Federal Republic of Nigeria

Second Biennial Update Report (BUR2) to the United Nations Framework Convention on Climate Change

June 2021

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Foreword

Nigeria became a Party to the United Nations Framework Convention on Climate Change (UNFCCC) in 1994 and ratified the Kyoto Protocol in 2004. From inception of being a Party to the Convention, Nigeria has participated actively in international climate policy negotiations and in the effort to meet its reporting obligation under the UNFCCC, has submitted its Initial National Communication (INC) in 2003, the Second National Communication (SNC) in February 2014 and the Third National Communication (TNC) in April, 2020. In order to meet our emission reduction obligation, the Intended Nationally Determined Contributions was submitted in 2015 to usher in the Paris Agreement and signed the instrument of ratification in 2016. The unwavering effort to support the enhancement of transparency for reporting on mitigation actions engineered the submission of Nigeria's First Biennial Update Report (BUR1) in 2018.

Dr. Mohammad Mahmood Abubakar
Honourable Minister
Federal Ministry of Environment

During the preparation of the Nigeria's Second Biennial Update Report (BUR2), a participatory process was undertaken through consistent technical studies, involvement and consultation of relevant Stakeholders at both national and sub-national levels of engagement, this is in order to foster transparency and to align with the procedures and guidelines for preparing this national document.

A holistic approach was adopted to collate information on Nigeria's National Circumstances; National Greenhouse Gas Inventory on the Energy, Industrial Process and Product Use (IPPU), Agriculture, Forest and Other Land Use (AFOLU) and Waste sectors, Mitigation actions; the Monitoring, Reporting and Verification system; Constraints and Gaps; and Support needed and received.

The Government of Nigeria, with its ambitious reduction target, is poised towards implementing an all-inclusive national response to Climate Change through emission reduction, adaptation to the impacts of the changing climate, and contributing to global discussions on optimal solutions to address climate change challenges. Within this context, the Federal Republic of Nigeria recently approved the revised National Climate Change Policy in order to embrace and accommodate the emerging global climate change related issues such as the Paris Agreement and Gender.

The Federal Ministry of Environment is honoured and delighted to submit its Second Biennial Update Report (BUR2) to the Convention, with the intention that the information contained therein will be of utmost importance towards achieving the country's sustainable environmental goals as well as meet the objectives of the UNFCCC.

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Dr. Mohammad Mahmood Abubakar
Honourable Minister
Federal Ministry of Environment

Acknowledgements

The contribution of all relevant Stakeholders of the Federal Republic of Nigeria in the development of Nigeria's Second Biennial Update Report is gratefully acknowledged. A special word of thanks goes to the former Director of the Department of Climate Change, Dr Yerima Peter Tarfa (*now Permanent Secretary, Federal Republic of Nigeria*) who spearheaded the whole preparatory process, and to the current National Focal Point, Mrs. Halima Bawa Bwari.

Nigeria acknowledges the financial contribution made by the Global Environment Facility with the support of the UNDP Country office as implementing Agency.

The Federal Republic of Nigeria expresses appreciation to our National Experts and the international consultancy firm engaged for this Project.

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- Energy Commission of Nigeria
- Federal Ministry of Agriculture & Rural Development
- Federal Ministry of Budget & National Planning
- Federal Ministry of Transport
- Federal Ministry of Water Resources
- Federal Ministry of Power, Works & Housing
- Federal Ministry of Environment
- Federal Ministry of Finance
- Federal Ministry of Health
- Federal Ministry of Science & Technology
- Federal Ministry of Trade & Investment
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- National Bureau of Statistics
- National Emergency Management Agency (NEMA)
- National Planning Commission
- Nigerian National Petroleum Corporation
- Nigerian Maritime Administration & Safety Agency (NIMASA)
- Nigerian Meteorological Agency (NIMET)

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Abbreviations and Acronyms

Abbreviation / Acronyms	Definition
°C	Degree Celsius
AA	Action agenda
AD	Activity Data
AFOLU	Agriculture, Forest and Other Land Use
AIDS	Acquired Immune Deficiency Syndrome
ALU	Agriculture and Land Use National Greenhouse Gas Inventory Software
AMS	Adaptive mesh size
AP	Action Plan
AR	Assessment Report
AWD	Alternate Wetting Drying
BAU	Business as usual
Bm	Biomass
BRT	Bus Rapid Transit
BTR	Biennial Transparency Reports
BUR	Biennial Update Report
C	Carbon
CBIT	Capacity Building Initiative for Transparency
CBO	Community Based Organisation
CC	Climate Change
CCAC	Climate and Clean Air Coalition
CCGT	Combined-Cycle Gas Turbine
CCN	Climate Change Network
CCSAP	Climate Change Strategy and Action Plan
CDC	Centre for Disease Control and Prevention
CDM	Clean Development Mechanism
CFE	Carbon Fund for Europe
CFL	Compact Fluorescent Lamp
CH_4	Methane
CHP	Combined Heat and Power
CILSS	Comité inter-États de lutte contre la sécheresse au Sahel
CMA	Conference of the Parties serving as the meeting of the Parties to the Paris Agreement
CNG	Compressed Natural Gas
CO	Carbon monoxide
CO_2	Carbon dioxide
CO_2-eq	carbon dioxide equivalent
COEFA	Council for Entrepreneurs for Africa
COP	Conference of Parties
COVID	Corona Virus Disease

Abbreviation / Acronyms	Definition
CP	Conference of Parties
CPA	Component project activity
CPEIR	Climate Public Expenditure and Institutional Review
CS	Country-specific
CSO	Civil Society Organisation
cT	Topical continental
CTCN	Climate Technology Centre and Network
DARE	Developmental Association for Renewable Energies
DCC	Department of Climate Change
DE	Digestible Energy
DEA	Department of Environmental Affairs
DFID	Department for International Development
DNA	Designated National Authority
DPR	Department of Petroleum Resources
ECN	Energy Commission of Nigeria
ECOWAS	Economic Community of West African States
ECREEE	ECOWAS Centre for Renewal Energy and Energy Efficiency
EE	Executing Entity
EEA	European Environment Agency
EF	Emission Factor
EIA	Energy Information Administration
ELPS	Escravos–Lagos Pipeline System
EMEP	European Monitoring and Evaluation Program
EPC	Engineer, procure and construct
EPCIC	Engineering, Procurement, Construction, Installation & Commissioning
ERGP	Economic Recovery & Growth Plan
ESIA	Environmental Social Impact Assessment
ETF	Enhanced Transparency Framework
EU	European Union
EUR	Euro
FAO	Food and Agricultural Organisation
FCT	Federal Capital Territory
FID	Final Investment Decision
FME	Federal Ministry of Environment
FMOH	Federal Ministry of Health
FMPW&H	Federal Ministry of Power, Works, and Housing
FMST	Federal Ministry of Science and Technology
FNC	First National Communication
FOLU	Forestry and Other Land Use
GCF	Green Climate Fund

Abbreviation / Acronyms	Definition
GDP	Gross Domestic Product
GEF	Global Environment Facility
GFRA	Global Forest Resources Assessment
Gg	Gigagram
GHG	GreenHouse Gas
GHGIMS	Greenhouse Gas Inventory Management System
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
GPG	Good Practice Guidance
GVM	Gross Vehicle Mass
GW	Gigawatt
GWH	Gigawatt Hour
GWP	Global Warming Potential
ha	Hectare (1 ha = 10,000 m^2)
HBF	Heinrich Böll Foundation
HBS	Henrich Boll Stiftung
HFC	Hydrofluorocarbons
HH	Household
HIV	Human Immunodeficiency Virus
IBC	Integrated Benefits Calculator
ICA	International consultation and analysis
ICCC	Inter-Ministerial Committee on Climate Change
ICEED	International Centre for Energy Environment and Development
ICREEE	Inter-Ministerial Committee on Renewable Energy and Energy Efficiency
ICT	Information and communications technology
IE	Included Elsewhere
IEA	International Energy Agency
IFC	International Finance Corporation
INC	Initial National Communication
INDC	Intended Nationally Determined Contribution
IPCC	Intergovernmental Panel on Climate Change
IPP	Independent power plant
IPPU	Industrial Processes and Product Use
ITCZ	Inter-Tropical Convergence Zone
IWRM	Integrated Water Resources Management
JV	Joint Venture
KCA	Key Category Analysis
km	Kilometre
km2	Square kilometre
kWh	Kilowatt-hour
LAWMA	Lagos Waste Management Authority

Abbreviation / Acronyms	Definition
LCD	Low carbon development
LEAP	Low Emissions Analysis Platform
LED	Light emitting diode
LFG	Landfill gas
LG	Local Government
LGA	Local Government Area
LNG	Liquefied natural gas
LPG	Liquefied Petroleum Gas.
LULUCF	Land use, land-use change and forestry
m	Metre
m/s	Metre per second
m^3	Cubic metre
mamsl	Metre above mean sea level
MARV	Measurement, Assessment, Reporting and Verification
MDA	Ministries departments and agencies
MDGs	Millenium Development Goals
MET	Ministry of Environment and Tourism
mm	Millimetre
MoU / MOU	Memorandum of Understanding
MPG	Modalities, Procedures and Guidelines
MRV	Measuring, Reporting and Verification
MSW	Municipal Solid Waste
mT	Tropical maritime
MW	MegaWatt
MWG	Mitigation Working Group
N_2O	Nitrous oxide
NA	Not Available
NACOP	National Council on Power
NAFIN	National Alliance for Improved Nutrition
NAI	Non-Annex I
NAMA	Nationally Appropriate Mitigation Action
NAOC	Nigerian Agip Oil Company
NAP	National Adaptation Plan
NASPA-CCN	National Adaptation Strategy and Plan of Action for Climate Change in Nigeria
NBS	National Bureau of Statistics
NC	National Communication
NCA	Nama coordinating Agency
NCCC	National Climate Change Committee
NCCPRS	National Climate Change Policy Response and Strategy
NDC	Nationally Determined Contributions

Abbreviation / Acronyms	Definition
NDP	National Development Plan
NE	Not Estimated
NEEAP	National Energy Efficiency Action Plan
NEPAD	New Partnership for Africa's Development
NESI	Nigerian Electricity Supply Industry
NESP	Nigerian Energy Support Programme
NEWMAP	Nigeria Erosion and Watershed Management Project
NGO	Non-Governmental Organization
NIE	NAMA Implementing Entity
NIIP	National Inventory Improvement Plan
NIR	National Inventory Report
NLNG	Nigeria LNG Limited
NMVOC	Non-Methane Volatile Organic Compound
NNPC	Nigeria National Petroleum Corporation
NO	Not Occurring
NO_x	Nitrogen oxides
NREAP	National Renewable Energy Action Plan
NREEEP	National renewable Energy and Energy Efficiency Policy
NREEP	National Energy Efficiency Action Plan
NRGI	Natural Resource Governance Institute
NSHDP	National Strategic Health Development Plan
NVDCP	National Vector-Born Disease Control Program
ODS	Ozone Depleting Substances
OGEMP	Off Grid Energy Master Plan
OGPP	Open Government partnership principles
OML	Oil Mining License
PA	Paris Agreement
PDNA	Post Disaster Needs Assessment
PFC	Perfluorocarbon
PHCN	Power Holding Company of Nigeria
PIDACC	Programme for integrated development and adaptation to climate change
PMS	Premium motor spirit
PoA	Program of Activities
PPA	Power Purchase Agreement
PV	Photovoltaic
QA	Quality Assurance
QC	Quality Control
RE	Renewable energy
REAP	Renewable Energy Access Program
REDD	Reducing Emissions from Deforestation and Degradation

Abbreviation / Acronyms	Definition
REEEI	Renewable Energy & Energy Efficiency Institute
REMP	Renewable Energy Master Plan
RUWES	Rural Women Energy Security
SAVE80	Save 80% of the firewood consumption of a traditional open fireplace (3-stone-fire)
SCCU	Special Climate Change Unit
SCF	Standard cubic foot
SCFPD	Standard cubic foot per day
SCM	Standard cubic meter (1 SCM = 1 m^3)
SE4ALL AA	Sustainable Energy for All Action Agenda
SF_6	Sulphur hexafluoride
SHP	Small Hydro Power
SLCP	Short Lived Climate Pollutant
SME	Small and Medium Enterprises
SNC	Second National Communication
SO_2	Sulphur dioxide
SPDC	Shell Petroleum Development Corporation
t	Tonne
TACCC	Transparent, accurate, consistent, complete and comparable
TBD	To be determined
TEPNG	Total Exploration and Production Nigeria
TFT	Thin-film transistor
TJ	Terajoule
TLS	Transfer Loading Station
TNC	Third national Communication
TNGP	Trans Nigeria Gas Pipeline
TTE	Technical Team of Experts
UGEAP	Universal Green Energy Access Program
UN	United Nations
UNDP	United Nations Development Program
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNICEF	United Nations International Children's Emergency Fund
USAID	United States Agency for International Development
USD	United States Dollar
USGS	United States Geological Survey
WAPCO	West African Gas Pipeline Company
WEC	World Energy Council
WHO	World Health Organization
WMO	World Meteorological Organization
WTTC	World Travel & Tourism Council

Executive Summary

ES 1. National circumstances and institutional arrangements

Geographical situation

The Federal Republic of Nigeria, commonly referred to as Nigeria, is located at the extreme inner corner of the Gulf of Guinea on the west coast of Africa between latitudes 3°15' to 13°30' N and longitudes 2°59' to 15°00' E. It borders Benin in the west, Niger in the north, Chad, and Cameroon in the east, and its coast in the south lies on the Gulf of Guinea in the Atlantic Ocean.

Nigeria is the 14th largest country in Africa with a land area of 923,768 km^2 of which land comprises 910,768 km^2 and water accounts for 13,000 km^2. It has a total boundary length of 4,900 km, including 853 km of coastline (Nigeria, 2017).

Governance

Nigeria is a federal presidential republic. It comprises 36 states and the Federal Capital Territory (FCT), where the capital, Abuja is located. Nigeria is officially a democratic secular country. The States and FCT are further sub-divided into 774 Local Government Areas or Area Councils for grassroot administration. The 36 States are grouped into six geopolitical zones for political and development purposes. The Constitution of the country provides for a presidential system of government in which there is an Executive, a Legislature and a Judiciary. The legislative structure is bicameral with upper and lower chambers at the Federal level while State governments and Local Councils operate a single legislative chamber. A judicial structure erected in all three tiers of government completes the operational framework for checks and balances and separation of powers in governance as enshrined in the Constitution. The Constitution further provides for the operation of three tiers of government, at the Federal, State and Local levels (Nigeria, 2014).

Convention Obligations

Under Article 4.1 (a) of the Convention, each Party should develop, periodically update, publish and make available to the Conference of the Parties (COP), in accordance with Article 12, national inventories of anthropogenic emissions by sources and removals by sinks of all greenhouse gases not controlled by the Montreal Protocol, to the extent its capacities permit, using comparable methodologies to be promoted and agreed upon by the COP.

As a Non-Annex 1 Party to the United Nations Framework Convention on Climate Change (UNFCCC), and more specifically as directed by Paragraph 60 (c) of decision 1/CP.16, Nigeria is obliged to report certain elements of information, notably:

> *Developing countries, consistent with their capabilities and the level of support provided for reporting, should also submit biennial update reports containing updates of national greenhouse gas inventories, including a national inventory report and information on mitigation actions, needs and support received*;

Since the inception of joint global actions on climate change arising from the Rio Conventions of 1992, Nigeria has been active on many fronts, submitting various reports including National Communications (NCs) and Biennial Update Reports (BURs), and producing strategic plans such as the National Adaptation Strategy and Plan of Action (NASPA). The numerous initiatives proposed in those reports paved the way for Nigeria to contribute to limiting Greenhouse Gas (GHG) emissions and the resulting global warming.

Institutional arrangements

The DCC of the Federal Ministry of Environment (FME) was set up to implement the Nigerian Government's *"commitment to introducing and implementing adaptation and mitigation measures necessary to reduce vulnerability to climate change"*.

The DCC comprises the following four Divisions:

- Greenhouse Gas Division
- Vulnerability and Adaptation Division
- Education, Awareness and Outreach Division
- Mitigation Division

In addition to the operations carried out by these divisions, DCC is also the convener and chair of the Inter-Ministerial Committee on Climate Change (ICCC). The functional organogram of DCC along with a detailed description is provided in the MRV chapter of this report.

Climate

Nigeria is located primarily within the lowland humid tropics. The climate of Nigeria is mainly influenced by three major air masses: the tropical maritime (mT), the tropical continental (cT) and the equatorial easterlies (Ojo, 1977; Iloeje, 1981).

Nigeria is generally characterized by a high temperature regime almost throughout the year. In the far south, mean maximum temperature is 32°C while in the north it is 41°C. However, the mean minimum temperature is 21°C in the south and below 13°C in the north which has a much higher annual range. The mean temperature for the country is 27°C, in the absence of altitudinal modifications. Over the last few decades, there has been a general increase in temperature throughout Nigeria.

The climate of the country varies from a very wet coastal area with annual rainfall greater than 3,500 mm to the Sahel region in the northwest and north-eastern parts, with annual rainfall less than 600 mm. The annual variation of rainfall, particularly in the northern parts, is large. This often results in climatic hazards, especially floods and droughts, which bring in their wake much suffering with devastating effects on food production and the nation's economy. Recent studies have revealed declining trends in rainfall. Often, substantial parts of Nigeria receive less than 75% of their annual rainfall and this is particularly worrisome in the north.

Relief, drainage and water resources

Nigeria has two main relief regions: the high plateaux ranging between 300 and more than 900 m above sea level, and the Lowlands, which are generally less than 300 m (Iloeje, 1981; Jeje and Adesina 1995). The high plateaux include the north central plateau, the eastern and north-eastern highlands, and the western uplands. The Lowlands comprise the Sokoto plains, the Niger-Benue trough, the Chad Basin, the interior coastal lowlands of western Nigeria, the lowlands and scarp lands of south eastern Nigeria and the Coastlands.

Most of the country's rivers take their sources from four main hydrological basins: the North Central plateau (Sokoto-Rima, Hadejia, Gongola, and Kaduna rivers), the Western Uplands (Moshi, Awun, Ogun, Osun, Osse rivers), the Eastern Highlands (Katsina-Ala, Donga rivers) and the Uri Plateau (Anambra, Imo and Cross rivers).

According to the 2008 State of the Environment Report (Federal Ministry of Environment, 2008), the total surface water resources potential for Nigeria is estimated at 267.3 billion m^3 while the groundwater

potential is evaluated at 51.9 billion m^3, giving a total of 319.2 billion m^3. In addition, the number of relatively large dams completed or under construction is about 160 with a total active storage of 30.7 billion m^3.

Demography

Even if there exist no precise statistics on the Nigerian population, various sources tend to agree that it is the most populated country in Africa and ranked 7th at world level in 2015. According to the Director General of the Nigerian National Population Commission (NPC) the country's population reached 182 million by late 2016 (Vanguard, 2016; Nigeria, NPC, 2017). This estimate was based on the last Population and Housing Census done in 2006 and using an annual growth rate of 3.5% weighed against other variables such as rising life expectancy and a declining infant mortality rate. According to the World Bank (https://data.worldbank.org/indicator/SP.POP.TOTL?locations=NG accessed 19 February 2021), the Nigerian population stood at 201 million in 2019.

Economic profile

Nigeria is a lower middle-income country. According to World Bank statistics, since 2012, the year during which it overtook South Africa, it has become the largest economy in Africa. In 2019, at constant 2010 USD, the Nigerian GDP stood at 479.75 billion and the GDP per capita was 2,387. Figure ES-1 illustrates the evolution of Nigeria's GDP during the period 2000 to 2019 (source World Bank, 2020).

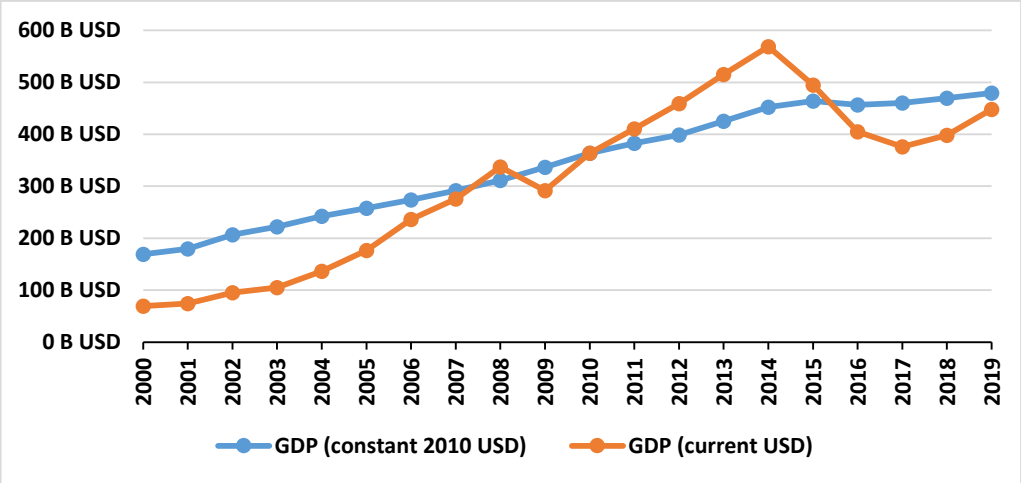

Figure ES-1 - GDP of Nigeria in constant 2010 USD and current USD

Between 2000 and 2014 the economy grew steadily at an average rate of 7% per year (Figure ES-2). Following the combined oil price collapse in 2014-2016 and negative production shocks, the gross domestic product (GDP) growth rate dropped to 2.7% in 2015 In 2016 during its first recession in 25 years, the economy contracted by 1.6%. Since 2017, the economy has recovered and a growth of 2.2% was recorded in 2019 (Figure ES-2) (source World Bank, 2020).

Key economic sectors

Energy

Oil and natural gas, and biomass constitute the main sources of energy for Nigeria. There is, however, significant efforts to harness the high potentials available from solar and wind.

