- *Residential and Other: 369 Gg or 12% of total net CO_2;*
- *The Cropland: 192 Gg, representing 6% of total net CO_2.*

CH_4 emissions*. Given the importance of livestock in Mauritania, enteric fermentation and management of "manure", are the major sources of methane emissions on CH4 99.72% of total emissions of this gas. In the absence of manure anaerobic conditions on a large scale (the only method of management is deposition on the course) all of this emission comes from enteric fermentation, or 219 Gg CH_4, or 95.41% of total emission of CH_4 in 2012. With regard to solid waste moisture content (humidity rate) of less than 10% has been the limiting factor. Other sources of CH_4, lower emission, consist of combustion of fuels, fires and burning in the open air of solid waste.*

N_2O emissions in 2010 totaled only 0,127 Gg and sources are dominated by fuel combustion (including biomass)

- *Road transport contribution: 49 T (15 Gg CO_2), or 38.43% of total N_2O emissions;*
- *The biomass burning contribution: 40 T (13 Gg CO_2), ie. 31.74% of total N_2O emissions;*

- *Rail Output contribution: 28 T (8.62 Gg CO_2), or 21.87% of total N_2O emissions;*
- *The energy industry contribution: 4 T (1.21 Gg CO_2), or 3% of total N_2O emissions.*

Emissions from non-CO2

Emissions from non-CO_2 emissions in 2012 totaled 59 Gg GHG dominated mainly by non-methane volatile organic compounds (NMVOCs) and carbon monoxide (CO).

Comments on the results of the inventory

***Categories key sources**.*

- *In 2012, the results of the inventory, based on **methodology of analysis by level**, revealed that emissions of GHG come from 7 (seven) categories :*
  - ***The LUCF sector** counting three categories: enteric fermentation, Forest Land remaining Forest Land and manure management;*
  - ***The energy sector** with four categories: (i) road transport; (ii) Energy Industries; (iii) manufacturing industries and construction; (iv) Other sectors.*
- *According to the given **method of evaluation by tendency**, 6 (six) categories key sources were identified.*

***Quality control and quality assurance - QA / QC.** In summary, despite the low quality of data activity of LUCF sector, transparency and credibility of the national inventory data were provided by: (i) the ability to demonstrate through appropriate documentation, transparency inventory process, (ii) the addition of other improvements to the inventory process and its commodities; and (iii) the inventory process uses consistent approaches to obtain comparable results for all source categories. Compared to previous surveys, the continued integration of QA / QC activities in the TNC inventory ensures better quality.*

***Emission trends**. Between 1990 and 2012, the evolution of total direct GHG emissions, showed a tendency for an increase from 3102 Gg CO_2 in 1990 to 7071 Gg CO_2 in 2012; thus an increase of the emission by 128%. Anomalies are derived directly from the LUCF sector heavily dependent on rainfall; the other sectors either follow a pace of almost steady growth (energy); or contribute little to the trend (PIUP and waste).*

***Emission trends by gas:** (i) the time series between 1990 and 2012, net emissions of CO_2 increased by 517% from 359 Gg in 1990 to 2215 Gg in 2010. This increase in CO_2 emissions is strongly influenced by the contribution of the energy sector; (ii) CH_4 emissions increased by 77% from 2708 Gg CO_2 in 1990 to 4810 Gg CO_2 in 2012 where livestock is the main contributor; (iii) For N_2O emission increase is very irregular due to the influence of the main source (bushfire) whose emissions are variable from one year to another.*

***Uncertainty.** While for some categories the uncertainties associated with are considered the weakest (energy industry), for others, the uncertainty of the estimates is particularly associated with the lack or in the poor quality of the given activities or even the lack of emissions. The overall uncertainty was estimated by using the approach level 1 methodology (IPCC, 2006).*

***Exhaustiveness**. The national inventory is a complete inventory of GHG emissions from direct and indirect gas as required by the UNFCCC: CO_2, CH_4, N_2O, HFCs, SF_6, PFCs, CO, NOx, NMVOC and SO_2.*

The main shortcoming remains the use of default emission factor instead of an emission factor generated by each sector; this is still due to the low level of adequacy of local socio-economic conditions of the country.