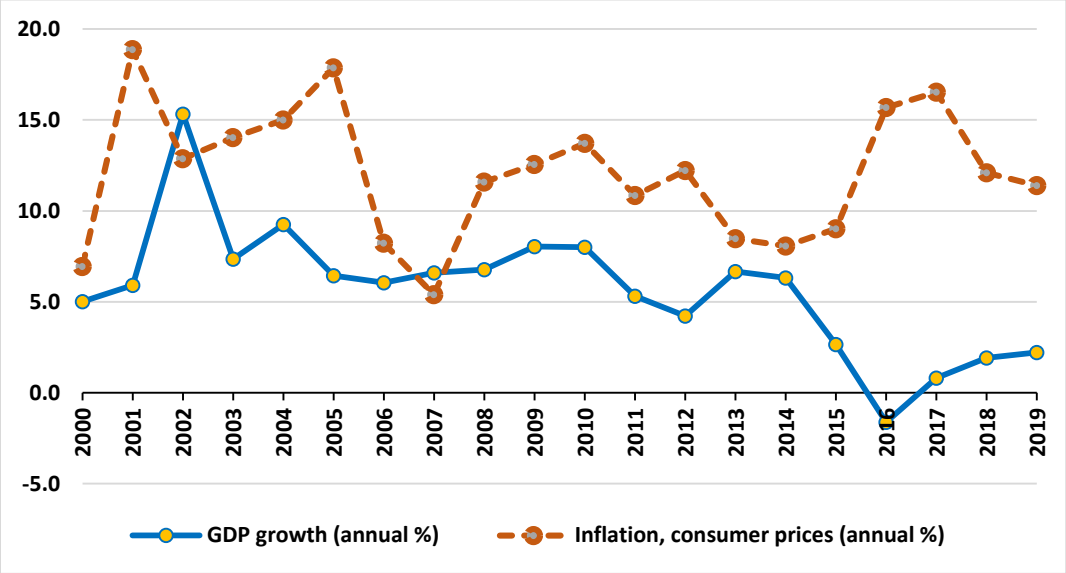

Figure ES-2 - Nigeria's GDP growth and inflation rate

Oil and natural gas

Nigeria has the second largest proven crude oil reserves of Africa and according to Abstract of Statistics 2016 (NBS, 2017) of the Nigerian National Bureau of Statistics, the reserves stood at 37,448.25 million barrels in 2014. During the same period, the country produced some 700 million barrels of crude oil whereas it exported 600 million barrels annually. The oil fields are in the south, specifically in the Niger delta and offshore in the Gulf of Guinea. Current exploration activities are mostly focused in the deep and ultra-deep waters offshore, with some activities in the Chad basin, located in the northeast of the country.

In general, the exploitation of petroleum resources in the last four decades has resulted in massive injection of hydrocarbons into the atmosphere as well as considerable environmental problems. This makes the sector an important one in the discussion of GHG-induced climate change, its consequences, and the need for mitigation and adaptation relative to this sector. A significant amount of Nigeria's gross natural gas production is flared (burned off) because some of Nigeria's oil fields lack the infrastructure needed to capture the natural gas produced with oil, known as associated gas. In 2014, Nigeria flared 10.73 billion m^3 of its associated gas production, or 12% of its gross production. However, while Nigeria still flares a significant portion of its gross natural gas production (12% in 2014), the amount of gas flared has been reduced by over 50% over the past decade to reduce GHG emissions and mitigate climate change.

Biomass

Nigeria is the third world largest producer of bioenergy, after China and India, respectively. In 2010, the share of bioenergy in total primary energy supply was over 80% (WEC, 2013). The biomass resources of Nigeria comprise crop residues, forage grasses and shrubs, animal wastes and waste arising from forestry, municipal and industrial activities, as well as aquatic biomass. Crops such sweet sorghum, maize and sugarcane are the most promising feedstocks for biofuel production.

Other energy sources

Coal: By the end of 2011, Nigeria had 21 million tonnes of proven recoverable bituminous coal reserves, including anthracite (WEC, 2013). It is among the top 5 countries in Africa, by reserves.

Wind: Wind is not a major source of energy in Nigeria. In 2011, Nigeria had only 2 MW of installed capacity (WEC, 2013).

Nuclear: Nigeria initially planned to have about 1000 MWe of nuclear power installed by 2017 and 4000 MWe by 2027. A draft strategy for the safe and sustainable management of radioactive waste and

spent nuclear fuel has also been prepared. It includes an option for use when repatriation of spent fuel is not possible (ECN, 2012).

Geothermal: The literature indicates that more studies are necessary, but current indications point to the potential for geothermal energy (Zira, 2013), with the geothermal gradient of the Anambra Basin ranging from 2.5 to 4.9°C /100m and that of the Bida Basin from 2 to 2.5°C/100m.

Solar: Nigeria lies within a high sunshine belt and thus has enormous solar energy potentials. Solar radiation is fairly well distributed with an average of about 19.8 MJm^{-2} day^{-1} and an average sunshine hours of 6 hours day^{-1}. If solar collectors or modules were used to cover 1% of Nigeria's land area, it is possible to generate 1850 $x10^3$ GWh of electricity per year, which is over one hundred times the current grid electricity consumption in the country. But this potential is yet to be properly harnessed. Nigeria is estimated to have only 20 MW of solar energy installed (REN21, 2014).

Hydro: Nigeria is reasonably endowed with large rivers and few natural falls. Small rivers and streams also exist within the present split of the country's eleven River Basin Authorities, some of which maintain minimum discharges all year round. In a study carried out in twelve states and four river basins, over 278 unexploited small hydropower (SHP) sites with a total potential of 734.3 MW were identified. However, SHP potential sites exist in virtually all parts of the country with an estimated total capacity of 3,500 MW. They indicate that Nigeria possesses potential renewable sources of energy along her numerous river systems, a total of 70 micro dams, 126 mini dams and 86 small sites have been identified.

Agriculture

The agriculture sector is a very important component of the Nigerian economy. Almost 78% of the total land mass of the country, representing 708,000 km^2, are under agriculture. Of these, 48.0% constitute arable lands, 42.8% are under permanent meadows and pastures, and the remaining 9.2% are under permanent crops.The sector is also the largest employer of the country and accounted for 25.1% of GDP (at constant basic price) in 2017. Crop production is by far the most important component of the agriculture sector, contributing 90% to the total GDP of the sector. Climate change poses a threat to Nigerian agriculture - the World Bank recently predicted an up to 30% drop in the country's crop output due to erratic rainfall and higher temperatures.

Human Health

In 2010, The National Strategic Health Development Plan (NSHDP) 2010 - 2015 (Nigeria-FMOH, 2010) described Nigeria's health situation as follows: *"The health indicators for Nigeria are among the worst in the world. Nigeria shoulders 10% of the global disease burden and is making slow progress towards achieving the 2015 targets for the health related Millenium Development Goals (MDGs). The health indicators in Nigeria have largely remained below country targets and internationally-set benchmarks due to weaknesses inherent in its health system."* In 2017, current health expenditure stood at 3.8 % of GDP.

Nonetheless, Nigeria made some progress in the achievement of the health related MDGs. Development indicators (WHO, 2015) showed the need for more concerted efforts in this sector. The prevalence of infectious and parasitic diseases like malaria (141 in 100,000), tuberculosis (282 in 100,000), HIV/AIDS (3.9% of the population) and Schistosomiasis among others, remains very high. Furthermore, illnesses such as diabetes and cardio-vascular diseases, often associated with increasing socio-economic wellbeing, are becoming significant health problems in the country (Babatimehin, 2003). Only 48% of the population has "sustainable" access to clean water and a lower proportion (44%) has good sanitation (World Bank, 2008).

Transportation

Air, rail, pipelines, road and water transportation facilities are available in the country but the most important in terms of functionality and number of patrons is road. The total length of Federal Government

highways is about 34,340 km. States also make complementary investments on high grade road development. The total railway length is about 4,000 km while water and air transportation are the least developed. The country has close to 8,600 km of water ways, the longest being on River Niger and the Benue system. Governments, at both the state and federal levels, are investing on airports to increase access to air travel. The contribution of the transport sector to GDP in 2017 was 1.2 % (at constant basic price) and considered as well below the required threshold for a sector that plays a major role in the nation's development.

Information and Communication

Within the Information and Communication sector which contributed 11.4% (at constant basic price) to GDP in 2017, Telecommunication & Information Services are by far the most important economic drivers. Though Nigeria has less than a million landlines it boasts certainly more than 100 million mobile cellular subscribers. The advent of mobile communication in the late 1990s has revolutionized the sector and impacted positively on the socio-economic development of the country. Incentives are being provided to enhance the development of information and communications technology (ICT) and its enabling infrastructure for every part of the country, including the rural areas. While encouraging investment in ICT, appropriate legal and regulatory frameworks are being put in place to safeguard the investments. In 2017, the Telecommunication & Information Services contributed 8.7% (at constant basic price) to GDP, showing its importance in the country's economy (National Bureau of Statistics, 2016).

Manufacturing

The manufacturing sector has the potential to boost economic growth and stimulate employment generation, wealth creation and poverty eradication. The sector, handicapped by low-capacity utilization, did not perform as expected for a long time. The country's vision for the manufacturing sector is *'a technologically driven and globally competitive manufacturing sector, with a high level of local content and contributing a high proportion of the National GDP'*. The stated focus of increasing annual growth in the manufacturing sector from 8% in 2005 to a minimum of 35.9% on the average annually (Vision 2020 Technical Report on Manufacturing) would no doubt have serious implications for energy use and climate change in the very near future. In 2017, the Manufacturing sector contributed 9.2% (at current basic price) to GDP.

Power sector

Power supply in Nigeria is a big challenge to the economy of the nation. Despite efforts by various governments and huge sums of money invested in the sector, the power supply is still inefficient and this hampered industrial development of the country. The per capita power consumption of 151 kWh per year in Nigeria is in the lower end of the spectrum in the African continent.

The 23 grid-connected generating plants in operation in the Nigerian Electricity Supply Industry (NESI) has a total installed capacity of only 11,165 MW and an available capacity of 7,139.6 MW as of June 2016. Equally, most of the generation is thermal based with an installed capacity of 9,044 MW (81% of the total installed capacity) and an available capacity of 6,079.6 MW (83% of the total available capacity). At present, less than half of Nigeria's population has access to grid-connected electricity.

The Electric Power Sector Reform Act was passed in 2005 to reposition the sector by changing its structure, and privatizing generation and distribution while retaining transmission under Government control. Today, Nigeria has 12.5 GW of installed capacity, but less than one third is operational (average of 3.9 GW in 2015; 3.0 GW in November 2016). Overall, only about 15% of installed capacity is eventually distributed to end-users, resulting in a huge shortage of electricity supply across the country.

A report on the National Water Resources Master Plan by the Federal Ministry of Water Resources in 2016 revealed that Nigeria has hydropower potential of about 12,220 MW, of which only about 1,930 MW has

been developed from Kainji, Jebba and Shiroro dams. There are also existing dams with a combined potential hydropower capacity of over 200 MW that are yet to be exploited while four dams that are under study and design have a combined potential of about 4,320 MW, namely Mambilla (3,050 MW), Gurara 11 (360 MW), Dasin Hausa (150 MW) and Zungeru (760 MW).

Wetlands

Wetlands are "*areas of marsh, fen, peat land or water, … with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six metres*" (Ramsar Convention, 1975). They support rural livelihoods serving for crop production, grazing animals, fishing, and harvesting of medicinal plants among others. The *fadama*[1] projects have hung on their potentials. Wetlands are also important for biodiversity promotion. Nigeria presently has 11 sites designated as Wetlands of international importance, with a surface area of 1,076,728 hectares.

Environmental Challenges

The main environmental challenges in Nigeria are land degradation, environmental pollution, floods, and erosion. Land degradation is stemming from many factors, including pressure on the land resources, which lead to deforestation or de-vegetation and eventually unproductive land. Environmental pollution is a serious challenge, especially around the major urban areas.

Climate Change

Accelerated climatic changes are expected to lead to potentially large impacts across Africa, including in Nigeria in the future. The scale of climate change will increase with higher global levels of GHG concentration from anthropogenic emissions. Climate models suggest that Africa's climate will generally become more variable, with high levels of uncertainty regarding climate projections in the Africa Sahel zone. Temperatures in West Africa, and particularly the Sahel, have increased more sharply than the global trend, and the average predicted rise in temperature between 1980/99 and 2080/99 is between 3°C and 4°C, which is more than 1.5 times the average global trend. For Nigeria, a sea level rise of 1 m could result in the loss of 75% of the Niger Delta (IPCC, 2007).

Deforestation

Nigeria is well endowed with forest resources, but their excessive exploitation is a source of concern and threat for the economic, social, and environmental context. Apart from providing a large proportion of the global supply of timber and fuel, forests also provide a wide range of non-wood products and environmental functions. These products include bush meat, medicine, watershed protection, stabilisation of the hydrological regime and carbon sequestration. Forests regulate global climate and act as a major agent of carbon exchange in the atmosphere (Obioha, 2009).

Deforestation is a significant environmental issue in Nigeria because of the direct impacts of the growing demand for land for various other uses, including agriculture, settlement development, logging, fuel wood extraction, transport facility development and mining.

Virtually almost all the forests in the country may have now disappeared due in part to the mismanagement of the country's natural areas. In the 1980s, about 400 hectares of forest and woodland out of every 1000 hectares suffered from deforestation while only 26 hectares were reforested on an annual basis (UNDP Nigeria, 1996). A review of data available from national sources, USGS and FAO indicated a rate of deforestation of around 114,000 ^{ha} or 0.72 % annually. To protect natural areas for ecological purposes, efforts need to be made to intensify forest preservation, encourage the use of

[1] In Nigeria, the term "Fadama" is a Hausa name for irrigable land—usually low-lying plains underlaid by shallow aquifers found along major river systems.

alternatives to wood and continue sensitize the communities on the need to protect the forests. Desertification is also a key environmental challenge in the northern parts of the country.

According to Obioha (2009), Nigeria has been losing about 351,000 km^2 of landmass to the desert, which is advancing southward at the rate of 0.6 km annually. Other authors have reported a desert encroachment rate of 1 km per year with the same general southward trend.

Floods

Floods in the last two decades have become more frequent everywhere in the country. Inadequate watershed management, unplanned rapid urbanization, blockage of river/drainage channels through careless waste disposal, poor land use practices, land clearing for agricultural purposes, sub-standard dam construction and deforestation among other factors influence the occurrence and severity of flooding in the country. The most flood-prone areas include:

- The low-lying coastal areas of southern Nigeria such as Calabar, Warri, Port-Harcourt and Lagos where annual rainfall is high. The adverse impacts of flooding are felt more seriously when stormy weather coincides with high tides.
- The floodplains of the major rivers such as the Niger, Benue, Gongola, Sokoto, Hadejia, Katsina-Ala, Donga, Kaduna, Gurara, Ogun and Anambra.
- The flat, low-lying areas around and to the South of Lake Chad which may be flooded during and even a few weeks after the rains.

Environmental Pollution

Environmental pollution is increasing due to large human population concentrations, industrial activities, agricultural change, use of new technologies, increase in recycling of items particularly metal and consumer products, and, poor institutional, logistic and policy frameworks for managing pollutants. Air pollution is influenced by many factors, particularly industrial activities and use of spent automobile engine oil. Water pollution results mainly from the discharge of household and industrial effluents as well as petroleum products through oil spills into water bodies and streams. The use of fertilizers and other farm inputs are also contributing factors to soil and water pollution in many parts of the country.

Waste

The burden of waste management is growing everywhere, more particularly in the urban areas. The total amount of domestic waste per annum in Nigeria is estimated at about 36 million tonnes (0.50 kg/capita/day) and is increasing according to the National Bureau of Statistics (NBS) (personal communication, 2019). The problem is largely with collection and disposal. Waste is indiscriminately disposed of in many areas, and solid waste dumps dot the urban landscape in many parts of the country. Only about 44% of waste in Nigeria is collected (NBS, 2019), leaving so much unattended to. Generally, there are inadequate facilities for refuse collection and management in many parts of the country.

Economic and developmental challenges

While Nigeria has made some progress in socio-economic terms in recent years, its human capital development remains weak due to under-investment and the country ranked 152 out of 157 countries in the World Bank's 2018 Human Capital Index (World Bank, 2019). The Nigerian economy continues to be dominated by the oil sector which fetches more than 90% of the foreign exchange for the country. The impact of the sector is however little felt by most of the people. Hence, the massive developmental challenges which Nigeria must face include the need to reduce the dependency on oil and diversify the economy, address insufficient infrastructure, and build strong and effective institutions, as well as governance issues and public financial management systems.

According to the World bank (2019), inequality in terms of income and opportunities has been growing rapidly and has adversely affected poverty reduction. The North-South divide has widened in recent years due to the Boko Haram insurgency and a lack of economic development in the northern part of the country. Large pockets of Nigeria's population still live in poverty, without adequate access to basic services, and could benefit from more inclusive development policies. The lack of job opportunities is at the core of the high poverty levels, of regional inequality, and of social and political unrest in the country. Hence, the critical economic issues concern is the need to foster sustainable rapid economic growth that will cater for the needs of over 200 million people.

ES 2. National Greenhouse Gas Inventory

Introduction

In line with articles 4 and 12 of the UNFCCC, which state that non-Annex I Parties should include information on a national inventory of anthropogenic emissions by source and absorption by sinks of all GHG not controlled by the Protocol of Montreal, within the limits of their possibilities, using in its preparation the comparable methodologies promoted and approved by the Conference of Parties. Nigeria has prepared and submitted two GHG inventories for the base years of 1994 and 2000. So far, Nigeria has compiled and submitted four GHG inventories, the latest in 2020 as a component of the NC3.

Decision 18/CMA.1 introduced the Enhanced Reporting Framework of the Paris Agreement, and Annex III to this decision provides the Modalities, Procedures and Guidelines for presenting results of the GHG inventories of NAI Parties as National Inventory Reports (NIRs) on a stand-alone basis or as a component of the Biennial Transparency Reports (BTRs). Being a signatory Party to the Paris Agreement, Nigeria is presenting the results of this inventory in a stand-alone inventory report (NIR1) in preparation towards meeting the ETF.

Institutional arrangements

The DCC of the FME has the responsibility of climate change activities in the country. DCC is one of six technical departments in Nigeria's FME. It has four divisions, each responsible for a major thematic area of climate change. One of these is the GHG Division within which rests the responsibility of producing the GHG inventories for reporting to the Convention. The institutional arrangements and GHG inventory management system are more fully described in the NIR1 and the chapter on MRV.

The compilation and production of a national GHG inventory requires the successful implementation of well-defined steps. While Nigeria lacked a fully-fledged GHG inventory management system and perfect institutional arrangements (IA) when producing the inventory for the BUR1, the BUR2 offered the opportunity for the GHG inventory team members to understand and implement the steps of the inventory cycle with the support of the international consultant.

Coverage

This GHG inventory covers the whole territory of the Federal Republic of Nigeria and estimates are computed at the national scale.

The national GHG inventory includes estimates for the four IPCC sectors, Energy; Industrial Processes and Product Use (IPPU); Agriculture, Forestry and Other Land Use (AFOLU) and Waste. However, the categories and subcategories of these sectors have not been fully exhausted due to lack of AD in some cases. The coverage of activity areas is provided under the completeness section of this chapter.

The GHG inventory includes emissions of the direct GHGs carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O). Additionally, estimates of the GHG precursors oxides of nitrogen (NO_X), carbon monoxide

(CO), non-methane volatile organic compounds (NMVOCs), and sulphur dioxide (SO_2) were made as appropriate.

Estimates have been made for the year 2017. In line with the requirement to provide a trend of estimates, the period 2000 to 2017 has been adopted. Furthermore, for the sake of consistency for reporting, estimates for the years 2000 to 2016 have been recalculated whenever required, and using the same methodology and data sources to reflect improved AD or EFs as appropriate.

Method

Estimates of GHG emissions provided in this report have been compiled using the 2006 IPCC Guidelines for National GHG Inventories (IPCC 2007) and the IPCC Good Practice Guidance (GPG) and Uncertainty Management in National GHG Inventories (IPCC 2000). The purpose of adopting these guidelines and the GPG is to ensure that the GHG emission estimates are Transparent, Accurate, Complete, Consistent and Comparable (TACCC) as far as possible. Results of the KCA from the GHG inventory of the NC3, availability of resources, existing capacity and availability of AD dictated the level for estimating emissions of categories and allocation of limited resources for compilation of the inventory.

Completeness

Results of the GHG inventory of the NC3, availability of resources, existing capacity, availability of activity data and national emission factors dictated the choice of source categories to be included for compilation. A prioritization exercise was conducted, and the highest emitting source categories were privileged. For this inventory, one more category, namely coal mining has been included.

Data Sources

Activity data used in the compilation of this inventory were sourced from a combination of national and international institutions. During data collection, priority was given to data generated within the country. However, in cases where the required data was not available in the country, data from credible international organizations such as the International Energy Agency (IEA), United Nations databases, World Bank and FAO were used.

QA/QC procedures

QC and QA procedures, as defined in the *2006 IPCC Guidelines* (IPCC, 2007) have yet to be implemented by Nigeria during the preparation of the inventory. Again, this is being addressed within the UNFCCC project and will be further developed within the contemplated Capacity Building Initiative for Transparency (CBIT) project when funds become available. It is anticipated that a first QA / QC plan as per IPCC standard will be developed and implemented when the next inventory will be compiled.

Given these circumstances, the only QC that could be done was through comparison of national data sets with those from international databases and through assessment of consistency of the time series data.

QA has not been done on a routine basis as per IPCC recommendations for this inventory except for the one by the independent international consultant who was not involved with the preparation of the inventory.

Additionally, Nigeria volunteered to the UNFCCC and Global Support Programme undertaking a QA exercise on its inventory compilation process adopted for the NC3. The recommendations from the QA exercise, were addressed partially but still need further improvement.

Uncertainty Assessment

For this Inventory, a Tier 1 uncertainty analysis of the aggregated figures as required by the 2006 IPCC Guidelines, Vol. 1 (IPCC, 2007) was performed. Based on the quality of the data and whether the EFs used were defaults or nationally derived, uncertainty levels were assigned to the two parameters and the combined uncertainty calculated using the tool available within the IPCC inventory software.

Uncertainty levels for the individual years of the period 2000 to 2017 varied from 8.3% to 19.0% while the trend assessment, when adding one successive year on the base year 2000 for the years 2001 to 2017, ranged from 10.9% to 13.9%.

National emissions

Nigeria remained a net emitter over the period 2000 to 2017 as the emissions from all categories combined exceeded the removals from the Land category. The total emissions increased by 213,768 Gg from 464,416 Gg in 2000 to 678,184 Gg in 2017, representing an increase of 46% over these 18 years. During the same period, the country recorded a regression of 23% in removals, from 5,908 Gg CO_2-eq to 4,543 Gg CO_2-eq. The trend for the period 2000 to 2017 indicates that national net emissions increased from 458,509 Gg CO_2-eq in 2000 to 673,641 Gg CO_2-eq in 2017 (Table ES-1). It is however comforting as the per capita emissions and GDP emissions index regressed over the period 2000 to 2017 from 3.78 to 3.55 tonnes and from 100 to 53.7 respectively (Table ES-1).

Table ES-1 - GHG emissions (Gg CO_2-eq) characteristics (2000 – 2017)

Year	Total emissions	AFOLU removals	Net	Per capita emission (t)	GDP emissions index (Year 1994 = 100)
2000	464,416	-5,908	458,509	3.78	100.0
2001	487,874	-5,786	482,088	3.87	99.2
2002	481,500	-5,651	475,849	3.73	84.9
2003	510,402	-5,623	504,779	3.85	83.8
2004	524,605	-5,551	519,054	3.86	78.9
2005	548,799	-5,339	543,460	3.93	77.5
2006	551,157	-5,226	545,930	3.85	73.4
2007	560,673	-5,225	555,449	3.81	70.0
2008	569,396	-5,069	564,327	3.77	66.6
2009	563,147	-4,925	558,222	3.63	61.0
2010	596,171	-4,796	591,375	3.74	59.8
2011	603,628	-5,336	598,292	3.69	57.5
2012	617,328	-4,277	613,052	3.67	56.4
2013	633,014	-5,021	627,993	3.66	54.2
2014	658,761	-5,345	653,416	3.71	53.1
2015	676,641	-4,830	671,811	3.71	53.1
2016	661,261	-4,791	656,469	3.54	52.7
2017	678,184	-4,543	673,641	3.55	53.7

Key Category Analysis

There are 16 key categories in the quantitative level assessment for the year 2017, the main one being Forestland remaining Forestland responsible for 46.9% of emissions, attributed to the combined effect of deforestation and wood removals for various uses. The other important emitting categories are from the Oil industry (8.8%), Gaseous Fuels under Energy Industries (8.2%), Road Transportation (5.3%), Enteric Fermentation (5.2%) and Natural Gas (4.6%). These key categories account for a total of 78.9% of the total

emissions. There are only twelve key categories in the trend assessment when compared to the level one. The three main contributors in the trend assessment are Forestland remaining Forestland, Gaseous Fuels under Energy Industries and Oil with more than 20% each, totalling 68.1% of the national emissions.

Constraints and Gaps

Nigeria still faces serious challenges to report to the required standards to the Convention, including the inventory component. To reduce uncertainties and aim at producing an inventory in line with TACCC principles and the ETF of the PA, Nigeria strengthened the personnel of the DCC, its national GHG inventory management system and institutional arrangements. One major challenge for estimating emissions was gaps in AD. The latter are not readily available. Thus, substantial data were sourced from international databases or extrapolated based on existing AD obtained from the Federal Institutions.

National GHG Inventory Improvement Plan

Based on the constraints, gaps and other challenges encountered during the preparation of the present inventory, a list of the most urgent improvements has been identified. Some of these have been addressed during the preparation of the NIR1 within the framework of the BUR2. However, most of the items still need further improvement and it is planned to cater for them during future inventory cycles and within the framework of the CBIT project in addition to the UNFCCC project providing support for the development and operationalization of the Greenhouse Gas Inventory Management System (GHGIMS).

ES 3. Mitigation actions and their effects

Nigeria has been active in implementing mitigation actions for quite some time to honour its commitments as a signatory Party to the Convention. It implemented numerous Clean Development Mechanism projects under the Kyoto Protocol and national ones using its own resources. This is reflected in the decrease observed in the per capita emissions and GDP emissions index during the period 2000 to 2017 (Figure ES-3).

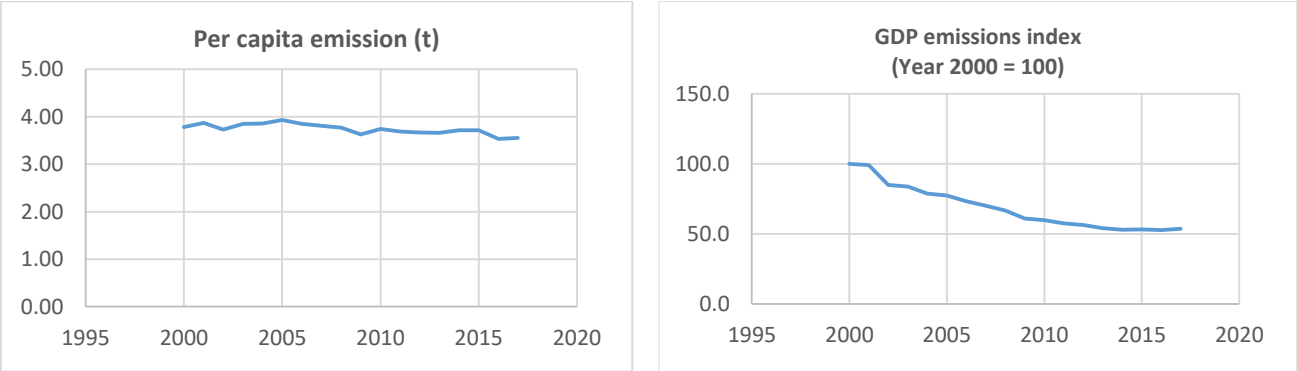

Figure ES-3 - Per capita GHG emissions and GDP emissions index

Nigeria's latest mitigation assessment is available in the NC3 (Federal Republic of Nigeria, 2020). The mitigation assessment was guided by the declared LCD agenda of the country in line with the various sectoral policies and plans developed within the framework of the NCCPRS. Given the urgency to curb maximum emissions as per the PA, Nigeria has privileged the highest emitting sectors, namely AFOLU and Energy, which represented 94% of emissions in the NC3 (Federal Republic of Nigeria, 2020) and in this inventory for 2017 also. The mitigation analysis consisted of an evaluation of the emissions reduction potential of deliberate measures in the different socio-economic sectors of the economy.

The measures by socio-economic sector are given in Table ES-2.

Table ES-2 - Mitigation measures identified in Nigeria's TNC

Economic sector	Measures
Energy (Energy Industries)	• Penetration of Renewable Energy to the electricity Grid
Energy (Oil and Gas production)	• Elimination of flaring of associated gas in the Nigerian oil and gas sectors
Energy (Industry and residential)	• Energy Efficiency Measures • Combined Heat and Power (CHP) Program • Penetration of Rooftop Solar PVs for Off-grid power generation • Cooking fuels switch • Efficient Fuelwood Cookstoves Program
Energy (Transport)	• BRT Transport Program
AFOLU (Land)	• Forest management (Afforestation, reforestation and reduction in wood removals)

The LEAP model was used to simulate and project emissions reductions for the year 2035 for the identified mitigation measures. The cumulative mitigation potential of the measures evaluated in the mitigation assessment is estimated at 170 million tonnes CO_2-eq in the year 2035. The AFOLU (Land) sector is projected to contribute 110 million tonnes and the Energy sector the remaining 60 million tonnes.

For the year 2019 under review, it is estimated that the CDM (Clean Development Mechanism) projects have resulted in an emission reduction of the order of 6,967 thousand tonnes annually, the PoA projects to a reduction of 215 thousand tonnes while emissions avoided by the locally funded projects have not been exhaustively estimated and thus not quantified and presented here. This is due to the lack of an operational MRV mitigation system.

ES 4. Information on domestic Measurement Reporting and Verification

Development of the MRV system of Nigeria

Paragraphs 61 and 62 of decision 1/CP.16 make it mandatory for NAI Parties to Measure, Report and Verify domestically and internationally supported mitigation actions with the latter also subject to international MRV. Therefore, MRV calls for the measurement and reporting of countries' climate mitigation actions. The development and establishment of a domestic MRV system represents a serious challenge to NAI countries as it is a new and additional responsibility within the framework of the preparation of BURs. Nigeria has some initiatives and existing capabilities within its present monitoring and evaluation system that can serve as basis for the development of the domestic MRV system after appropriate improvements and modifications. Institutionalization of the MRV will ensure that all resource requirements are considered and accounted for in advance and the necessary mechanisms are put in place to address all issues that may arise on a continuous and systematic way rather than on an ad-hoc basis.

A preliminary analysis, performed in view of the development of the domestic MRV system for tracking emissions, mitigation activities, and support needed and received, revealed the need for removal of numerous barriers, lack of appropriate legal framework, insufficient capacity and resources. The best option is viewed as being the strengthening of the existing monitoring and evaluation framework to upgrade it to the MRV system. The MRV system should reflect Nigeria's national circumstances with the underpinning legal framework spanning over different administration/government levels. It will contain both mandatory and voluntary components. The FME will spearhead the domestic MRV system in collaboration with the other Federal Ministries through the line MDAs and State government representatives within the Inter-Ministerial Committee on climate change. The DCC of the FME, as the focal entity, will coordinate and supervise the institutional arrangements through its technical

departments, themselves overseeing the more detailed activities of the thematic working groups. The latter will comprise representatives from various line ministries, state and local governments, private sector, civil society organizations, educational and research organizations as appropriate according to specificity of activities. The inter-ministerial committee provides a common coordination platform to harness the many relevant climate change related datasets that are available in different government departments and in private organizations.

GHG Inventory Management System

Following the preparation of the FNC, SNC, NC3 and BUR1, Nigeria seized the opportunity in 2018 to implement a robust GHGIMS following recommendations of the UNFCCC. In line with the recommendations and guidance, Nigeria began their in-house production of the GHG inventory of the BUR2 through the GHG inventory division of DCC in collaboration with other institutions concerned with the compilation of the inventory. An international company was contracted to provide support and backup on the development and implementation of the GHGIMS as well as on the compilation process while providing capacity building to staff of the GHG inventory division and other national experts on the technical aspects of the inventory. The transition was not fully successful, but some progress has been recorded in the development and implementation of the GHGIMS. The key achievement is the mapping of institutions to ensure completeness of the inventory. The results led to their integration in the newly created sectoral working groups Energy, IPPU, AFOLU and Waste. It should however be highlighted that this is still a major challenge for the country and it will take time to develop and implement the GHGIMS, make it fully operational and sustainable over time. Hence, capacity building will be an integral part when developing the GHGIMS including the Institutional Arrangements. Nigeria relies on the support of bilateral and multilateral partners to fully implement its sustainable GHGIMS. MRV of emissions

MRV of emissions seeks to measure, report and verify quantifiable emissions data at national, regional and plant levels for activities falling under the four IPCC sectors to track implementation of the NDC. FME, as focal point of the UNFCCC, has tasked DCC with collating and integrating information on climate change implementation across all MDAs under the supervision of the Inter-ministerial Committee on climate change.

Consequently, the GHG Division of the DCC oversees all activities of the system for MRV of emissions. The National Bureau of Statistics supports DCC GHG inventory Division for collecting the bulk of activity data required from public institutions and private sector companies. Most line ministries, including Departments under their purview, State and local governments and the civil society also contributes as suppliers of data as members of the working groups.

The sectoral working groups are responsible for the compilation and estimation of emissions. Thus, they are responsible for QA/QC of all activity data, entering these into the software including the associated level of uncertainties, analysing emission factors and choosing the most appropriate ones along with their uncertainty levels, estimating emissions, performing KCA, Uncertainty Analysis and identifying constraints, gaps and needs for inclusion in the NIIP. Sectoral working groups are also responsible for documenting the whole process and reporting for their respective sector. DCC takes charge of compilation at the national level and the preparation of the report, its review by stakeholders, approval, and submission to the COP.

MRV mitigation actions including NAMAs

Nationally Appropriate Mitigation Actions (NAMAs) are the central instruments within the UNFCCC framework to support developing countries' efforts in achieving the GHG emission reduction targets of their NDCs during the transition to a low carbon economy. Other ongoing and new mitigation actions not falling under NAMAs cannot be neglected. Thus, MRV of NAMAs and other mitigation actions are essential

to track progress and allow for backstopping of the mitigation programme. In addition, MRV cycles help to inform, understand, and correct deviations between projected and real performance, therefore triggering the necessary learning process and integration in the development plans.

The overall responsibility of the MRV system for mitigation, including NAMAs will rest with the FME through the Mitigation Division of the DCC supported by the GHG Inventory Division. The Mitigation Division will track and follow the different steps of the MRV system while estimation of emission reductions or removals stemming from the mitigation activity will be computed by the inventory team of the GHG inventory Division. The Measurement component will be under the responsibility of the Executing Entity (EE) which will also prepare regular monitoring reports and submit to the NAMA implementing Entity for follow-up. The latter will then submit to the NAMA Coordinating Agency, namely the Mitigation Division of the DCC for verification and approval for further transmission to the appropriate authority for verification. Once the latter process is satisfactorily completed, the final report will be prepared and submitted to the NAMA Donor or other collaborating/supporting partner depending on the type of NAMA. MRV of other mitigation activities will follow a similar process. The implementation details, support received, emission estimates and other benefits derived from the activity will then be included in the next BUR or BTR for submission to the UNFCCC.

MRV of support

Direct support from bilateral and multi-lateral partners for climate change activities has been of financial, technical, and technological nature notwithstanding capacity building of national experts on various thematic areas since Nigeria ratified the Convention. Additionally, Nigeria invested indirectly from its annual budget since it created a dedicated department, the DCC, within the FME. DCC has been further consolidated with the recruitment of additional staff members to enable it deliver on the enhanced reporting requirements, including the ETF of the PA. Similarly, although the FME is the focal point for activities falling under the UNFCCC and the international climate regime, nothing precluded other MDAs from cooperating and receiving support for their mandated activities that are climate related.

Given the new reporting context of the Convention and the need to track and monitor all support received, Nigeria is conscious that to face this new challenge it must work on developing and establishing rapidly a sustainable system for MRV of support. Existing institutional arrangements aimed at monitoring climate change activities could be exploited after appropriate changes and improvements to meet the challenges for MRV of support. The personnel involved with CDM and GEF projects could be reorganized into a division within DCC, with the mandate of tracking support received and needed for reporting in BURs and BTRS. The Inter-Ministerial Committee on Climate Change can act as the platform for collating all information pertaining to support for climate change related activities from all Federal Ministries. The latter can themselves collect the same information from the State Governments and the private sector under their jurisdiction. The information provided as per an agreed template can then be processed, documented, and archived by the DCC of the FME for retrieval when preparing the BURs and BTRs.

ES 5. Constraints and gaps, and related financial, technical and capacity needs, including a description of support needed and received

Introduction

Nigeria recognizes the support received from bilateral and multilateral partners to tackle climate change. However, it is obvious that the level of support received to-date has not been sufficient to enable Nigeria to actively play its role as it would have wished. The country is highly vulnerable, and the priority has been to invest national resources available for adaptation rather than mitigation to guarantee the well-being of the poorest segments of the population, including the more vulnerable groups and women, doubly so

within the context of the COVID-19 pandemic. Nigeria still faces numerous constraints and gaps of financial, technical and technological nature that the country will have to address in addition to capacity building to be able to cope with the threats posed by climate change. These constraints, gaps and needs relate to its obligations for reporting and implementation of the Convention.

GHG inventory

The major constraint faced in the estimation of GHGs emissions for the four IPCC sectors was the lack of good quality activity data. This lack of consistent activity data and process information resulted in heavy reliance on international data sources and generation of missing activity data to fill the gaps when estimating GHGs emissions and sinks within the country. National emission factors more appropriate to suit national circumstances for use with the higher tier methods were also not available. Nigeria is also still in the process of developing and implementing a high-quality GHG inventory management system with robust institutional arrangements for sustainable production of inventories. The effort is however slowed down by the lack of a pool of national experts able to compute GHG inventories on a facility, sectoral, regional, state, and national level.

Mitigation

Nigeria has already implemented several CDM projects under the Kyoto Protocol, and more recently, the country identified and reported clear mitigation opportunities for the medium term in its NDC, presently under revision to make it more ambitious. However, Nigeria is yet to develop its first NAMA due to lack of capacity, specifically, a well-computed inventory at facility level with proper baselines due to constraints and gaps reported associated with the GHG inventory. Overall, information on mitigation actions and their effects are very scarce and limited. While there are tremendous efforts made to mitigate the effects of climate change, this information is either unavailable or in most cases non-existent, as there is no centralized system of reporting or data collection on mitigation in the country. Information on climate change policies and larger national actions are usually available, but this information only contains the basic elements like programme name, implementation agency, and objective; with little to no information outlining the effects of the mitigation actions, emissions avoided, and benefits obtained.

Measurement, Reporting and Verification

Up to now, data collection for reporting in NCs has been on an ad-hoc basis, but this is not suitable for BURs which need a systematic and sustainable system. The key limitation of the present monitoring and evaluation system is the absence of systematic collection of data along with proper documentation and archiving. The development and implementation of the domestic MRV system will need to integrate various ministries, other government institutions, the private sector, and the civil society. Additionally, there will be the need to develop the appropriate human, technical and technological capabilities to make the process a success.

Technology transfer

Successful technology transfer is of utmost importance when tackling climate change issues. Nigeria still lacks an in-depth technology needs assessment and transfer to address climate change problems. Constraints and gaps relating to technology transfer in the context of mitigation and adaptation to climate change exist and will have to be corrected.

Support received and needed

Nigeria lacks systematic documentation in most areas including support received. Where such related support has been received, the information is not readily available in the public domain. The difficulty in locating such information is because most of the support is non-monetary and little weight is attached to

it for national accounting purposes, resulting in insufficient motivation to record, report and account for them. No exhaustive assessment of support needed to implement fully all identified mitigation and adaptation actions has been made. Nigeria has not yet conducted and documented a comprehensive financial, technical assistance, technology transfer and capacity building needs assessment for climate change. The extent of financial assistance required is also not provided and it is planned to start work on this aspect to provide the information in the next BUR.

ES 6. Information on the level of support received to enable the preparation and submission of biennial update reports

The Global Environment Facility (GEF), through the UNDP country office acting as the implementing agency, provided funds to the level of USD 352,000 to support Nigeria prepare its first Biennial Update Reports (BUR1) for the fulfilment of its obligations under the United Nations Framework Convention on Climate Change (UNFCCC). The government of the Federal Government of Nigeria through the DCC of the FME provided in kind support to the value of USD 50 000 to successfully complete the preparation of the BUR1.

ES 7. Any other information relevant to the achievement of the objective of the Convention and suitable for inclusion in its Biennial Update Report

National climate change strategies and plans

The sustainable development of Nigeria is guided by two strategic documents, Vision 2020 adopted in 2010 and the more recent Economic Sustainability Plan approved in 2020. Within Vision 2020, Nigeria developed, enacted and adopted several legislations and plans to translate it into the wider policies, plans and action. The main one, the National Climate Change Policy Response and Strategy (NCCPRS), adopted and implemented in 2012, envisions a climate change-resilient Nigeria ready for rapid and sustainable socio-economic development. The Economic Sustainability Plan has among several objectives, the prioritisation of solar power. The plan aims at developing a solar power strategy which will create 250,000 jobs while powering 5 million households at an estimated cost of 240 billion Naira by encouraging private sector investment.

Impacts and Vulnerability

The 2014 World Climate Change Vulnerability Index, published by the global risk analytics company Verisk Maplecroft, classified Nigeria as one of the ten most vulnerable countries in the world. The vulnerability and adaptation assessment of the NC3 confirmed this finding. It underlined the general south-north divide to vulnerability. Generally, the Southwest and Southeast are relatively less vulnerable than other parts of the country. The three northern zones showed higher vulnerability than those in the south, the Northeast being the most vulnerable region. Aware of the significant importance of adaptation to climate change, Nigeria developed the National Adaptation Plan Framework in 2020 to facilitate the management of the medium- and long-term adaptation needs of the country in a coherent and coordinated manner.

1 National circumstances and institutional arrangements

1.1 Geographical situation

The Federal Republic of Nigeria, commonly referred to as Nigeria, is located at the extreme inner corner of the Gulf of Guinea on the west coast of Africa between latitudes 3°15' to 13°30' N and longitudes 2°59' to 15°00' E. It borders Benin in the west, Niger in the north, Chad, and Cameroon in the east, and its coast in the south lies on the Gulf of Guinea in the Atlantic Ocean (Figure 1.1).

Nigeria is the 14th largest country in Africa with a land area of 923,768 km^2 of which land comprises 910,768 km^2 and water accounts for 13,000 km^2. It has a total boundary length of 4,900 km, including 853 km of coastline (Nigeria, 2017).