Chapitre 3. General description of steps taken to implement the Convention

Approaches for assessing climate change impacts and vulnerability:

Approaches used in the preparation of the TNC for assessing climate change impacts and vulnerability of the country' socioeconomic systems are based on supporting current proactive and unpredicted political decisions arising from the policy makers or political governing rulers to initiate some salvation actions. Unpredicted, as they are not based on prior studies capable to anticipate possible impacts; this is highly risky particularly when these initiatives are linked to sources highly tributary of climate change; proactive due to the pertinence of the initiative and its positive impact on the final beneficiaries. These actions of salvation underlined objectives are to bring about multiple opportunities and ways to create jobs and reward economic usages of the natural resources in the target areas. So, it was for each sector separately meant to undertake the necessary investigations to reinforce the policy decision taken or raise ahead of time the underlying constraints, obstacles and opposable arguments:

- ***Wheat cultivation**: To support the government's decision to introduce the wheat crop in the country's agricultural typology. This decision is backed by the large share of wheat in the diet of Mauritanian's households. The assignment is therefore to consider the impacts and risks associated with such a decision assuming that the wheat may not be in its eco-climatic natural environment and its biological characteristics could be tributary of current erratic climate change. The study concluded on the appropriateness of the decision and the adaptation of wheat cropping in Mauritania under currently applied specific technical itinerary.*
- ***Forestry**: The case of El Athef in the Wilaya of Gorgol is worthy of study. The ecological value of this ecosystem has been always a puzzle for the local authorities for identifying its natural resources potentials and its shared forms of suitable and sustainable management of the local communities. The study concluded by the pertinence of transferring this area into a biosphere area.*
- ***Natural ecosystems and rangelands** of the Wilayas of the southeast handle the bulk of Mauritanian cattle every year and remain exposed to bushfires when they are not recurrent droughts that limit the intake capacity for livestock. The impacts of climate change on current courses are an invaluable informational value.*
- ***The reserve of Foum Gleita** was targeted by the government for supplying all the surrounding villages and a source for other activities as part of an initiative called "Aftout El Charghi." The investigation of the TNC was to show that this water reservoir can support, despite the trends of climate change, all uses and needs programmed water. The expert in charge, on the basis of modeling multiple needs provided together with a reasonable rate of population growth, should make simulations to say under what conditions filling the tank and how time horizon, such decision would be sustainable. And if so what accompanying measures are necessary to recommend to the government.*
- ***The coastal area** and the settlements in the district of Nouakchott are two interrelated issues because of their exposure to the same climatic effects of rising saline, rise of the sea level, recurrent flooding due to the combination of rain, saline nature of the soil, silting and threats of marine incursions.*
- ***Health** due to the first climate victims recorded in 2012 due to heat waves, identified as a priority sector but dismissed by lack of reliable data reported by the expert.*

Climate change and variability observed data.

Three major indicators have materialized the spatial-temporal variability and climate trends. These are: (i) the dynamics of drought with two variables (the evolution of total rainfall and the length of the dry period); (ii) climate change characterized by the temporal evolution of low temperatures, heat waves and cold temperature; and (iii) Floods in two variables (simple rainfall intensity and frequency of heavy rains). The result of the spatial variability of climate has been achieved based on the reference climate that is to say the normal 1961-1990.

***The spatial-temporal evolution of low temperatures**. It is clear that the frequencies of low temperatures tend to drop significantly. This downward trend affects more cold nights. Cold days have decreased from the cold nights in the west, center and south of the country. Climate series highlight the growth of this indicator although 6 stations provide trends slight decrease in heat waves. The maximum increase in heat waves is observed; about the cold waves, all station data show trends in the reduction.*

***Scenarios of climate change**. Early evolution of temperatures expected for 2050 an overall increase in temperature to a maximum of more than 2 ° C in the northeast, increasing temperatures more than 2 °C, over most of the territory, except for the south coast. And 2100, a sharp rise in temperatures is expected with the strong assumption of no more than 4.5 ° C in the southern Wilaya of Assaba and Guidimakha, and a warming of more than 3.5 ° C in the east. While a clear downward trend of rainfall is expected in the country in general, there is a predicted increase in rainfall in the area in the extreme northeast of the country (Ech-Chaguat Lemgheity) where the annual average is around less 20mm.*

***Floods**. The simple intensity of floods has been increased. space wide index shows a relatively high to the north and northwest of the country, the middle and low medium to strong growth in the south. For the characterization of the rainstorms index results emerged a tendency to a slight increase. General trends in the country, have been marked by a decline in rainfall totals and increased dry periods. Also, global warming seems to be confirmed in Mauritania with a net decrease in frequency of low temperatures, cold waves and an increase in heat waves.*

The impacts of climate change and future vulnerability.

According to anticipated scenarios Mauritania lack of adequate measures of local adaptation and GHG mitigation at the global level should experience a strong socio-economic and environmental exposure to weather. This is the cause of significant and adverse impacts that remain poorly documented, particularly for understanding the socio-economic costs that would result. To this end, in addition to the risks related to the vulnerability of the economy to exogenous shocks, impacts of climate change, without being exhaustive, particularly affect vital sectors of the national economy as resources water, agricultural production and animal husbandry, the coastal economy and natural ecosystems. Ultimately, the

Measures to facilitate adequate adaptation to climate change[1]

Two mega activities are listed: (i) Measures addressing risk of flooding in the city of Nouakchott; activities have been already initiated and intensified since 2013; (ii) Measures addressing the risk of silting of Nouakchott: A large mobilization took place to stop the threat to the city, thanks to the involvement of the Head of State. A proposed portfolio of six projects is submitted as a response to each one of the vulnerability studied in the national communication at the benefit of the visited sites.