Figure 1.1 - Location map of Nigeria

1.2 Governance

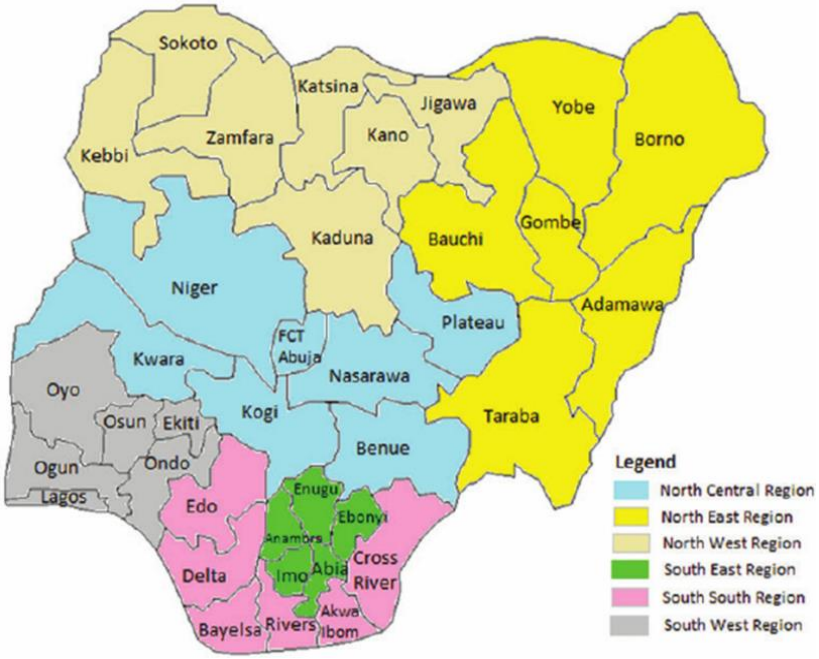

Figure 1.2 - Geopolitical zones of Nigeria

Nigeria is a federal presidential republic. It comprises 36 states and the Federal Capital Territory (FCT), where the capital, Abuja is located. Nigeria is officially a democratic secular country. The states and FCT are further sub-divided into 774 Local Government Areas, or Area Councils, for grassroot administration. The 36 states are grouped into six geopolitical zones for political and development purposes. These are shown in Figure 1.2. The Constitution of the country provides for a presidential system of government in which there is an Executive, a Legislature and a Judiciary. The legislative structure is bicameral with upper and lower chambers at the Federal level while state governments and Local Councils operate a single legislative chamber. A judicial structure erected in all three tiers of government completes the operational framework for checks and balances and separation of powers in governance as enshrined in the Constitution. The Constitution further provides for the operation of three tiers of government, at the federal, state and local levels (Nigeria, 2014).

1.3 Convention Obligations

Under Article 4.1 (a) of the Convention, each Party has to develop, periodically update, publish and make available to the Conference of the Parties (COP), in accordance with Article 12, national inventories of anthropogenic emissions by sources and removals by sinks of all greenhouse gases not controlled by the Montreal Protocol, to the extent its capacities permit, using comparable methodologies to be promoted and agreed upon by the COP.

As a Non-Annex 1 Party to the United Nations Framework Convention on Climate Change (UNFCCC), and more specifically as directed by Paragraph 60 (c) of decision 1/CP.16 Nigeria is obliged to report certain elements of information as follows:

> *Developing countries, consistent with their capabilities and the level of support provided for reporting, should also submit biennial update reports containing updates of national greenhouse gas inventories, including a national inventory report and information on mitigation actions, needs and support received*.

Since the inception of joint global actions on climate change arising from the Rio Conventions of 1992, Nigeria has been active on many fronts. In 2003, it submitted its First National Communication (FNC). It prepared other major documents including the National Adaptation Strategy and Plan of Action (NASPA) to guide its adaptation efforts. A National Climate Change Policy and Response Strategy (NCCPRS) has been adopted in 2012. These two policies pave the way for Nigeria to contribute to limiting Greenhouse Gas (GHG) emissions and the resulting global warming and adapt to the impacts of climate change stemming from the global warming. There have also been efforts to strengthen the institutional arrangements for climate change response in the country. One major aspect of this is the upgrading of the Special Climate Change Unit (SCCU) to a Department of Climate Change (DCC) in the Federal Ministry of Environment (FME). The Second National Communication (SNC) was submitted in 2014, the Third National Communication (NC3) in 2020 and the First Biennial Update Report (BUR) in 2017, thus furthering the country's obligations to the UNFCCC and enabling the latter to capture progress on the implementation of the Convention. Nigeria also submitted the Intended Nationally Determined Contributions to the UNFCCC within the framework of the Paris Agreement in 2015.

1.4 Institutional arrangements

The DCC of the FME was set up to implement the Nigerian Government's *"commitment to introducing and implementing adaptation and mitigation measures necessary to reduce vulnerability to climate change"*. The mandate of the department is:

> *"To co-ordinate national implementation of the United Nations Framework Convention on Climate Change, its protocol and any other legally binding agreement for implementing climate change activities"* (Department of Climate Change, 2017).

FME is Nigeria's focal point to the UNFCCC and as such its mission, through the DCC, is:

> *"To regularly update information regarding national inventory of the Green House Gas emission and mitigation options, vulnerability assessment and adaptation measures and to satisfactorily provide a sustainable policy framework and enabling environment for the implementation of the UNFCCC and Kyoto Protocol and any other climate change guidelines, laws and control in Nigeria"* (Department of Climate Change, 2017).

DCC comprises the following four Divisions:

- Green House Gas division (GHG)
- Vulnerability and Adaptation division
- Education, Awareness and Outreach division
- Mitigation division

In addition to the operations carried out by these divisions, DCC is also the convener and chair of the Inter-Ministerial Committee on Climate Change (ICCC). The functional organogram of DCC is depicted in **Error! eference source not found.** and a detailed description is provided in the MRV chapter of this report.

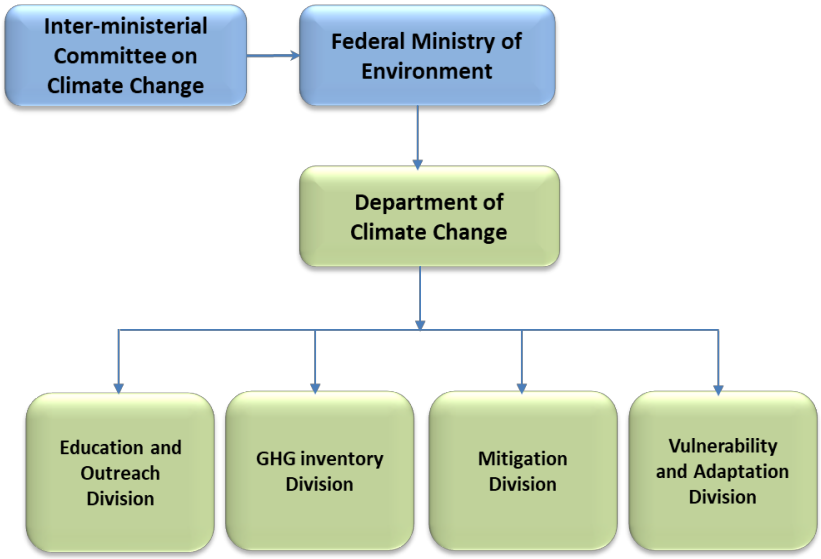

Figure 1.3 - Organogram for implementing climate change activities

1.5 Climate

Nigeria is located primarily within the lowland humid tropics. The climate of Nigeria is mainly influenced by three major air masses: the tropical maritime (mT), the tropical continental (cT) and the equatorial easterlies (Ojo, 1977; Iloeje, 1981).

Nigeria is generally characterized by a high temperature regime almost throughout the year. In the far south, mean maximum temperature is 32°C while in the north it is 41°C. However, the mean minimum temperature is 21°C in the south and below 13°C in the north which has a much higher annual range. The mean temperature for the country is 27°C, in the absence of altitudinal modifications. Over the last few decades, there has been a general increase in temperature throughout Nigeria.

The climate of the country varies from a very wet coastal area with annual rainfall greater than 3,500 mm to the Sahel region in the northwest and north-eastern parts, with annual rainfall less than 600 mm. The annual variation of rainfall, particularly in the northern parts, is large. This often results in climatic hazards, especially floods and droughts, which bring in their wake much suffering with devastating effects on food production and the nation's economy. Recent studies have revealed declining trends in rainfall. Often, substantial parts of Nigeria receive less than 75% of their annual rainfall and this is particularly worrisome in the north.

1.6 Relief, drainage and water resources

Nigeria has two main relief regions: the high plateaux ranging between 300 and more than 900 m above sea level, and the Lowlands, which are generally less than 300 m (Iloeje, 1981; Jeje and Adesina 1995). The

high plateaux include the north central plateau, the eastern and north-eastern highlands, and the western uplands. The Lowlands comprise the Sokoto plains, the Niger-Benue trough, the Chad Basin, the interior coastal lowlands of western Nigeria, the lowlands and scarp lands of south eastern Nigeria and the coastlands.

The Niger Delta is a low-lying region, cut up by a complicated system of natural channels through which the River Niger finds its way to the sea. It is made up of three distinct sub-regions. These are (a) the freshwater zone (b) the mangrove swamps, and (c) the zone of coastal sands and beach ridges. The freshwater zone, which starts from the apex of the delta, just below the town of Aboh, is essentially an extension of the lower Niger floodplains. The numerous water channels in this zone are bordered by natural levees, which provide the sites for most of the settlements and farmlands in the zone. The mangrove swamps, covering about 10,360 km^2 and located to the south of the freshwater swamps, are sparsely settled. Strips of sandy beaches and ridges, which vary from a few meters to some 16 km, separate the mangrove swamps from the open sea. In addition to natural levees, ox-bow lakes are common landforms in the Niger Delta. The high rainfall in the region, coupled with the abundance of surface water and the flat terrain, create a serious drainage problem, and makes road construction very difficult.

Most of the country's rivers take their sources from four main hydrological basins: the North Central plateau (Sokoto-Rima, Hadejia, Gongola, and Kaduna rivers), the Western Uplands (Moshi, Awun, Ogun, Osun, Osse rivers), the Eastern Highlands (Katsina-Ala, Donga rivers) and the Uri Plateau (Anambra, Imo and Cross rivers). These drainage and relief features of the country have impacts on water resources and land use potentials of the country, particularly for agriculture. According to the 2008 State of the Environment Report (Federal Ministry of Environment, 2008), the total surface water resources potential for Nigeria is estimated at 267.3 billion m^3 while the groundwater potential is evaluated at 51.9 billion m^3, giving a total of 319.2 billion m^3. In addition, the number of relatively large dams completed or under construction is about 160 with a total active storage of 30.7 billion m^3.

1.7 Vegetation

Nigeria's vegetation is largely a reflection of its tropical climate. Hence, the distribution of the native vegetation types tends to follow the climatic patterns as described below and illustrated in Figure 1.4.

Salt and freshwater swamps are found along the coast, stretching inland for 1 to 2 km in the Lagos region to over 30 km in areas regularly inundated by salty tidal waters. They occupy 2,130,000 and 858,000 ha of the terrestrial lands respectively, making a total of 2,988,000 ha (Nigerian Environmental Study/Action Team, 1991; Olalekan et al., 2014). The saline wetlands are predominantly covered with mangrove species *Rizophora mangle* (red mangrove) and *R. racemosa*. Beyond the reach of the tidal waters, the mangroves give way to freshwater plants, the most important ones being *Pandanus sp.*, *Dalburger escatophylum* and *Machaerum lunatus*.

The **tropical lowland rainforest** belt lies to the north of the salt and freshwater swamps and consists of a dense evergreen vegetation of tall trees with undergrowth of small trees, shrubs, and grasses. The rainforests are dominated by three layers of tree crowns, with the tallest trees being more than 36 m in height (Richards, 1977). Wherever the forest is relatively untouched, the top canopy becomes closely interlocked, preventing the sun from reaching the ground, resulting in the forest floors being completely devoid of plants.

The **Guinea savanna** is the most extensive vegetation belt in Nigeria and is associated with areas receiving 1,000 to 1,500 mm of annual rainfall spread over up to 6 months. It consists of a mix of trees and grasses,

with trees being more numerous in sparsely settled areas. The trees are distinctive, typically fire-tolerant to the annual bush fires that are common in the savanna. Some of the common species are *Vitellaria paradoxa*, *Parkia biglobosa* and *Danielia oliveri.* Along the riverbanks of the savanna are finger-like extensions of the lowland rainforests known as gallery forests.

The **Sudan savanna** belt occurs north of the Guinea savanna with rainfall of about 600 to 1000 mm and up to 6 months of dry season. It stretches from the Sokoto Plains to the Chad Basin, covering over a quarter of the country's land area. The vegetation consists of grasses 1 to 2 m high and often stunted trees such as the acacia, gum Arabic, date palm, and baobab.

The Sahel savanna, the last of the main vegetation belts of Nigeria, occurs in the extreme northeast where the annual rainfall is less than 500 mm and the dry season exceeds 8 months. The atmosphere is dry except for one to two months in the middle of the short-wet season. The grasses are short and tussock, 0.5 to 1.0 m high between sand dunes. Acacia is the dominant species in this zone, although date palms appear here and there. The swampy shores of Lake Chad support tall reeds growing on seasonally flooded flat land.

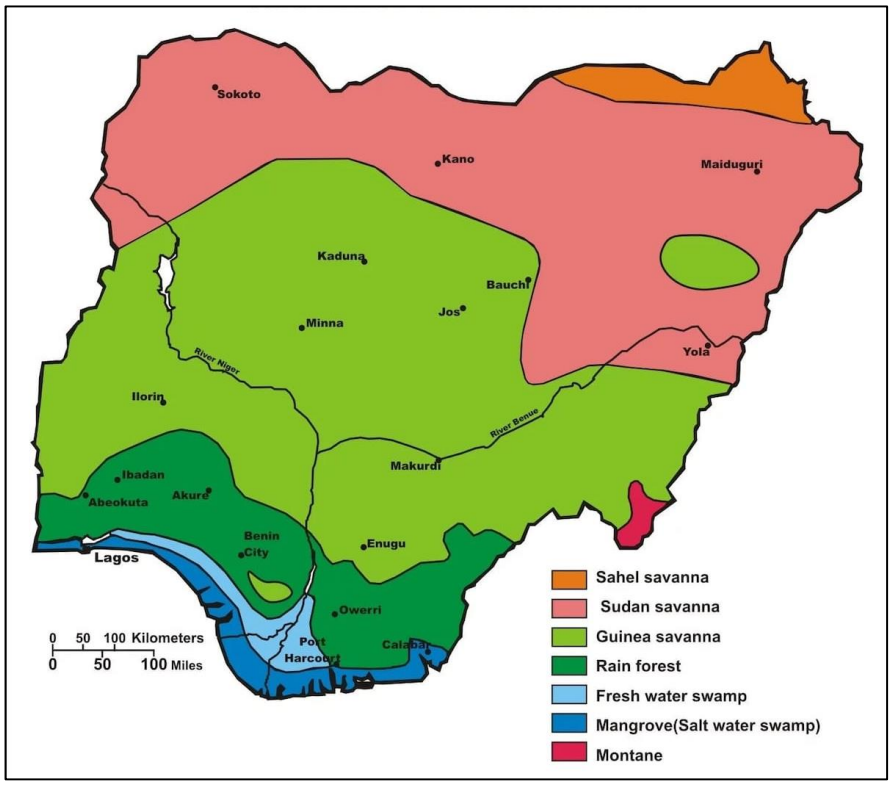

Figure 1.4 - Nigeria Agro-Ecological Zones / Vegetation

1.8 Land Resources and uses

The total land area of about 923,769 km^2 constitutes a huge resource for Nigeria. It is a critical factor of Nigeria's environment since it significantly supports basic socio-economic and cultural activities. Land use is thus the critical factor responsible for the environmental changes taking place at various scales in the country. The demographic increase associated with the needs of the population have led to the conversion of more than 60% of the country's pristine land for anthropogenic activities, with agriculture responsible for the larger proportion of this. Conversion of land to agriculture is predominant in the savanna. Concurrently, high rates of change are also observed to account for settlements and open mines, with changes increasing between 1 to 2% annually (USAID, 2017).

Originally, Nigeria was covered by a variety of forests and wooded savannas which constituted some of the richest ecosystems in terms of biodiversity (Keay, 1989). These natural plant covers had been sources of wood and other nature-based resources for several centuries, and as long as population pressure was light, their exploitation was sustainable. With the rapid population growth and its demands, the extraction has resulted in deforestation as well as de-vegetation of the savanna at unsustainable rates. The effect of deforestation and de-vegetation is considerable for the country as the two related phenomena amount to resource degradation and ecological losses especially with respect to biodiversity loss, soil erosion, and reduction of the carbon "sink" of the country.

1.9 Coastal and Marine Environment

The marine and coastal environment is an important ecological zone in Nigeria. It extends inland by about 15 km in the Lagos area, 150 km in the Niger Delta and 25 km east of the Delta. It consists of barrier bar / lagoon systems, the Mahin mud coast, the Niger Delta, Strand coast and a moderately wide continental shelf. The dominant feature of this environment is the Niger Delta, which covers an area of about 70,000 km^2 and one of the largest wetlands in the world (FAO, 2006). The marine and coastal environment harbours more than 20% of the country's population with major centres such as Lagos, Port Harcourt and Benin City.

The coastal environment houses the oil and gas industry of Nigeria. Although the oil sector has experienced some setbacks in the recent past, particularly due to the downturn in the world oil market, the sector has remained the main source of foreign exchange earnings for Nigeria. The coastal environment also has non-fuel minerals like sand and heavy minerals. It also supports agriculture and fish production. Many recreational and touristic resources including beaches, coastal lagoons and estuaries are also found in this zone. For many reasons such as vibrant local economies, population concentrations and closeness to shipping facilities, almost half of Nigeria's industries are located within the coastal zone (HBF, 2008).

1.10 Demography

Even if there exist no precise statistics on the Nigerian population, various sources tend to agree that it is the most populated country in Africa and ranked 7th at world level in 2015. According to the Director General of the Nigerian National Population Commission (NPC) the country's population had reached 182 million by late 2016 (Vanguard, 2016; Nigeria, NPC, 2017). This estimate was based on the last Population and Housing Census done in 2006, using an annual growth rate of 3.5% weighed against other variables such as rising life expectancy and a declining infant mortality rate. According to the World Bank (https://data.worldbank.org/indicator/SP.POP.TOTL?locations=NG, accessed 19 February 2021), the Nigerian population stood at 201 million in 2019.

Two important demographic aspects need to be considered for the sustainable socio-economic development of Nigeria:

(i) the growing youth bulge, with those under 14 years accounting for more than 40% of the population, urging for the planning of the transition from youths to the next category especially, given the relatively high unemployment rate in the country.

(ii) the rapid urbanisation of the Nigerian society. According to the 2006 census, around 39% of the population lived in urban regions and World Bank statistics estimate that urban dwellers, will represent 50.2% of total population and will surpass their rural counterparts by 2018. In 2019, 51.16 % of Nigeria's total population lived in urban areas and cities (https://www.statista.com/statistics/455904/urbanization-in-nigeria/, accessed 19 February 2021).

1.11 Economic profile

Nigeria is a lower middle-income country. According to World Bank statistics, since 2012, the year during which it overtook South Africa, it has become the largest economy in Africa. In 2019, at constant 2010 USD, the Nigerian GDP stood at 479.75 billion and the GDP per capita was 2,387. Figure 1.5 illustrates the evolution of Nigeria's GDP during the period 2000 to 2019 (source World Bank, 2020).

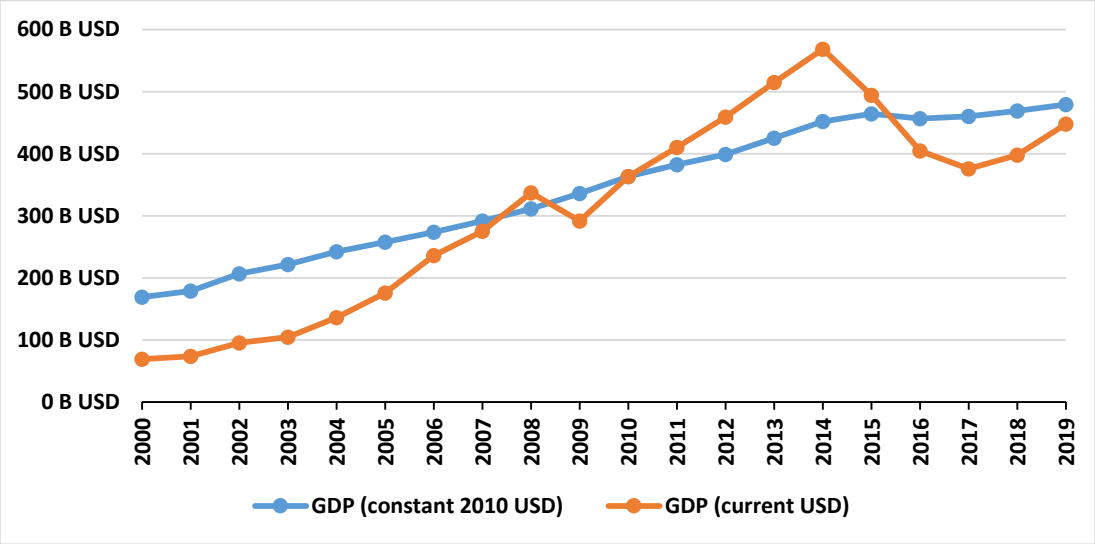

Figure 1.5 - GDP of Nigeria in constant 2010 USD and current USD

Between 2000 and 2014 the economy grew steadily at an average rate of 7% per year (Figure 1.6). Following the oil price collapse in 2014-2016, combined with negative production shocks, the gross domestic product (GDP) growth rate dropped to 2.7% in 2015. In 2016 during its first recession in 25 years, the economy contracted by 1.6%. Since 2017, the economy has recovered and a growth of 2.2% was recorded in 2019 (Figure 1.6) (source World Bank, 2020).

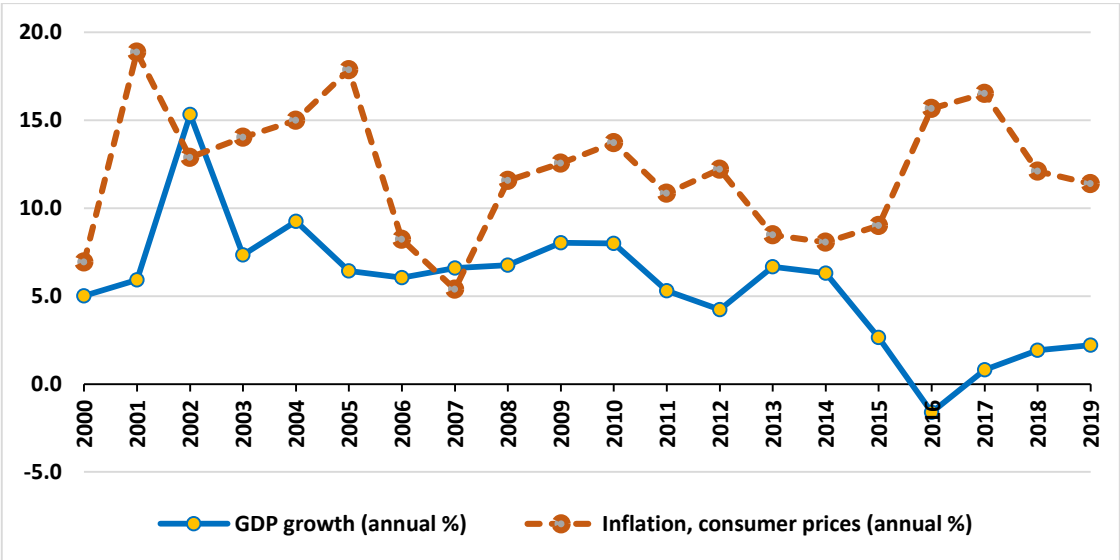

Figure 1.6 - Nigeria's GDP growth and inflation rate

The services sector which had been driving the economy from 2006 to 2010 with an average annual growth rate of 12.7%, started to decline as from 2011, averaging 5.8% growth up to 2015. The sector was severely hit as from 2016 with an average negative growth rate of 0.8% which declined even further to -0.9% in 2017.

Growth of the industrial sector has been erratic during the period 2006 to 2017 – recovering from a period of negative growth from 2006 to 2008 (average growth of -2.0%), then recording a period of erratic positive growth from 2009 to 2014 (average growth of 4.6%) to finally recording two consecutive years of negative growth in 2015 and 2016 before recording some recovery in 2017 with a positive growth of 2.1%.

During the 2002 to 2017 period, the agricultural sector exhibited some more resilience in that it did not record any negative growth. However, growth gradually declined from an average of 7.0% during the period 2006 to 2009 to an average of 3.8% during the period 2015 to 2017.

The economy is greatly influenced by the erratic growth pattern of the oil sector (Figure 1.7) as Nigeria remains heavily dependent on oil revenues. In recent years, oil and gas have accounted for more than 90% of the country's exports and more than 70% of consolidated budgetary revenue. Hence, while the oil sector contributes less than 15% to total GDP and despite the contraction of that sector, inflows from oil sales still play a significant role in the economy and have helped bolster domestic demand, thereby driving economic growth (World Bank Group, 2015).

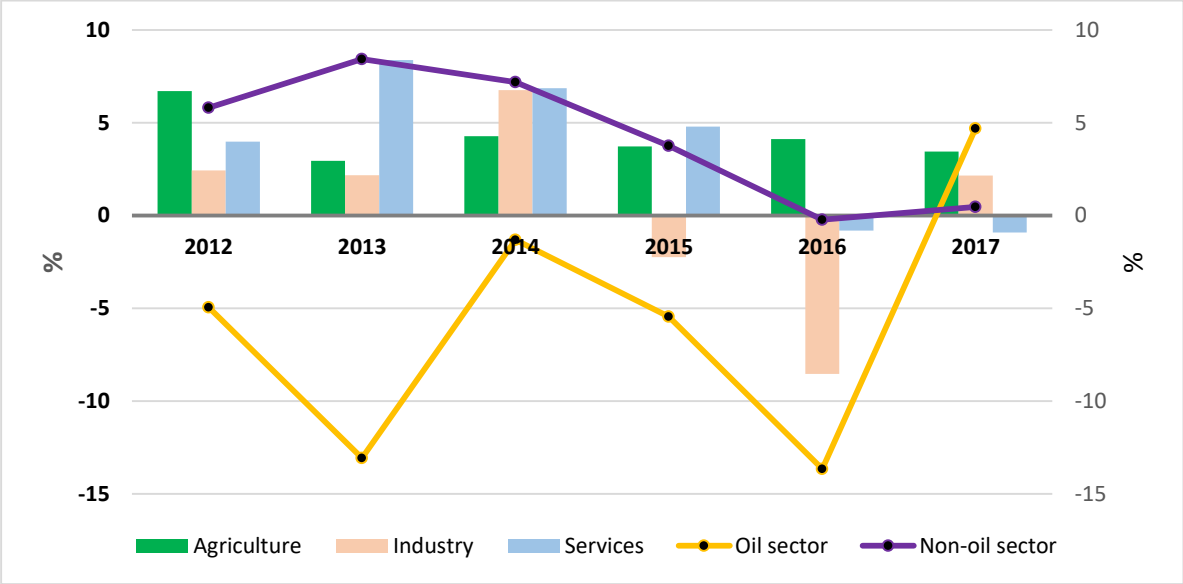

Figure 1.7 Growth rate of main economic sectors of Nigeria

Source: (The World Bank, 2017)

Since 2015, economic growth remains muted. According to a World Bank report (https://www.worldbank.org/en/country/nigeria/overview#1) , growth is too low to lift the bottom half of the population out of poverty. The fragility of the agriculture sector weakens prospects for the rural poor, while high food inflation adversely impacts the livelihoods of the urban poor. Despite expansion in some sectors, employment creation remains weak and insufficient to absorb the fast-growing labour force, resulting in a high rate of unemployment, with another 20% of the labour force underemployed. Furthermore, the instability in the North and the resulting displacement of people contribute to the high incidence of poverty in the North East.

The report further states that without significant structural policy reforms, Nigeria's medium-term growth is projected to remain stable at around 2% and that since the economy is expected to grow more slowly than the population, living standards are expected to worsen. According to the same source, the reported GDP growth rate for 2019 was 2.2%.

1.12 Key economic sectors

1.12.1 Energy

Oil and natural gas, and biomass constitute the main sources of energy for Nigeria. There is, however, significant efforts to harness the high potentials available from solar and wind.

1.12.2 Oil and natural gas

Nigeria has the second largest proven crude oil reserves of Africa and according to Abstract of Statistics 2016 (NBS, 2017) of the Nigerian National Bureau of Statistics, the reserves stood at 37,448.25 million barrels in 2014. During the same period, the country produced some 700 million barrels of crude oil whereas it exported 600 million barrels annually. The oil fields are in the south, specifically in the Niger delta and offshore in the Gulf of Guinea. Current exploration activities are mostly focused in the deep and ultra-deep waters offshore, with some activities in the Chad basin, located in the northeast of the country.

In general, the exploitation of petroleum resources in the last four decades has resulted in massive injection of hydrocarbons into the atmosphere as well as considerable environmental problems. This makes the sector an important one in the discussion of GHG-induced climate change, its consequences, and the need for mitigation and adaptation relative to this sector.

Nigeria is one of the main gas producers in Africa and production is expected to double between now and 2030, increasing to about 400 billion m^3 per annum. Proved recoverable reserves of natural gas in Nigeria at the end of 2011 were 5,110 billion m^3. Current production, at 29 billion m^3, is estimated to last more than 100 years (WEC, 2013). A significant amount of Nigeria's gross natural gas production is flared (burned off) because some of Nigeria's oil fields lack the infrastructure needed to capture the natural gas produced with oil, known as associated gas. In 2014, Nigeria flared 10.73 billion m^3 of its associated gas production, or 12% of its gross production and ranked as the world's fifth-largest gas flaring country, accounting for 8% of the total amount flared globally in 2014 (EIA, 2016). However, it is worthy to note that while Nigeria still flares a significant portion of its gross natural gas production (12% in 2014), the amount of gas flared has regressed by more than 50% over the past decade. Nigeria now ranks as the fifth-largest natural gas flaring country, down from the second position it held in 2011. Several recently developed and upcoming natural gas projects that are focused on monetizing previously flared natural gas will further reduce the country's contribution to global GHG emissions through gas flaring. This is proposed in the country's NDC and expected for completion by 2030.

1.12.3 Biomass

Nigeria is the third world largest producer of bioenergy, after China and India, respectively. In 2010, the share of bioenergy of total primary energy supply was over 80% (WEC, 2013). In 2011, Nigeria was among the largest fuel wood producers, along with India, China, Brazil, and Ethiopia. The biomass resources of Nigeria can be identified as crop residues, forage grasses and shrubs, animal wastes and waste arising from forestry, municipal and industrial activities, as well as aquatic biomass. Crops such sweet sorghum, maize and sugarcane are the most promising feedstocks for biofuel production. It has been estimated that Nigeria produces about 227,500 tonnes of fresh animal waste daily. As 1 kg of fresh animal waste produces about 0.03 m^3 biogas, Nigeria can potentially produce about 6.8 million m^3 of biogas every day from animal waste only. Although biogas technology is not common in Nigeria, various studies have been carried out on the technology and policy aspects of biogas production by scientists in the country.

1.12.4 Other energy sources

Coal: By the end of 2011, Nigeria had 21 million tonnes of proven recoverable bituminous coal reserves, including anthracite (WEC, 2013). It is among the top 5 countries in Africa, by reserves.

Wind: Wind is not a major source of energy in Nigeria. In 2011, Nigeria had only 2 MW of installed capacity (WEC, 2013).

Nuclear: Nigeria initially planned to have about 1000 MWe of nuclear power installed by 2017 and 4000 MWe by 2027. A draft strategy for the safe and sustainable management of radioactive waste and spent nuclear fuel has also been prepared. It includes an option for use when repatriation of spent fuel is not possible (ECN, 2012).

Geothermal: The literature indicates that more studies are necessary, but current indications point to the potential for geothermal energy (Zira, 2013), with the geothermal gradient of the Anambra Basin ranging from 2.5 to 4.9°C /100m and that of the Bida Basin from 2 to 2.5°C/100m.

Solar: Nigeria lies within a high sunshine belt and thus has enormous solar energy potentials. Solar radiation is fairly well distributed with an average of about 19.8 MJm^{-2} day^{-1} and an average sunshine hours of 6 hours day^{-1}. If solar collectors or modules were used to cover 1% of Nigeria's land area, it is possible to generate 1850 $x10^3$ GWh of electricity per year, which is over one hundred times the current grid electricity consumption in the country. But this potential is yet to be properly harnessed. Nigeria is estimated to have only 20 MW of solar energy installed (REN21, 2014).

Hydro: Nigeria is reasonably endowed with large rivers and few natural falls. Small rivers and streams also exist within the present split of the country's eleven River Basin Authorities, some of which maintain minimum discharges all year round. In a study carried out in twelve states and four river basins, over 278 unexploited small hydropower (SHP) sites with a total potential of 734.3 MW were identified. However, SHP potential sites exist in virtually all parts of the country with an estimated total capacity of 3,500 MW. They indicate that Nigeria possesses potential renewable sources of energy along her numerous river systems, a total of 70 micro dams, 126 mini dams and 86 small sites have been identified.

1.12.5 Agriculture

The agriculture sector is a very important important component of the Nigerian economy. Almost 78% of the total land mass of the country, representing 708,000 km^2, are under agriculture. Of these, 48.0% constitute arable lands, 42.8% are under permanent meadows and pastures and the remaining 9.2% are under permanent crops.The sector is also the largest employer of the country and accounted for 25.1% of GDP (at constant basic price) in 2017.

Crop production is by far the most important component of the agriculture sector, contributing 90% to the total GDP of the sector. Climate change poses a threat to Nigerian agriculture - the World Bank recently predicted an up to 30% drop in the country's crop output due to erratic rainfall and higher temperatures.

1.12.6 Human Health

In 2010, The National Strategic Health Development Plan (NSHDP) 2010 - 2015 (Nigeria-FMOH, 2010) described Nigeria's health situation as follows: *"The health indicators for Nigeria are among the worst in the world. Nigeria shoulders 10% of the global disease burden and is making slow progress towards achieving the 2015 targets for the health related Millenium Development Goals (MDGs). The health indicators in Nigeria have largely remained below country targets and internationally-set benchmarks due to weaknesses inherent in its health system."* In 2017, current health expenditure stood at 3.8 % of GDP.

According to the same report, the key challenges for achieving Nigeria's national health objectives were related to:

- the weak health system characterized by constrained governance systems and structures,

- low levels of health care financing and poor predictability and release of funds with inadequate financial protection for the poor,
- shortage and non-uniform distribution of human resources for health,
- poor quality service delivery,
- inadequate and untimely availability of quality health commodities,
- lack of routine health services data,
- low levels of research for health,
- weak partnership and coordination,
- poor community participation and poor utilization of health services, particularly child and maternal services.

Nonetheless, Nigeria made some progress in the achievement of the health related MDGs. Development indicators (WHO, 2015) showed the need for more concerted efforts in this sector. The prevalence of infectious and parasitic diseases like malaria (141 in 100,000), tuberculosis (282 in 100,000), HIV/AIDS (3.9% of the population) and Schistosomiasis among others, remains very high. Furthermore, illnesses such as diabetes and cardio-vascular diseases, often associated with increasing socio-economic wellbeing, are becoming significant health problems in the country (Babatimehin, 2003). Only 48% of the population has "sustainable" access to clean water and a lower proportion (44%) has good sanitation (World Bank, 2008).

1.12.7 Transportation

Air, rail, pipelines, road and water transportation facilities are available in the country but the most important in terms of functionality and number of patronage is road. The total length of Federal Government highways is about 34,340 km. States also make complementary investments on high grade road development. The total railway length is about 4,000 km while water and air transportation are the least developed. The country has close to 8,600 km of water ways, the longest being on River Niger and the Benue system. Governments, at both the state and federal levels, are investing on airports to increase access to air travel. In general, every facet of transportation is inadequate or inefficient. Roads are often in a state of disrepair or incapable of handling the ever-increasing traffic volume. This has impacted negatively on the socio-economic development of the country. The contribution of the transport sector to GDP in 2017 was 1.2 % (at constant basic price) and considered as well below the required threshold for a sector that plays a major role in the nation's development.

1.12.8 Information and Communication

Within the Information and Communication sector which contributed 11.4% (at constant basic price) to GDP in 2017, Telecommunication & Information Services are by far the most important economic drivers. Though Nigeria has less than a million landlines it boasts certainly more than 100 million mobile cellular subscribers. The advent of mobile communication in the late 1990s has revolutionized the sector and impacted positively on the socio-economic development of the country. Incentives are being provided to enhance the development of information and communications technology (ICT) and its enabling infrastructure for every part of the country, including the rural areas. While encouraging investment in ICT, appropriate legal and regulatory frameworks are being put in place to safeguard the investments. In 2017, the Telecommunication & Information Services contributed 8.7% (at constant basic price) to GDP, showing its importance in the country's economy (National Bureau of Statistics, 2016).

1.12.9 Manufacturing

The manufacturing sector has the potential to boost economic growth and stimulate employment generation, wealth creation and poverty eradication. The sector, handicapped by low-capacity utilization, did not perform as much as expected for a long time.

The country's vision for the manufacturing sector is *'a technologically driven and globally competitive manufacturing sector, with a high level of local content and contributing a high proportion of the National GDP'*. The stated focus of increasing annual growth in the manufacturing sector from 8% in 2005 to a minimum of 35.9% on the average annually (Vision 2020 Technical Report on Manufacturing) would no doubt have serious implications for energy use and climate change in the very near future. In 2017, the Manufacturing sector contributed 9.2% (at current basic price) to GDP.

1.12.10 Power sector

Power supply in Nigeria is a big challenge to the economy of the nation. Despite efforts by various governments and huge sums of money invested in the sector, the power supply is still inefficient and this hampered industrial development of the nation. The per capita power consumption of 151 kWh per year in Nigeria is among the lower end of the spectrum in the African continent.

The 23 grid-connected generating plants in operation in the Nigerian Electricity Supply Industry (NESI) has a total installed capacity of only 11,165 MW and an available capacity of 7,139.6 MW as of June 2016. Equally, most of the generation is thermal based with an installed capacity of 9,044 MW (81% of the total installed capacity) and an available capacity of 6,079.6 MW (83% of the total available capacity).

Hydropower from three major plants accounts for 1,938.4 MW of total installed capacity and an available capacity of 1,060 MW (54.7%) with limited contributions by non-hydropower renewable sources making up the remainder. At present, less than half of Nigeria's population has access to grid-connected electricity.

The Electric Power Sector Reform Act was passed in 2005 to reposition the sector by changing its structure, and privatizing generation and distribution while retaining transmission under Government control. Today, Nigeria has 12.5 GW of installed capacity, but less than one third is operational (average of 3.9 GW in 2015; 3.0 GW in November 2016). Overall, only about 15% of installed capacity is eventually distributed to end-users, resulting in a huge shortage of electricity supply across the country.

A report on the National Water Resources Master Plan by the Federal Ministry of Water Resources in 2016 revealed that Nigeria has hydropower potential of about 12,220 MW, of which only about 1,930 MW has been developed from Kainji, Jebba and Shiroro dams. There are also existing dams with a combined potential hydropower capacity of over 200 MW that are yet to be exploited while four dams that are under study and design have a combined potential of about 4,320 MW, namely Mambilla (3,050 MW), Gurara 11 (360 MW), Dasin Hausa (150 MW) and Zungeru (760 MW).

1.12.11 Wetlands

Wetlands are *"areas of marsh, fen, peat land or water, … with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six metres"* (Ramsar Convention, 1975). They support rural livelihoods serving for crop production, grazing animals, fishing, and harvesting of medicinal plants among others. The *fadama*[2] projects have hung on their potentials. Wetlands are also important for biodiversity promotion. Nigeria presently has 11 sites designated as Wetlands of international importance, with a surface area of 1,076,728 hectares.

1.13 Environmental Challenges

The main environmental challenges in Nigeria are land degradation, environmental pollution, floods, and erosion. Land degradation is stemming from many factors, including pressure on the land resources, which

[2] In Nigeria, the term "Fadama" is a Hausa name for irrigable land—usually low-lying plains underlaid by shallow aquifers found along major river systems.

lead to deforestation or de-vegetation and eventually unproductive land. Environmental pollution is a serious challenge, especially around the major urban areas.

1.13.1 Climate Change

Accelerated climatic changes are expected to lead to potentially large impacts across Africa, including in Nigeria in the future. The scale of climate change will increase with higher global levels of GHG concentration from anthropogenic emissions. Climate models suggest that Africa's climate will generally become more variable, with high levels of uncertainty regarding climate projections in the Africa Sahel zone. Temperatures in West Africa, and particularly the Sahel, have increased more sharply than the global trend, and the average predicted rise in temperature between 1980/99 and 2080/99 is between 3°C and 4°C, which is more than 1.5 times the average global trend. For Nigeria, a sea level rise of 1 m could result in the loss of 75% of the Niger Delta (IPCC, 2007).

1.13.2 Deforestation

Nigeria is well endowed with forest resources, but their excessive exploitation is a source of concern and threat for the economic, social, and environmental context. Apart from providing a large proportion of the global supply of timber and fuel, forests also provide a wide range of non-wood products and environmental functions. These products include bush meat, medicine, watershed protection, stabilisation of the hydrological regime and carbon sequestration. Forests regulate global climate and act as a major agent of carbon exchange in the atmosphere (Obioha, 2009).

Deforestation is a significant environmental issue in Nigeria because of the direct impacts of the growing demand for land for various other uses, including agriculture, settlement development, logging, fuel wood extraction, transport facility development and mining.

Virtually almost all of the forests in the country may have now disappeared due in part to the mismanagement of the country's natural areas. In the 1980s, about 400 hectares of forest and woodland out of every 1000 hectares suffered from deforestation while only 26 hectares were reforested on an annual basis (UNDP Nigeria, 1996). A review of data available from national sources, USGS and FAO indicated a rate of deforestation of around 114,000 ha or 0.72 % annually. To protect natural areas for ecological purposes, efforts need to be made to intensify forest preservation, encourage the use of alternatives to wood and continue sensitize the communities on the need to protect the forests. Desertification is also a key environmental challenge in the northern parts of the country.

According to Obioha (2009), Nigeria has been losing about 351,000 km^2 of landmass to the desert, which is advancing southward at the rate of 0.6 km annually. Other authors have reported a desert encroachment rate of 1 km per year with the same general southward trend.

1.13.3 Floods

Floods in the last two decades have become more frequent everywhere in the country. Inadequate watershed management, unplanned rapid urbanization, blockage of river/drainage channels through careless waste disposal, poor land use practices, land clearing for agricultural purposes, sub-standard dam construction and deforestation among other factors influence the occurrence and severity of flooding in the country. The most flood-prone areas include:

- The low-lying coastal areas of southern Nigeria such as Calabar, Warri, Port-Harcourt and Lagos where annual rainfall is high. The adverse impacts of flooding are felt more seriously when stormy weather coincides with high tides.

- The floodplains of the major rivers such as the Niger, Benue, Gongola, Sokoto, Hadejia, Katsina-Ala, Donga, Kaduna, Gurara, Ogun and Anambra.
- The flat, low-lying areas around and to the South of Lake Chad which may be flooded during and even a few weeks after the rains.

1.13.4 Environmental Pollution

Environmental pollution is increasing due to large human population concentrations, industrial activities, agricultural change, use of new technologies, increase in recycling of items particularly metal and consumer products, and, poor institutional, logistic and policy frameworks for managing pollutants. Air pollution is influenced by many factors, particularly industrial activities and use of spent automobile engine oil. Water pollution results mainly from the discharge of household and industrial effluents as well as petroleum products through oil spills into water bodies and streams. The use of fertilizers and other farm inputs are also contributing factors to soil and water pollution in many parts of the country.