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[1] ***Nota bene : Une omission majeure a été constatée relative à la prise en compte de l'incidence de la vulnérabilité du pays sur la sécurité alimentaire ; celle-ci sera traitée dans la 4ème communication nationale.***

Chapitre 4. Measures to Mitigate Climate Change

***Overall evaluation of mitigation results**. The evaluation of mitigation concerns 19 measures covering a potential cumulative reduction of GHG emissions by about 40328 Gg CO_2 in 2030; an attenuation rate of change in emissions of around 41% : (i) The energy sector (10 projects whose total mitigation potential is 9640 Gg CO2, 24% of the national potential) ; (ii) The LUCF (7 projects with a mitigation cumulated total of 30271 Gg CO_2 or 75% of national mitigation potential for the period 2010-2030); (iii) IPPU (two projects of combined capacity of 31 Gg CO_2 equivalent to 0.1% of national mitigation potential); (iv) The waste sector (the sector remains low emission due to fossilization of solid waste as a result of low humidity and missing waste treatment).*

***Barriers and Obstacles**. In the current state of things, seven barriers impeding the achievement of specific objectives of national communications were identified and proposed to the Government with the objective to be lifted in order to facilitate the country benefiting from many more opportunities and advantages provided by GEF enabling exercises.*

Chapitre 5. Projections of GHG emissions from 1911 to 2030

***Projection of baseline emissions**. According to the baseline scenario, total Mauritania's GHG emissions will increase from 5892 Gg CO_2 in 2010 to 13916 Gg in 2030, which is an increase more than a double (136%). This increase is strongly attributed to both sectors LUCF (141%) and energy (125%).*

***Projected emissions mitigation scenario**. According to the mitigation scenario, total GHG emissions in Mauritania increased from 5892 Gg CO_2 in 2010 to 8542 Gg in 2030, increasing by 48%. This increase is strongly supported by sectors of the LUCF (63%), particularly the livestock sub-sector, which remains a subsistence activity based on transhumance whose diet remains uncontrollable. The energy sector reflects a small increase (16%) according to the objective of its strategy to reach 20% renewable energy generation by 2020.*

- ***Projected emissions from the energy sector**. The attenuation of the energy scenario predicts an increase in gross emissions from the sector about 95% from 2056 Gg CO_2 in 2010 to 4012 Gg CO_2 in 2030. This growth is significantly lower than that of the baseline scenario mainly because it takes into account the tremendous increase in emissions avoided by renewable sources from -160 Gg CO_2 in 2010 to -1799 Gg CO_2 in 2030. The energy sector is the second largest in the emission of GHG. In this context the evaluation of mitigation has paid more attention to this area by dividing it into three components (i) Renewable Energy, (ii) Domestic energy and (iii) Conventional Energy. The energy sector ranks second in GHG emissions.*
    - ***Renewable Energy**. Taking into account the objectives of the sector strategy, the mitigation scenario proposes the consolidation of power generation via solar and wind power. These two components will be introduced in three phases.*
    - ***Conventional Energy**. In conventional energy four mitigation options are proposed: (i) Substitution of fuel oil by LPG; (ii) Standardization of the road transport sector; (iii) Implementation of the train South project; (iv) Electrification of the so-called "Southern train".*
- *Projected emissions from other sectors: (i) Two options are proposed for the industrial sector; and (ii) in the LUCF sector, carbon balance was considered reversing to the positive trend through the sequestration of CO2 volume of around 1.5 that of the scenario without mitigation measures (baseline) in 2030.*

Chapitre 6. Other relevant information

***Steps taken to integrate climate change**. This integration has to date concerned that key framework documents and following schedule: (i) The Strategic Framework for the Fight against Poverty from 2012 to 2015; (ii) National Action Plan for the Environment from 2012 to 2016; (iii) The following sectoral strategies: (i) PAN / LCD of MDEDD (December 2012); (ii) the National Food Security Strategy for Mauritania in 2015-2030 horizons; (iii) The National Agricultural Investment Program and Food Security for Mauritania (2012-2015).*