1.13.5 Waste

The burden of waste management is growing everywhere, more particularly in the urban areas. The total amount of domestic waste per annum in Nigeria is estimated at about 36 million tonnes (0.50 kg/capita/day) and is increasing according to the National Bureau of Statistics (NBS) (personal communication, 2019). The problem is largely with collection and disposal. Waste is indiscriminately disposed of in many areas, and solid waste dumps dot the urban landscape in many parts of the country. Only about 44% of waste in Nigeria is collected (NBS, 2019), leaving so much unattended to. Generally, there are inadequate facilities for refuse collection and management in many parts of the country.

1.14 Economic and development challenges

While Nigeria has made some progress in socio-economic terms in recent years, its human capital development remains weak due to under-investment and the country ranked 152 out of 157 countries in the World Bank's 2018 Human Capital Index (World Bank, 2019). The Nigerian economy continues to be dominated by the oil sector which fetches more than 90% of the foreign exchange for the country. The impact of the sector is however little felt by most of the people. Hence, the massive developmental challenges which Nigeria must face include the need to reduce the dependency on oil and diversify the economy, address insufficient infrastructure, and build strong and effective institutions, as well as governance issues and public financial management systems.

According to the World bank (2019), inequality in terms of income and opportunities has been growing rapidly and has adversely affected poverty reduction. The North-South divide has widened in recent years due to the Boko Haram insurgency and a lack of economic development in the northern part of the country. Large pockets of Nigeria's population still live in poverty, without adequate access to basic services, and could benefit from more inclusive development policies. The lack of job opportunities is at the core of the high poverty levels, of regional inequality, and of social and political unrest in the country. Hence, the critical economic issues concern is the need to foster sustainable rapid economic growth that will cater for the needs of over 200 million people.

1.15 Gender mainstreaming in climate actions and reporting

Gender mainstreaming in climate reporting is an issue which has not received enough attention in the past. During the preparation of this BUR2, more attention should have been given to this issue but has not been the case, notably because of the COVID-19 pandemic which limited severely physical interactions and the holding of workshops. In view of promoting gender considerations and balance in climate actions, Nigeria reviewed and launched its updated National Action Plan on Gender and Climate Change in Nigeria

in March 2021. Since the BUR2 was already finalized, gender integration has been done sparingly. In the same context, one day was dedicated during the pre-validation workshop, attended by a wide range of stakeholders, to assess integration in the BUR2 and make recommendations accordingly. The summary of the gender session on gender is reproduced in Table 1.1. from the workshop proceedings. The gender issue will be fully considered during the preparation of the next report to the UNFCCC.

Table 1.1 - Summary of gender analysis from pre-validation workshop

Groups Gender Issues	Mitigation Strategies	Recommendations
AGRICULTURE, FOREST AND OTHER LAND USE (AFOLU)		
- Men and women are involved. Small ruminants are mostly done by women while men focus on large ruminants. - Majority of men are involved in fish production while more women are involved in processing. Processing uses majorly wood for smoking and drying of fish which causes emission - Men are largely responsible for deforestation by logging and women use wood and charcoal for cooking. Men bring the wood for cooking. - Clearing of forest to convert to farmlands, roads constructions and residential areas is done majorly by the men. It is after this that women come in	- Climate Smart Agriculture - Sustainable agricultural practices. - Manure management. - Intensive farming. - Use renewable energy for fish processing and other cleaner sources. - Forest conservation, alternative cooking energy sources, production and use of wood efficient stoves. - Farmer-managed natural regeneration practice be adopted. - Building green – build high rising to minimize space to be cleared.	- Climate Smart Agriculture practice(s) required in crop and livestock production. - Use renewable energy for fish processing and other cleaner sources. - Forest conservation, alternative cooking energy sources, production and use of wood efficient stoves to mitigate deforestation. - Agro-forestry practices. - Advocate implementation of necessary national law that encourages green spaces in compounds.
ENERGY		
- Energy Industries: Women and men are involved in charcoal production. - The business of charcoal production is open to both genders to operate. - Women make decisions on production technology employed and volumes of charcoal production where they are the business owners. - For the public electricity and crude oil refining, women are minority. - Women are involved in the following industries: chemicals, food production, mining and quarrying, wood and wood products, textile and leather. - Mining and quarrying: Women are actively involved in this activity; there is reasonable access to the mining sites though the control is skewed to favour the male population who makes decision. - Food production: Women are the major players in cottage industries in the food, beverage and tobacco industry. For	- Encourage women to Employ energy efficient kilns. - Employ clean energy using kilns. - Education and awareness to educate the women on available efficient technologies. - Mining & quarrying: The use of crushers in place of crude method where fuelwood is used as energy source. - Food, beverage and tobacco etc.: transition to cleaner and efficient energy sources. - Low emission mass transportation scheme - Use of renewable energy for lighting, cooling and heating. - Use of energy efficient technologies for cooking. - Transition from traditional biomass fuel to clean cooking fuels e.g. LPG, electricity, solar. (Has co-benefits	- Need for detailed sectoral gender analysis taking cognisance of region and location specific needs e.g., north-south, and/or rural-urban differences.

Groups Gender Issues	Mitigation Strategies	Recommendations
example, garri production, oil processing, local beverage. Tobacco is male dominated - Textile and leather: The cottage industries in textile subsector (tie & dye, weaving) are dominated by women in the south but by men in the north. While the leather is dominated by men. - Chemicals: There is increased participation of women in the production of paints albeit in small scale. - Transport: The public transport sector is dominated by men, however in recent times, women have been increasingly involved in operating public transport vehicles (buses, tricycles, motorcycles). Furthermore, both men and women have equal access to transport facilities including aviation, etc. there is no restriction to travel placed on women, therefore the travel habits of the male and female population are near equal, contributing equally to total passenger kilometres. - Women use fuels for cooking, heating, cooling and lighting in the commercial sector. Women are the main operators of restaurants, cafeterias in public and private institutions their role as homemakers. - Fish farms are predominantly men owned but with increasing participation of women in operation of fish farms.	that serves as an adaptation measure). - Use of renewable energy and energy efficient technologies in agriculture, forestry, fishing and fish farms.	
INDUSTRIAL PROCESSES AND PRODUCT USE (IPPU)		
- Land – Government / men – Women are vulnerable in this sector - Electricity- Government/Private Sector - Gender sensitive - Policies – Gender sensitive - Raw Resources - Gender Sensitive - Technology – Gender Sensitive - Manpower – Women are vulnerable - Finance – Women are vulnerable in terms of resource control - Incentives – Gender balance	- Cultural changes/ awareness Creation. - Map all the process line to understand the rate of men to women in use of raw materials. - Mainstreaming Gender in all Government policies. - Map all the process line to understand the rate of men to women in use of raw materials. - Map all the process line to understand the rate of men to women in use of raw materials. - Map all the process line to understand the rate of men to women in use of raw materials.	- All government documents should be gender sensitive. - Participation incentives: women need safe childcare options if they were to participate fully in the training. - Safe spaces: Connecting women with role models can help build their confidence to navigate careers in the ICT sector and other male-dominated industries. - Community buy-in: Social and cultural norms around appropriate types

Groups Gender Issues	Mitigation Strategies	Recommendations
	- Identify processes / technologies that are gender friendly.	of work can restrict women's participation in the digital economy. - Flexible curriculum**:** There is need to address issues that has to do with male dominated jobs.
WASTE		
- DOMESTIC WASTE: in the informal sector men usually take control over waste materials with higher value for recycling. It is also common to find that men mainly collect waste and sell the segregated material while women segregate the collected items at home and are responsible for disposing those with no value. - AGRICULTURAL WASTE ARE VERY UNIQUE AND BOTH GENDER INVOLVED. - Women play important and varied role in agriculture, but they are constrained by two important types of gender gaps. Women have unequal access, relative to men and to productive resources. Generally, men do the majority of field work. - MEDICAL WASTE: There is equal participation of men and women in terms of access, control & decision making. - INDUSTRIAL WASTE (WASTE FROM MARKETS, WASTE FROM MANUFACTURING PROCESSING) - Women are predominantly active in waste from markets.	- Segregation of municipal solid waste at source. - Awareness campaign on proper waste disposal method. - Discouraging burning of municipal solid waste. - Proper waste recycling. processes to be encouraged - Anaerobic digestion method for liquid waste disposal.	- Proper disposal of medical waste by incineration. - Proper constructed and well-managed land fill method of municipal waste disposal should be encouraged. - Proper enforcement of municipal solid waste disposal laws and regulations. - Waste disposal policy review should be given attention.

2 National Greenhouse Gas Inventory

2.1 Background

Nigeria has submitted four national GHG inventories to-date as components of national reports, three in NCs and one in its BUR1 to meet its reporting obligations. The latest GHG inventory was presented in the NC3 in 2020. This GHG inventory is being compiled within the framework of the preparation of the BUR2. It builds up on the one presented in the NC3 and includes an additional year as well as recalculations as appropriate for the period 2000 to 2016. Nigeria is presenting its first national inventory report (NIR1) on a stand-alone basis in line with the new reporting requirements in accordance with Decision 18/CMA.1 for maximizing transparency as advocated under the Paris Agreement, and is also including in a condensed format as a chapter of the BUR2. Readers are referred to the NIR1 for full details concerning this inventory chapter.

The preparation of the present inventory started in 2019 and two years were allocated to implement and complete the different steps of the inventory cycle as depicted in Figure 2.1. However, the process was not successful due to limited capacity and the lack of a robust GHG inventory management system (GHGIMS). In fact, all previous GHG inventories were compiled by local consultancy firms. Considering the higher frequency of preparation and submission of national reports, the higher standard and quality, and the ETF of the PA, Nigeria decided to transition from outsourcing to in-house production of the national reports, including the GHG inventories. However, because the existing GHGIMS is not well structured and robust enough to undertake the full compilation of the inventory due to serious lack of capacity, Nigeria resorted to consultants to support staff of the DCC and the working groups while providing capacity building to prepare for future reporting. This challenge is also being addressed presently within the framework of the UNFCCC project, *Setting-Up Sustainable National GHG Inventory Management Systems,* to support developing countries.

The Initial and Second NCs of the Republic of Nigeria provided information on the National Inventory of GHGs for base years 1994 and 2000. These inventories were compiled at Tier 1 level using the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (IPCC, 1997). The activity areas covered were somewhat limited in the first inventory and more categories were gradually addressed as the compilation progressed from one inventory to the next. The third inventory presented in the BUR1 and the fourth in the NC3 were submitted to the UNFCCC in 2018 and 2020, respectively. These inventories have been compiled mostly at the Tier 1 level. The 2006 IPCC Guidelines and software were used for compiling the last two inventories.

2.2 Framework and cycle for inventory preparation

Nigeria kick-started the in-house production of its GHG inventory by DCC which was supported by other institutions concerned with the compilation of the inventory. An international company was contracted to provide support and backup on the compilation process while providing capacity building to staff of the GHG Division of DCC and other national experts on the technical aspects of the inventory. The country also benefited from the services of an international consultant made available by the UNFCCC to support development and implementation of the GHGIMS for sustainable compilation of GHG inventories. The UNFCCC project followed a quality assurance exercise done by the secretariat. The transition was not fully successful, but some progress was recorded in the development and implementation of the GHGIMS.

The existing GHGIMS, inclusive of the institutional arrangements for compiling the inventory, is being strengthened. The existing institutional arrangements which is being consolidated are provided in the MRV chapter of the BUR2 under the latter system for tracking emissions.

The compilation and production of a national GHG inventory requires the successful implementation of well-defined steps through a well-structured, robust GHGIMS. Ideally, the GHGIMS should cater for the following:

- Smooth management and coordination of the inventory process
- Institutional arrangements inclusive of clearly agreed roles and responsibilities of stakeholders participating in the process.
- Allocation of tasks to teams for activities of the inventory cycle.
- A National data collection framework to ensure an automatic flow as per the timing of the inventory cycle.
- Necessary arrangements such as memorandum of understanding (MoU) and legislations to guarantee an automatic flow and timely availability of the required data.
- A functional QA / QC system including the plan for its implementation.
- Systematic documentation of all data and other information used during the process, and
- An appropriate archiving system for storage of all information pertaining to all inventories compiled by the country.

Nigeria lacked a fully-fledged GHGIMS and appropriate institutional arrangements and the inventory for the BUR2 offered the platform for the GHG inventory team members to understand and implement the steps of the inventory cycle with the support of the international consultant. This was done within the existing framework, the objective being to capacitate the national experts in implementing the steps provided in Figure 2.1 as part of the GHGIMS.

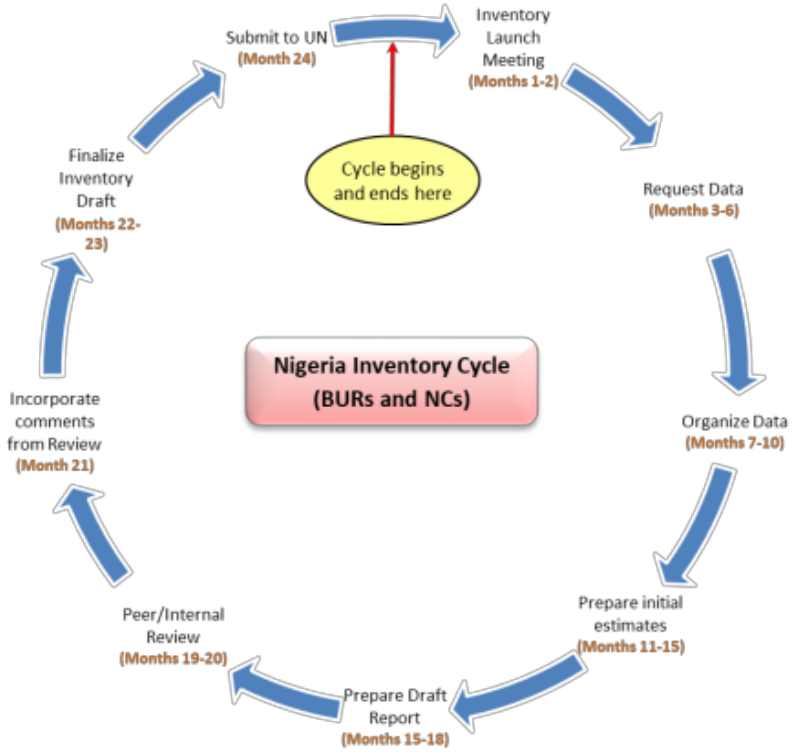

Figure 2.1 - The inventory cycle of Nigeria

The different steps adopted for the preparation of the inventory were:

- Review of previous inventory and prioritisation of resources.
- Collection, quality control and validation of AD.
- Selection of Method - Tier level for each category and sub-category.
- Selection of emission factors (EFs) and Derivation of local EFs wherever possible.
- Validation of AD and EFs during a workshop serving for capacity building concurrently.
- Computation of GHG emissions.
- Key Category Analysis.
- Uncertainty analysis.
- QA / QC of emission computations and estimates.
- Assessment of completeness.
- Recalculations.
- Trend analysis.
- Identification of gaps, constraints and needs.
- Preparation of a National Inventory Improvement Plan.
- Preparation of the draft NIR.
- Circulation of draft NIR to stakeholders for comments.
- Integration of stakeholder's comments.
- Validation of NIR, and
- Submission of NIR to UNFCCC as a stand-alone document and as a chapter of the BUR2.

2.3 Overview of the inventory

2.3.1 Coverage

This GHG inventory covers the whole territory of the Federal Republic of Nigeria and estimates are computed at the national scale.

The national GHG inventory includes estimates for the four IPCC sectors, Energy; Industrial Processes and Product Use (IPPU); Agriculture, Forestry and Other Land Use (AFOLU) and Waste. However, the categories and subcategories of these sectors have not been fully exhausted due to lack of AD in some cases. The coverage of activity areas is provided under the completeness section of this chapter.

The GHG inventory includes emissions of the direct GHGs carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O). Additionally, estimates of the GHG precursors oxides of nitrogen (NO_X), carbon monoxide (CO), non-methane volatile organic compounds (NMVOCs), and sulphur dioxide (SO_2) were made as appropriate.

Estimates have been made for the year 2017. In line with the requirement to provide a trend of estimates, the period 2000 to 2017 has been adopted. Furthermore, for the sake of consistency for reporting, estimates for the years 2000 to 2016 have been recalculated whenever required, and using the same methodology and data sources to reflect improved AD or EFs as appropriate.

2.3.2 Method

Estimates of GHG emissions provided in this report have been compiled using the 2006 IPCC Guidelines for National GHG Inventories (IPCC 2007) and the IPCC Good Practice Guidance (GPG) and Uncertainty Management in National GHG Inventories (IPCC 2000). The purpose of adopting these guidelines and GPG

is to ensure that the GHG emission estimates are Transparent, Accurate, Complete, Consistent and Comparable (TACCC) as far as possible.

A key category analysis (KCA) was conducted to identify activities in the four IPCC sectors responsible for 95% of national emissions and sinks within the economy, the objective being to identify which sources should be given priority for refining emission estimates. Results of the KCA from the GHG inventory of the NC3, availability of resources, existing capacity and availability of AD dictated the level for estimating emissions of categories. A prioritization exercise was conducted, and the highest emitting source categories were privileged, the intent being to improve estimates by moving to Tier 2. Selection of the Tier level was guided by the general decision-tree reproduced in Figure 2.2 and category specific decision trees provided in the Guidelines. Generally, the selection of the Tier level for all sectors was constrained by the limited availability of disaggregated AD (e.g., facility level data) and national EFs. This led to the adoption of the Tier 1 level for all categories estimated except LAND. Stock and EFs were generated for estimating emissions in this category using a mix of Tiers 1 and 2 as appropriate. National AD was complemented with those available in international databases and IPCC default EFs were used. Detailed descriptions of the methods adopted for generating missing data and equations used in each sector, including AD and EFs used, are provided in the NIR1.

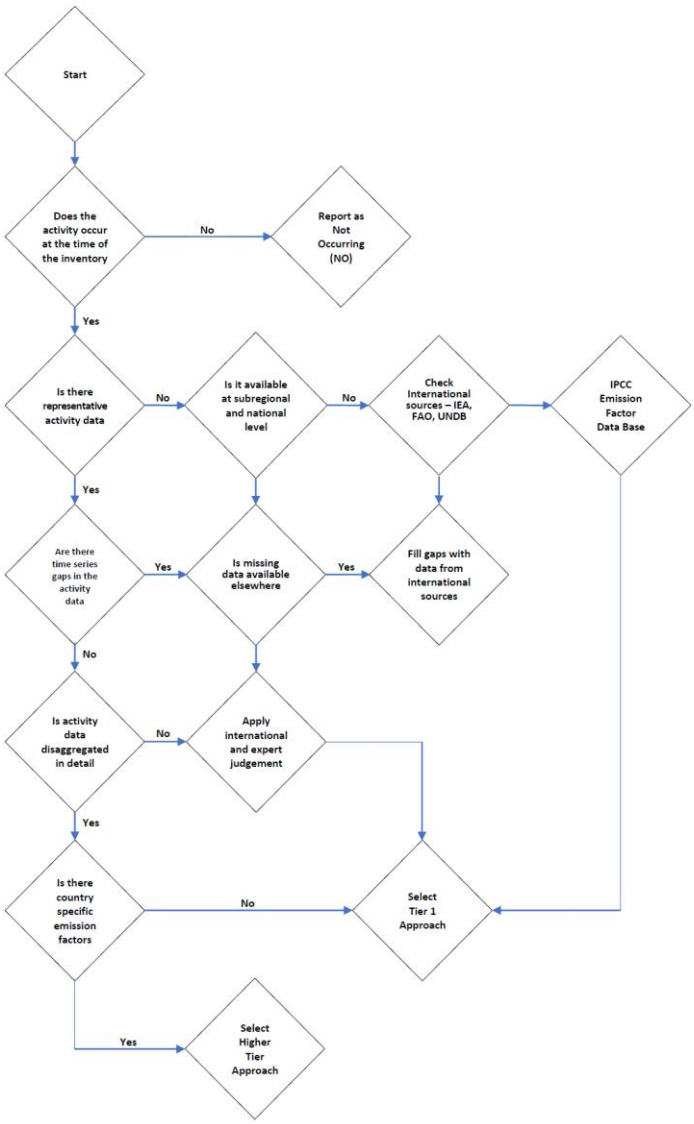

Figure 2.2 - Decision tree used to determine Tier Level method

2.4 Key Category Analysis

KCA gives the characteristics of the emission sources and sinks. According to the 2006 IPCC Guidelines (V1_4_Ch4_Method_Choice), key categories are those which contribute 95% of the total annual emissions, when ranked from the largest to the smallest emitter. A key category is one that is prioritized within the national inventory system because its estimate has a significant influence on a country's total inventory of direct GHGs in terms of the absolute level of emissions, the trend in emissions, or both (IPCC, 2000). Thus, it is good practice to identify key categories, as it helps prioritize efforts and improve the overall quality of the national inventory, while also guiding mitigation policies, strategies and actions.

The KCA was performed using the tool available within the IPCC inventory software for both the level and trend assessments. The results for the level assessment for the year 2017 are presented in Table 2.1 and the trend assessment in Table 2.2.