***Activities relating to technology transfer**. Among the technologies introduced in Mauritania having place or coming in response to the impacts of climate change: (i) Introduction and promotion of species and varieties adapted / early / resilient; (ii) Intensification and diversification of irrigated crops; (iii) IPM against pests; (iv) Technical optimized management of irrigation systems; (v) Construction of water dams and micro-management of lowlands; (vi) techniques of sustainable land management (SLM); (vii) Integrated management of soil fertility (ISFM) (viii) CES / DRS techniques; (ix) Agroforestry; (x) Sulfuric Acid Generator (SAG): a new technology to rehabilitate saline-sodic soils; (xi) Development of the fields as contours; (xii) Cereals banks; (xiii) the rains stimulated; (xiv) Inoculation of natural pastures; (xv) Development of fodder crops; (xvi) Treatment of roughage and manufacture of multi-nutritional blocks; (xvii) silage Techniques; (xviii) The control of grazing; (xix) artificial insemination techniques; (xx) Promoting family poultry; (xxi) Generation of electricity from renewable natural resources; (xxii) Generation of electricity from cleaner fossil fuels and energy efficiency; (xxiii) energy from natural gas; (xxiv) Technology combined cycle; (xxv) Energy Efficiency; (xxvi) Forest Management for carbon conservation; (xxvii) Forest Management for capture and storage of carbon; (xxviii) Management for carbon substitution; (xxiv) aerial seeding.*

Climate Change Research and Systematic Observations

***Scientific research.** Scientific research is embryonic. The main centers are NMO, INRSP, University of Nouakchott, ENS and IMROP. The activities are mainly conducted within the framework of project / program development by three structures: (i) The national meteorological office; (ii) National Institute of Public Health Research. An initiative on the health and environmental vulnerability of disadvantaged neighborhoods of Nouakchott for the analysis of the conditions for the emergence and development of diseases in urban Sahel (launched with the National Centre of Competence in Research North-South - NCCR-NS with financial support from the Swiss national Fund for scientific Research and the management development and Swiss cooperation; (iii) Mauritanian Institute of Oceanographic Research and Fisheries (IMROP) conducts various research programs' 'climate-resources'.*

***Systematic observations**: (i) Meteorological Observation: The national earth observation network consists of three main branches: the synoptic network (comprised of 10 automatic stations and 4 classic), the network of marine stations (AWS Three marine weather are currently operating on the Atlantic coast of Mauritania, one of which is equipped with a radar. a project to install three marine stations is over GSM) network and the rainfall (about 150 rainfall stations SPIA are operational. 400 'gauges, farmers' are in test phase); (ii) Space Observations: The reception of related weather observation satellite data is carried out from two earth stations; (iii) Observations aloft: The upper air observations in the troposphere, made for purposes of weather forecasting have been arrested since 1993 in Mauritanian.*

***Observation of water resources**: Several structures share the mission of resource management: (i) The surface water resources. Monitoring of surface water resources is provided by the Department of Rural Development (DAR) of the Ministry of Rural Development; (ii) The ground-based observations are the responsibility of the DAR; (iii) Space observations are supported by the African Union (AU), European Union (EUMETSAT) and the technical support of CILSS (AGRHYMET); a receiving earth station satellite data (AMESD) was established in 2011 to strengthen the capacity of the DAR in connection with the systematic monitoring of resources; (iv) The hydrogeological resources. The observation and monitoring of hydrogeological resources are made promptly for exploration and exploitation of the main groundwater that are Benichab, Boulenouar and of Dhar. The main actors involved in this field are the SERC and SNDE under the supervision of MHA.*

***Information on education, training and public awareness**. Considerable efforts have been undertaken by the CCPNCC for training, especially in the field of IGES, mitigation, vulnerability and adaptation, but also in education and awareness of climate change. A total of 46 types of training were provided for experts, trainers of secondary school education and policy makers.*

Chapitre 7. Constraints and gaps, and related financial, technical and capacity needs

***Difficulties and shortcomings**. Among the gaps encountered is the lack of access to reliable data on conventional energy in the context of IGES studies; and to keep qualified expert available. It was the same for the expertise and data on livestock and technologies. Another major shortcoming relates to the legal and regulatory aspects. The Environmental Code and its implementing regulations are silent with regard to climate change. In particular GHG emissions are not regulated making access difficult for emitting sources. Another equally important gap is the institutional dimension. Indeed, before September 17, 2013, the Ministry was a Delegated Ministry to the Prime Minister Office and did not have enough institutional power to assert in front of other state structures to carry the message integration of climate change into sectoral strategies and policies. This has weighed as a real weight on the CCPNCC activities, including research / data collection from producing departmental structures and / or holders of activity data. Another aspect related to the positioning of MEDD is the lack of financial resources that are granted by the state budget to strengthen its response capacity and operation. For example, the budget for counterpart funding by the GEF could never be mobilized to acquire software and undertake in-situ demonstrative activities of the resilience of communities and their sources of livelihood, yet under the project.*

***Needs for capacity building**. The capacity building component is a priority in the implementation of the UNFCCC. The experts in charge of conducting the studies are far behind having the capacity to mastering the tools and manipulating software provided for making scenarios with GHGI results and projecting associated mitigation and vulnerability impacts and scenarios.*