Table 2.1 - Key Category Analysis for the year 2017 - Approach 1 - Level Assessment

A	B	C	D	E	F	G
IPCC Category code	IPCC Category	GHG	"2017 Ex,t (Gg CO_2-eq)"	"|Ex,t| (Gg CO_2-eq)"	Lx,t	Cumulative Total of Column F
3.B.1.a	Forest land Remaining Forest land	CO_2	319,971	319,971	0.469	0.469
1.B.2.a	Oil	CH_4	60,314	60,314	0.088	0.557
1.A.1	Energy Industries - Gaseous Fuels	CO_2	55,750	55,750	0.082	0.639
1.A.3.b	Road Transportation	CO_2	36,000	36,000	0.053	0.691
3.A.1	Enteric Fermentation	CH_4	35,474	35,474	0.052	0.743
1.B.2.b	Natural Gas	CH_4	31,184	31,184	0.046	0.789
1.A.4	Other Sectors - Biomass	CH_4	18,883	18,883	0.028	0.817
1.A.4	Other Sectors - Liquid Fuels	CO_2	16,997	16,997	0.025	0.842
3.C.4	Direct N_2O Emissions from managed soils	N_2O	16,089	16,089	0.024	0.865
4.D	Wastewater Treatment and Discharge	CH_4	15,332	15,332	0.022	0.888
1.A.2	Manufacturing Industries and Construction - Gaseous Fuels	CO_2	12,771	12,771	0.019	0.906
3.C.7	Rice cultivation	CH_4	9,572	9,572	0.014	0.920
4.A	Solid Waste Disposal	CH_4	7,894	7,894	0.012	0.932
2.C.1	Iron and Steel Production	CO_2	6,360	6,360	0.009	0.941
4.D	Wastewater Treatment and Discharge	N_2O	5,998	5,998	0.009	0.950
3.C.5	Indirect N_2O Emissions from managed soils	N_2O	5,255	5,255	0.008	0.958

There are 16 key categories in the quantitative level assessment for the year 2017, the main one being Forestland remaining Forestland responsible for 46.9% of emissions, attributed to the combined effect of deforestation and wood removals for various uses. The other important emitting categories are from the Oil industry (8.8%), Gaseous Fuels under Energy Industries (8.2%), Road Transportation (5.3%), Enteric Fermentation (5.2%) and Natural Gas (4.6%). These key categories account for a total of 78.9% of the total emissions. The remaining key categories listed in Table 2.1 contribute the difference of 16.1% of the 95% considered under the KCA.

The results change quite drastically when considering the trend assessment covering the period 2000 to 2017 (Table 2.2). There are now only twelve key categories compared to the level assessment. The three main contributors in the trend assessment are Forestland remaining Forestland, Gaseous Fuels under Energy Industries and Oil with more than 20% each, totalling 68.1% of the 95% of national emissions.

Table 2.2 - Key Category Analysis (2000 – 2017) - Approach 1 - Trend Assessment

A	B	C	D	E	F	G	H
IPCC Category code	IPCC Category	GHG	2000 Year Estimate Ex0 (Gg CO_2-eq)	2017 Year Estimate Ext (Gg CO_2-eq)	Trend Assessment (Txt)	% Contribution to Trend	Cumulative Total of Column G
3.B.1.a	Forest land Remaining Forest land	CO_2	256,674	319,971	0.121	26.3%	0.263
1.A.1	Energy Industries - Gaseous Fuels	CO_2	6,999	55,750	0.097	20.9%	0.472
1.B.2.a	Oil	CH_4	71,970	60,314	0.097	20.9%	0.681
1.A.3.b	Road Transportation	CO_2	14,518	36,000	0.031	6.7%	0.748
1.A.2	Manufacturing Industries and Construction - Gaseous Fuels	CO_2	1,705	12,771	0.022	4.7%	0.795
1.A.4	Other Sectors - Liquid Fuels	CO_2	5,424	16,997	0.019	4.2%	0.837
1.B.2.b	Natural Gas	CH_4	16,118	31,184	0.016	3.5%	0.871
2.A.1	Cement production	CO_2	714	5,240	0.009	1.9%	0.891
2.C.1	Iron and Steel Production	CO_2	1,791	6,360	0.008	1.7%	0.908
1.B.2.a	Oil	CO_2	5,626	4,715	0.008	1.6%	0.924
4.A	Solid Waste Disposal	CH_4	3,069	7,894	0.007	1.6%	0.940
1.A.4	Other Sectors - Biomass	CH_4	14,551	18,883	0.005	1.1%	0.951

The summary of Key Categories based on the quantitative criterion to the 95% level assessments for the year 2017 and trend, for the period 2000 to 2017, is presented in Table 2.3. Ten categories came out under both the level and trend assessments, two under trend only and the remaining four solely under level assessment.

Table 2.3 - Summary of Key Categories for level (2017) and trend (2000 – 2017) assessments

Number	IPCC category code	IPCC category	GHG	Approach used	Criterion
1	1.A.1	Energy Industries - Gaseous Fuels	CO_2	L1 T1	Quantitative
2	1.A.2	Manufacturing Industries and Construction - Gaseous Fuels	CO_2	L1 T1	Quantitative
3	1.A.4	Other Sectors - Liquid Fuels	CO_2	L1 T1	Quantitative
4	1.A.4	Other Sectors - Biomass	CH_4	L1 T1	Quantitative
5	1.B.2.a	Oil	CH_4	L1 T1	Quantitative
6	1.B.2.b	Natural Gas	CH_4	L1 T1	Quantitative
7	2.C.1	Iron and Steel Production	CO_2	L1 T1	Quantitative
8	3.B.1.a	Forest land Remaining Forest land	CO_2	L1 T1	Quantitative
9	4.A	Solid Waste Disposal	CH_4	L1 T1	Quantitative
10	1.A.3.b	Road Transportation	CO_2	L1 T1	Quantitative
11	1.B.2.a	Oil	CO_2	T1	Quantitative
12	2.A.1	Cement production	CO_2	T1	Quantitative
13	3.A.1	Enteric Fermentation	CH_4	L1	Quantitative
14	3.C.4	Direct N2O Emissions from managed soils	N_2O	L1	Quantitative

Number	IPCC category code	IPCC category	GHG	Approach used	Criterion
15	3.C.7	Rice cultivation	CH_4	L1	Quantitative
16	4.D	Wastewater Treatment and Discharge	CH_4	L1	Quantitative

Notation keys: L = key category according to level assessment; T = key category according to trend assessment; and Q = key category according to qualitative criteria. The Approach used to identify the key category is included as L1, L2, T1 or T2.

2.5 Methodological issues

This section gives an overview of the methodological approach adopted for all sectors and sub-sectors covered in this inventory report.

The method adopted to compute emissions involved multiplying AD by the relevant appropriate EF, as shown below:

Emissions (E) = Activity Data (AD) x Emission Factor (EF)

All the methods and tools recommended by IPCC for the computation of emissions in an inventory have been used and followed to be in line with Good Practices.

Global Warming Potentials (GWPs) adopted for providing a consistent basis for comparing the relative effect of the emissions of all GHGs, uniformized over a period of 100 years by converting the emissions of the other GHGs to that of CO_2, were from the IPCC Fifth Assessment Report (AR5) as recommended in the Annex to Decision 18 / CMA.1. The values adopted for the three direct GHGs CO_2, CH_4 and N_2O are provided in Table 2.4.

Table 2.4 - Global Warming Potential

Gas		Global Warming Potential
Carbon Dioxide	(CO_2)	1
Methane	(CH_4)	28
Nitrous Oxide	(N_2O)	265

Default EFs were assessed for their appropriateness, namely the situations under which they have been developed and the extent to which these were representative of national circumstances prior to their adoption.

A declared national framework for data collection and archiving to meet the requirements for preparing GHG inventories is still lacking. Such a framework is being developed with the support provided by the UNFCCC Secretariat under the programme *Technical assistance for sustainable national GHG inventory management systems in developing countries*. Thus, derived data and estimates were used to fill gaps in the time series quite frequently. These were considered reliable and sound since they were based on peer reviewed publications and other observations. Estimates used included fuel use for navigation and domestic aviation, and forest areas by type. Most missing AD for the period 2000 to 2017 were generated using the splicing techniques recommended in the 2006 IPCC Guidelines and based on related socio-economic factors.

2.6 Quality Assurance and Quality Control (QA / QC)

Availability of good quality AD that have undergone a rigorous Quality Control and Quality Assurance for compiling GHG inventories has been and remains a serious challenge in Nigeria. Usually, data collected by

the public sector are quality controlled and archived by the National Bureau of Statistics (NBS). The private sector implements their own QC / QA within its data collection and archiving process, but this is not very transparent. Thus, the upfront QA / QC procedures remained beyond the GHG inventory compilation team and the AD collected for the time series presented numerous outliers. This shortcoming is presently being addressed under the GHGIMS consolidation process.

QC and QA procedures, as defined in the *2006 IPCC Guidelines* (IPCC, 2007) is yet to be implemented by Nigeria during the preparation of the inventory. Again, this is being addressed within the UNFCCC project and will be further developed within the contemplated Capacity Building Initiative for Transparency (CBIT) project when funds become available. It is anticipated that a first QA / QC plan as per IPCC standard will be developed and implemented when the next inventory will be compiled. Given these circumstances, the only QC that could be done was through comparison of national data sets with those from international databases and through assessment of consistency of the time series data.

QA has not been done on a routine basis as per IPCC recommendations for this inventory except for the one by the independent international consultant who was not involved with the preparation of the inventory. The exercise comprised the following steps:

- Confirm data quality and reliability used for computing emissions.
- Compare AD with those available on international websites such as FAO and International Energy Agency (IEA).
- Review the AD and EFs adopted within each source category as a first step;
- Review and check the calculation steps in the software database to ensure accuracy; and
- The results from the software database was exactly replicated in the NIR1.

Nigeria volunteered to the UNFCCC and Global Support Programme undertaking a QA exercise on its inventory compilation process adopted for the NC3. The recommendations from the QA exercise, listed below, were addressed partially and still need further improvement:

- Institutional arrangements to ensure an annual flow of AD for preparing the inventory.
- Improve AD for the AFOLU sector, generate land use changes, national stock and EFs to move to Tier 2.
- Development of legal arrangements for securing collaboration of other institutions.
- Improved documentation and archiving, and
- Capacity building in various areas of inventory compilation.

2.7 Uncertainty assessment

Uncertainty estimation is an essential element of a GHG Inventory in addition to the KCA to provide information on the source categories to be prioritized for maximum resources to be allocated to improve the quality of the inventory. Inventories prepared in accordance with *2006 IPCC guidelines* (IPCC, 2007) will typically contain a wide range of uncertainties in the emission estimates associated with the AD and EF used. Estimates may be of good quality with low uncertainties when carefully measured and demonstrably complete data sets are used or of lower quality with higher uncertainty estimates such as with N_2O fluxes from soils and waterways.

For this Inventory, a Tier 1 uncertainty analysis of the aggregated figures as required by the 2006 IPCC Guidelines, Vol. 1 (IPCC, 2007) was performed. Based on the quality of the data and whether the EFs used were defaults or nationally derived, uncertainty levels were assigned to the two parameters and the combined uncertainty calculated using the tool available within the IPCC inventory software. In most

cases, the uncertainty values within the range recommended by the IPCC Guidelines were allocated to AD and EFs. Thus, lower uncertainties were allocated to AD obtained from measurements made and recorded, higher values for interpolated and extrapolated AD and the highest ones in the range when the AD have been estimated. Regarding the default EFs, the average value recommended in the IPCC Guidelines were adopted. Whenever there was a need to revert to expert judgement, the protocol was to consult with more than one expert from the typical sector or industry to ascertain on the level of uncertainty to be adopted from within the range provided in the IPCC guidelines. In cases where IPCC has a recommended methodology, the uncertainty level was derived according to the procedure proposed in the IPCC Guidelines and used in the uncertainty analysis. Uncertainties in total emissions based on the IPCC tool, including emissions and removals from the Land sector is presented in Table 2.5. Uncertainty levels for the individual years of the period 2000 to 2017 varied from 8.3% to 19.0% while the trend assessment when adding one successive year on the base year 2000 for the years 2001 to 2017 ranged from 10.9% to 13.9%. The complete uncertainty analysis for 2017 is provided in the NIR1.

Table 2.5 - Overall uncertainty (%)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008
Annual	19.0	8.9	9.0	8.8	8.7	8.6	8.6	8.5	8.5
Trend (base year 2000)	-	10.9	11.0	11.2	11.3	11.5	11.7	11.8	11.9

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017
Annual	8.7	8.5	8.5	8.4	8.4	8.3	8.3	8.5	8.4
Trend (base year 2000)	12.1	12.3	12.5	12.6	12.8	13.1	13.3	13.4	13.6

2.8 Assessment of completeness

An assessment of the completeness of the inventory was made for individual activity areas within each source category. For this inventory, one more category, namely coal mining has been assessed. The completeness results (Table 2.6) present the coverage and exhaustiveness of this inventory. To simplify the presentation of the completeness table, the sub-categories within a category where activities are not occurring in the country have not been spelt out fully but kept rather at the category level only. The methodology adopted was according to the *2006 IPCC Guidelines* (IPCC 2007) with the following notation keys used:

- E Estimated
- NA Not Applicable
- NO Not Occurring
- NE Not Estimated
- IE Included Elsewhere

Table 2.6 - Completeness of the 2017 GHG inventory

Categories	Net CO_2 (1)(2)	CH_4	N_2O	HFCs	PFCs	SF_6	Other halogenated gases with CO_2 equivalent conversion factors (3)	Other halogenated gases without CO_2 equivalent conversion factors (4)	NO_X	CO	NMVOCs	SO_2
Total National Emissions and Removals	E	E	E	NE	NE	NE	NE	NE	E	E	E	E
1 - Energy	E	E	E	NA	NA	NA	NA	NA	E	E	E	E
1.A - Fuel Combustion Activities	E	E	E	NA	NA	NA	NA	NA	E	E	E	E
1.A.1 - Energy Industries	E	E	E	NA	NA	NA	NA	NA	E	E	E	E
1.A.2 - Manufacturing Industries and Construction	E	E	E	NA	NA	NA	NA	NA	E	E	E	E
1.A.3 - Transport	E	E	E	NA	NA	NA	NA	NA	E	E	E	E
1.A.4 - Other Sectors	E	E	E	NA	NA	NA	NA	NA	E	E	E	E
1.A.5 - Non-Specified	NE	NE	NE	NA	NA	NA	NA	NA	NE	NE	NE	NE
1.B - Fugitive emissions from fuels	E	E	E	NA	NA	NA	NA	NA	E	E	E	E
1.B.1 - Solid Fuels	NE	E	NA	NA	NA	NA	NA	NA	NA	NA	E	NA
1.B.2 - Oil and Natural Gas	E	E	E	NA	NA	NA	NA	NA	E	E	E	E
1.B.3 - Other emissions from Energy Production	NO	NO	NO	NA	NA	NA	NA	NA	NO	NO	NO	NA
1.C - Carbon dioxide Transport and Storage	NO	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1.C.1 - Transport of CO_2	NO	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1.C.2 - Injection and Storage	NO	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1.C.3 - Other	NO	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2 - Industrial Processes and Product Use	E	E	NE	NE	NE	NE	NE	NE	E	E	E	NE
2.A - Mineral Industry	E	NO	NO	NA	NA	NA	NA	NA	NO	NO	NO	NO
2.A.1 - Cement production	E	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2.A.2 - Lime production	NO	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2.A.3 - Glass Production	NO	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2.A.4 - Other Process Uses of Carbonates	NO	NA	NA	NA	NA	NA	NA	NA	NO	NO	NO	NO
2.A.5 - Other (please specify)	NO	NO	NO	NA	NA	NA	NA	NA	NO	NO	NO	NO
2.B - Chemical Industry	E	NO	NE	NO	NO	NO	NO	NO	E	E	NO	NO
2.B.1 - Ammonia Production	E	NA	NA	NA	NA	NA	NA	NA	E	E	NO	NO
2.B.2 - Nitric Acid Production	NA	NA	NE	NA	NA	NA	NA	NA	NE	NE	NE	NE
2.B.3 - Adipic Acid Production	NA	NA	NO	NA	NA	NA	NA	NA	NO	NO	NO	NO

Categories	Net CO_2 (1)(2)	CH_4	N_2O	HFCs	PFCs	SF_6	Other halogenated gases with CO_2 equivalent conversion factors (3)	Other halogenated gases without CO_2 equivalent conversion factors (4)	NO_X	CO	NMVOCs	SO_2
2.B.4 - Caprolactam, Glyoxal and Glyoxylic Acid Production	NA	NA	NO	NA	NA	NA	NA	NA	NO	NO	NO	NO
2.B.5 - Carbide Production	NO	NO	NA	NA	NA	NA	NA	NA	NO	NO	NO	NO
2.B.6 - Titanium Dioxide Production	NO	NA	NA	NA	NA	NA	NA	NA	NO	NO	NO	NO
2.B.7 - Soda Ash Production	NO	NA	NA	NA	NA	NA	NA	NA	NO	NO	NO	NO
2.B.8 - Petrochemical and Carbon Black Production	NO	NO	NA	NA	NA	NA	NA	NA	NO	NO	NO	NO
2.B.9 - Fluorochemical Production	NA	NA	NA	NO	NO	NO	NO	NO	NO	NO	NO	NO
2.B.10 - Other (Please specify)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
2.C - Metal Industry	E	E	NO	NO	NO	NO	NO	NO	NO	NO	E	NO
2.C.1 - Iron and Steel Production	E	E	NA	NA	NA	NA	NA	NA	NO	NO	E	NO
2.C.2 - Ferroalloys Production	NO	NO	NA	NA	NA	NA	NA	NA	NO	NO	NO	NO
2.C.3 - Aluminium production	NO	NA	NA	NA	NO	NA	NA	NO	NO	NO	NO	NO
2.C.4 - Magnesium production	NO	NA	NA	NA	NA	NO	NA	NO	NO	NO	NO	NO
2.C.5 - Lead Production	NO	NA	NA	NA	NA	NA	NA	NA	NO	NO	NO	NO
2.C.6 - Zinc Production	NO	NA	NA	NA	NA	NA	NA	NA	NO	NO	NO	NO
2.C.7 - Other (please specify)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
2.D - Non-Energy Products from Fuels and Solvent Use	NE	NO	NO	NA	NA	NA	NA	NA	NO	NO	NE	NO
2.D.1 - Lubricant Use	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2.D.2 - Paraffin Wax Use	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2.D.3 - Solvent Use	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NE	NA
2.D.4 - Other (please specify)	NO	NO	NO	NA	NA	NA	NA	NA	NO	NO	NO	NO
2.E - Electronics Industry	NO	NO	NO	NO	NO	NO	NO	NO	NA	NA	NA	NA
2.E.1 - Integrated Circuit or Semiconductor	NA	NA	NA	NO	NO	NO	NO	NO	NA	NA	NA	NA
2.E.2 - c	NA	NA	NA	NA	NO	NO	NO	NO	NA	NA	NA	NA
2.E.3 - Photovoltaics	NA	NA	NA	NA	NO	NA	NA	NO	NA	NA	NA	NA
2.E.4 - Heat Transfer Fluid	NA	NA	NA	NA	NO	NA	NA	NO	NA	NA	NA	NA
2.E.5 - Other (please specify)	NO	NO	NO	NO	NO	NO	NO	NO	NA	NA	NA	NA
2.F - Product Uses as Substitutes for Ozone Depleting Substances	NA	NA	NA	NE	NE	NA	NA	NA	NA	NA	NA	NA
2.F.1 - Refrigeration and Air Conditioning	NA	NA	NA	NE	NA	NA	NA	NA	NA	NA	NA	NA
2.F.2 - Foam Blowing Agents	NA	NA	NA	NO	NA	NA	NA	NA	NA	NA	NA	NA

Categories	Net CO_2 (1)(2)	CH_4	N_2O	HFCs	PFCs	SF_6	Other halogenated gases with CO_2 equivalent conversion factors (3)	Other halogenated gases without CO_2 equivalent conversion factors (4)	NO_X	CO	NMVOCs	SO_2
2.F.3 - Fire Protection	NA	NA	NA	NE	NE	NA	NA	NA	NA	NA	NA	NA
2.F.4 - Aerosols	NA	NA	NA	NE	NA	NA	NA	NA	NA	NA	NA	NA
2.F.5 - Solvents	NA	NA	NA	NE	NE	NA	NA	NA	NA	NA	NA	NA
2.F.6 - Other Applications (please specify)	NA	NA	NA	NO	NO	NA	NA	NA	NA	NA	NA	NA
2.G - Other Product Manufacture and Use	NO	NO	NE	NO	NE	NE	NO	NE	NA	NA	NA	NA
2.G.1 - Electrical Equipment	NA	NA	NA	NA	NE	NE	NA	NE	NA	NA	NA	NA
2.G.2 - SF_6 and PFCs from Other Product Uses	NA	NA	NA	NA	NE	NE	NA	NE	NA	NA	NA	NA
2.G.3 - N_2O from Product Uses	NA	NA	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA
2.G.4 - Other (Please specify)	NO	NO	NO	NO	NO	NO	NO	NO	NA	NA	NA	NA
2.H - Other	NE	NE	NO	NA	NA	NA	NA	NA	NE	NE	NE	NE
2.H.1 - Pulp and Paper Industry	NE	NE	NA	NA	NA	NA	NA	NA	NE	NE	NE	NE
2.H.2 - Food and Beverages Industry	NE	NE	NA	NA	NA	NA	NA	NA	NE	NE	NE	NE
2.H.3 - Other (please specify)	NO	NO	NO	NA	NA	NA	NA	NA	NO	NO	NO	NO
3 - Agriculture, Forestry, and Other Land Use	E	E	E	NA	NA	NA	NA	NA	E	E	NE	NO
3.A - Livestock	NA	E	E	NA	NA	NA	NA	NA	NA	NA	NE	NA
3.A.1 - Enteric Fermentation	NA	E	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3.A.2 - Manure Management	NA	E	E	NA	NA	NA	NA	NA	NA	NA	NE	NA
3.B - Land	E	NA	NO	NA	NA	NA	NA	NA	NO	NO	NO	NO
3.B.1 - Forestland	E	NA	NA	NA	NA	NA	NA	NA	NO	NO	NO	NO
3.B.2 - Cropland	NE	NA	NA	NA	NA	NA	NA	NA	NO	NO	NO	NO
3.B.3 - Grassland	NE	NA	NA	NA	NA	NA	NA	NA	NO	NO	NO	NO
3.B.4 - Wetlands	NO	NA	NO	NA	NA	NA	NA	NA	NO	NO	NO	NO
3.B.5 - Settlements	NE	NA	NA	NA	NA	NA	NA	NA	NO	NO	NO	NO
3.B.6 - Other Land	NE	NA	NA	NA	NA	NA	NA	NA	NO	NO	NO	NO
3.C - Aggregate sources and non-CO_2 emissions sources on land	NE	E	E	NA	NA	NA	NA	NA	E	E	NA	NA
3.C.1 - Emissions from biomass burning	NA	E	E	NA	NA	NA	NA	NA	E	E	NA	NA
3.C.2 - Liming	NO	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3.C.3 - Urea application	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3.C.4 - Direct N_2O Emissions from managed soils	NA	NA	E	NA	NA	NA	NA	NA	NA	NA	NA	NA

Categories	Net CO_2 (1)(2)	CH_4	N_2O	HFCs	PFCs	SF_6	Other halogenated gases with CO_2 equivalent conversion factors (3)	Other halogenated gases without CO_2 equivalent conversion factors (4)	NO_X	CO	NMVOCs	SO_2
3.C.5 - Indirect N_2O Emissions from managed soils	NA	NA	E	NA	NA	NA	NA	NA	NA	NA	NA	NA
3.C.6 - Indirect N_2O Emissions from manure management	NA	NA	E	NA	NA	NA	NA	NA	NA	NA	NA	NA
3.C.7 - Rice cultivations	NA	E	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3.C.8 - Other (please specify)	NA	NO	NO	NA	NA	NA	NA	NA	NA	NA	NA	NA
3.D - Other	E	NO	NO	NA	NA	NA	NA	NA	NO	NO	NO	NO
3.D.1 - Harvested Wood Products	E	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3.D.2 - Other (please specify)	NO	NO	NO	NA	NA	NA	NA	NA	NO	NO	NO	NO
4 - Waste	E	E	E	NA	NA	NA	NA	NA	E	E	E	E
4.A - Solid Waste Disposal	NA	E	NO	NA	NA	NA	NA	NA	NO	NO	E	NA
4.B - Biological Treatment of Solid Waste	NA	NO	NO	NA	NA	NA	NA	NA	NO	NO	NO	NA
4.C - Incineration and Open Burning of Waste	E	E	E	NA	NA	NA	NA	NA	E	E	E	E
4.D - Wastewater Treatment and Discharge	NA	E	E	NA	NA	NA	NA	NA	NO	NO	E	NA
4.E - Other (please specify)	NO	NO	NO	NA	NA	NA	NA	NA	NO	NO	NO	NO
5 - Other	NO	NO	NE	NO	NO	NO	NO	NO	NO	NO	NO	NO
5.A - Indirect N_2O emissions from the atmospheric deposition of nitrogen in NO_X and NH_3	NA	NA	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA
5.B - Other (please specify)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Memo Items (5)												
International Bunkers	E	E	E	NA	NA	NA	NA	NA	E	E	E	E
1.A.3.a.i - International Aviation (International Bunkers)	E	E	E	NA	NA	NA	NA	NA	E	E	E	E
1.A.3.d.i - International water-borne navigation (International bunkers)	E	E	E	NA	NA	NA	NA	NA	E	E	E	E
1.A.5.c - Multilateral Operations	NE	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO

2.9 Recalculations

During the computation of the present inventory, recalculations were done for the Waste sector in line with new data collected on composition and for 2016 whenever new datasets became available. Recalculated emissions for the base years 2000 and 2010 are given in Table 2.7 while for the remaining years of the time series, the recalculations, if any, can be captured in the sectoral results of the NIR1. Original estimates for the year 2000 were made according to the Revised 1996 IPCC Guidelines, Tier 1 level, lower coverage of activity areas compared to the present inventory while recalculated values are compiled in line with the 2006 IPCC Guidelines and newly derived national stock and EFs for the Land sector. The wide difference between the inventory compiled in 2000 and recalculated in 2017 is primarily attributed to a higher coverage of emitting sources while the difference between the inventory of the NC3 recalculated for the BUR2 is due to addition of Coal mining and improved waste composition data.

Table 2.7 - Comparison of original and recalculated emissions of past inventories presented in national communications

Year	2000		2010	
	SNC	BUR2	NC3	BUR2
Net emissions	214,210	458,509	541,191	591,375

2.10 Time series consistency

This inventory now covers the period 2000 to 2017 and AD within each of the categories were abstracted from the same sources for all years. The same EFs have been used throughout the time series and the QA / QC procedures were kept constant for the whole inventory period. This enabled a consistent time series to be built with a good level of confidence in the trend of emissions.

2.11 Gaps, constraints and needs

Nigeria still faces serious challenges to report to the required standards to the Convention, including the inventory component. To reduce uncertainties and aim at producing an inventory in line with TACCC principles, Nigeria strengthened the personnel of the DCC, its national GHG inventory management system and institutional arrangements. The major challenge for estimating emissions was gaps in AD. The latter are not readily available. Thus, substantial data were sourced from international databases or extrapolated based on existing AD obtained from the Federal Institutions.

The following problems were encountered during the preparation of this national inventory of GHGs:

- Information required for the inventory were obtained from various sources until DCC implements the data collection framework for an automatic flow on an annual basis.
- Almost all the AD, including those from the NBS, are still not yet in the required format for feeding in the software to make the emission estimates.
- End-use consumption data for some of the sectors and categories are not readily available and had to be generated based on scientific and consumption parameters.
- Reliable national biomass (bm) data such as timber, fuelwood, wood waste and charcoal consumed or produced were not available and had to be derived using statistical modelling or adopted from international databases.
- There were frequent inconsistencies when data were collected from different sources.

- Lack of EFs to better represent national circumstances and provide for more accurate estimates even if this is being addressed for some key categories.
- Emissions for a substantial number of categories have not been estimated due to lack of AD, and
- DCC staff are not yet ready to take over the full inventory compilation process because of insufficient capacity which dictated the contracting of consultants.

2.12 National Inventory Improvement Plan (NIIP)

Based on the constraints, gaps and other challenges encountered during the preparation of the present inventory, a list of the most urgent improvements has been identified. These are listed below and have been partially addressed during the preparation of the NIR1 within the framework of the BUR2. However, most of the items still need further improvement and it is planned to cater for them during future inventory cycles and within the framework of the CBIT project in addition to the UNFCCC project providing support for the development and operationalization of the GHGIMS.

- National framework for adequate and proper data capture, QC, validation, storage and retrieval needs to be developed to facilitate the compilation of future inventories.
- Capacity building of national experts and strengthening of the existing institutional framework within a robust GHGIMS to provide improved coordinated action for a smooth implementation of the GHG inventory cycle for annual estimation of emissions.
- Development of national EFs to enable adoption of Tier 2 methods for key categories.
- Development and implementation of a QA / QC system including a QA / QC plan in order to reduce uncertainty and improve inventory quality.
- Access sufficient financial resources to strengthen the present system at the States' level to provide adequate support to DCC for inventory compilation and coordination.
- Institutionalisation of an archiving system.
- Pursue efforts for collecting the required AD for categories not covered in this exercise, to improve completeness of future inventories.
- Conduct new forest inventories to confirm the stock and EFs derived based on data obtained from old forest inventories, scientific publication and other sources.
- Produce maps for 1990 to 2020 matching IPCC representation of land classes to refine land use change data over 5 years periods to provide for a better estimate of emissions in the Land sector while supporting implementation of the REDD+ initiative, and
- Add the missing years 1990 to 1999 to complete the full time series 1990 to the latest year for compliance in inventory compilation.

2.13 Estimates of greenhouse gases

2.13.1 Overview

Only a condensed version of the results of the inventory is given in this chapter. It consists of estimates of aggregated emissions trends for the full time series 2000 to 2017 at the national level, for the four IPCC sectors and for the direct and indirect GHGs as well as for SO_2. The short and long summary tables for the year 2017 also are included at the end of this chapter. Details (sectoral tables) pertaining to all categories and sub-categories of the four IPCC sectors, the full Uncertainty analysis and Completeness of the inventory are available in the stand-alone NIR1 submitted along with this BUR2.

2.13.2 Trend of national emissions

The trends of GHG emissions for the Republic of Nigeria cover the period 2000 to 2017. Nigeria remained a net emitter over the period 2000 to 2017 as the emissions from all categories combined exceeded the removals from the Land category. The total emissions increased by 213,768 Gg from 464,416 Gg in 2000 to 678,184 Gg in 2017, representing an increase of 46% over these 18 years. During the same period, the country recorded a regression of 23% in removals, from 5,908 Gg CO_2-eq to 4,543 Gg CO_2-eq. The trend for the period 2000 to 2017 indicates that national net emissions increased from 458,509 Gg CO_2-eq in 2000 to 673,641 Gg CO_2-eq in 2017 (Table 2.8).

Table 2.8 - GHG emissions (Gg CO_2-eq) characteristics (2000 – 2017)

Year	Total emissions	AFOLU removals	Net	Per capita emission (t)	GDP emissions index (Year 2000 = 100)
2000	464,416	-5,908	458,509	3.78	100.0
2001	487,874	-5,786	482,088	3.87	99.2
2002	481,500	-5,651	475,849	3.73	84.9
2003	510,402	-5,623	504,779	3.85	83.8
2004	524,605	-5,551	519,054	3.86	78.9
2005	548,799	-5,339	543,460	3.93	77.5
2006	551,157	-5,226	545,930	3.85	73.4
2007	560,673	-5,225	555,449	3.81	70.0
2008	569,396	-5,069	564,327	3.77	66.6
2009	563,147	-4,925	558,222	3.63	61.0
2010	596,171	-4,796	591,375	3.74	59.8
2011	603,628	-5,336	598,292	3.69	57.5
2012	617,328	-4,277	613,052	3.67	56.4
2013	633,014	-5,021	627,993	3.66	54.2
2014	658,761	-5,345	653,416	3.71	53.1
2015	676,641	-4,830	671,811	3.71	53.1
2016	661,261	-4,791	656,469	3.54	52.7
2017	678,184	-4,543	673,641	3.55	53.7

Per capita emissions of GHG varied between 3.93 and 3.54 during the period 2000 to 2017 with an overall decrease from 3.78 tonnes CO_2-eq in 2000 to 3.55 tonnes in 2017 (Figure 2.3). The GDP emissions index decreased almost steadily from 100 in the year 2000 to 53.7 in 2017 (Figure 2.4).

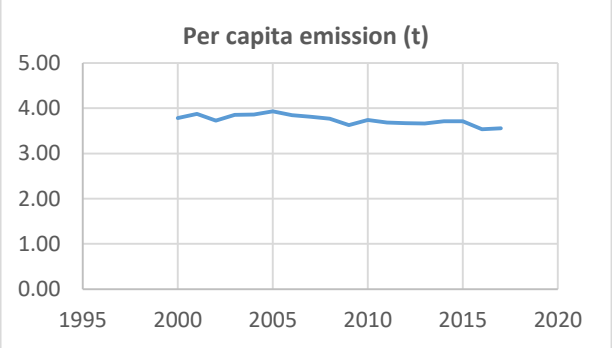

Figure 2.3 - Per capita GHG emissions (2000 – 2017)

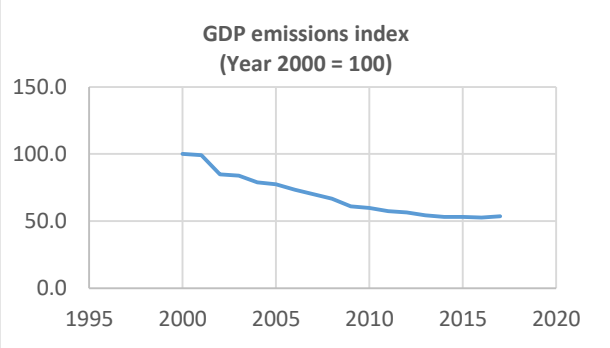

Figure 2.4 - GDP emissions index (2000 – 2017)

2.13.3 Trend of emissions by sector

Total national emissions increased by 46% over these 18 years, through increases in all sectors. The AFOLU sector remained the leading emitter throughout this period followed by Energy, for all years under review. The Waste sector remained the third contributor with the IPPU sector emitting the least over the time series.

Emissions from the Energy sector increased from 142,674 Gg CO_2-eq (31% of national emissions) in 2000 to 245,918 Gg CO_2-eq (36% of national emissions) in 2017 as depicted in **Error! Reference source not ound.**. During the period 2000 to 2017, the emissions increased by 72%.

AFOLU emissions over the 2000 to 2017 period increased by 29% from 301,970 Gg CO_2-eq in 2000 to 389,790 Gg CO_2-eq in 2017 (Table 2.9). However, although AFOLU remained the highest contributor to national emissions, its share in these emissions decreased from 65% in 2000 to 57% in 2017.

The contribution of the IPPU sector in total national emissions increased from 2,511 Gg CO_2-eq in 2000 to a peak of 13,271 in 2015 to regress thereafter to 11,618 Gg CO_2-eq in 2017 (Table 2.9). IPPU represented 0.5% of national missions in 2000 and 1.7% in 2017.

Emissions from Waste increased slowly from 3.7% of national emissions in 2000 to 4.5% in 2017. Emissions from the Waste sector increased from the 2000 level of 17,261 Gg CO_2-eq to 30,857 Gg CO_2-eq in 2017, representing a 79% increase.

Table 2.9 - National GHG emissions (Gg, CO_2-eq) by sector (2000 – 2017)

Year	Total emissions	Energy	IPPU	AFOLU	Waste
2000	464,416	142,674	2,511	301,970	17,261
2001	487,874	161,275	2,512	306,131	17,956
2002	481,500	150,384	2,481	309,999	18,637
2003	510,402	170,277	5,895	314,851	19,378
2004	524,605	178,980	6,013	319,492	20,121
2005	548,799	196,640	6,181	325,040	20,938
2006	551,157	192,145	6,300	331,070	21,641
2007	560,673	196,041	6,772	335,509	22,351
2008	569,396	199,933	7,360	338,957	23,147
2009	563,147	187,354	7,864	343,968	23,961
2010	596,171	211,571	8,247	351,483	24,870
2011	603,628	213,507	9,128	355,361	25,632
2012	617,328	218,109	10,835	361,925	26,460
2013	633,014	225,842	12,294	367,524	27,354
2014	658,761	244,136	12,468	373,884	28,273
2015	676,641	254,996	13,271	379,036	29,337
2016	661,261	235,166	12,004	383,882	30,208
2017	678,184	245,918	11,618	389,790	30,857

2.13.4 Trend in emissions of direct GHGs

The main contributor to the national GHG emissions remained CO_2 followed by CH_4 and N_2O. However, the share of CO_2 and N_2O increased while that of CH_4 regressed over the time series. In 2017, the share of the GHG emissions was as follows: 68% CO_2, 27% CH_4 and 5% N_2O. The trend of the aggregated emissions and removals by gas is given in Table 2.10 and Figure 2.5.

Table 2.10 - Aggregated emissions and removals by gas (2000 – 2017)

Year	Total GHG emissions (CO_2-eq)	Removals (CO_2) (CO_2-eq)	Net emissions (CO_2-eq)	CO_2 (Gg)	CH_4 (CO_2-eq)	N_2O (CO_2-eq)
2000	464,416	-5,908	458,509	296,508	148,086	19,822
2001	487,874	-5,786	482,088	311,818	155,463	20,593
2002	481,500	-5,651	475,849	317,288	143,306	20,906
2003	510,402	-5,623	504,779	331,479	157,217	21,706
2004	524,605	-5,551	519,054	335,562	167,207	21,835
2005	548,799	-5,339	543,460	356,009	169,860	22,930
2006	551,157	-5,226	545,930	358,165	169,310	23,681
2007	560,673	-5,225	555,449	368,726	167,647	24,300
2008	569,396	-5,069	564,327	379,227	164,984	25,186
2009	563,147	-4,925	558,222	376,174	160,906	26,067
2010	596,171	-4,796	591,375	387,708	181,339	27,124
2011	603,628	-5,336	598,292	396,498	180,098	27,032
2012	617,328	-4,277	613,052	404,999	184,422	27,907
2013	633,014	-5,021	627,993	425,326	178,569	29,119
2014	658,761	-5,345	653,416	445,917	183,221	29,623
2015	676,641	-4,830	671,811	459,266	187,304	30,071
2016	661,261	-4,791	656,469	452,099	177,917	31,245
2017	678,184	-4,543	673,641	462,884	182,686	32,614

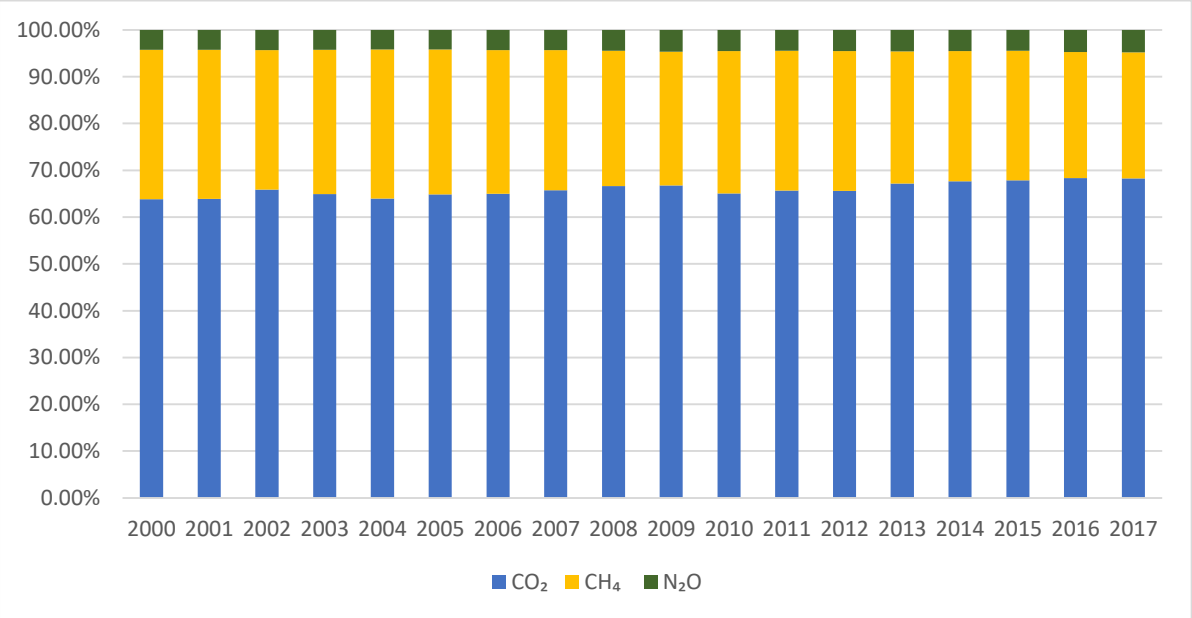

Figure 2.5 - Share of aggregated emissions (Gg CO_2-eq) by gas (2000 – 2017)

2.13.5 Carbon dioxide (CO_2)

National CO_2 emissions increased by 56% from the 2000 level of 296,508 Gg (Table 2.11) to 462,884 Gg in 2017. In the same year, the sector that emitted the highest amount of CO_2 was AFOLU with 319,971 Gg followed by Energy with 131,196 Gg, IPPU with 11,602 Gg and Waste with 115 Gg (Table 2.11).

Table 2.11 - CO_2 emissions (Gg) by source category (2000 – 2017)

Year	Total emissions	Total net emissions	Energy	IPPU	AFOLU - emissions	AFOLU - removals	Waste
2000	296,508	290,600	37,253	2,507	256,674	-5,908	74
2001	311,818	306,032	49,593	2,508	259,641	-5,786	76
2002	317,288	311,637	51,963	2,476	262,771	-5,651	78
2003	331,479	325,856	59,250	5,882	266,267	-5,623	80
2004	335,562	330,011	59,399	5,999	270,082	-5,551	82
2005	356,009	350,670	75,819	6,168	273,939	-5,339	84
2006	358,165	352,939	74,280	6,286	277,513	-5,226	86
2007	368,726	363,502	80,654	6,759	281,226	-5,225	88
2008	379,227	374,157	88,685	7,346	283,105	-5,069	90
2009	376,174	371,249	80,258	7,850	287,973	-4,925	92
2010	387,708	382,911	87,808	8,234	291,571	-4,796	95
2011	396,498	391,162	91,585	9,114	295,704	-5,336	95
2012	404,999	400,722	94,844	10,821	299,235	-4,277	99
2013	425,326	420,305	109,675	12,279	303,270	-5,021	102
2014	445,917	440,572	125,005	12,453	308,355	-5,345	105
2015	459,266	454,436	133,225	13,255	312,676	-4,830	110
2016	452,099	447,307	124,022	11,988	315,977	-4,791	112
2017	462,884	458,341	131,196	11,602	319,971	-4,543	115

2.13.6 Methane (CH_4)

CH_4 was the next contributor in national emissions after CO_2. CH_4 emissions increased by 23% from the 2000 level of 148,086 Gg CO_2-eq to 182,686 Gg CO_2-eq in 2017 (Table 2.12). Energy remained the highest contributor throughout the time series with an average of 66% followed by AFOLU with 23% and Waste with 11%. The contribution of the IPPU sector was insignificant with less than 1%.

Table 2.12 - CH_4 emissions (Gg) by source category (2000 – 2017)

Year	Total (Gg CO_2-eq)	Total	Energy	IPPU	AFOLU - emissions	Waste
2000	148,086	5,289	3,681	0.2	1,114	493
2001	155,463	5,552	3,901	0.2	1,136	515
2002	143,306	5,118	3,425	0.2	1,156	536
2003	157,217	5,615	3,874	0.5	1,184	557
2004	167,207	5,972	4,179	0.5	1,214	578
2005	169,860	6,066	4,221	0.5	1,246	599
2006	169,310	6,047	4,115	0.5	1,311	620
2007	167,647	5,987	4,024	0.5	1,322	641
2008	164,984	5,892	3,875	0.5	1,354	663
2009	160,906	5,747	3,726	0.5	1,336	685
2010	181,339	6,476	4,319	0.5	1,449	708
2011	180,098	6,432	4,251	0.5	1,451	730
2012	184,422	6,587	4,296	0.5	1,536	755
2013	178,569	6,377	4,035	0.5	1,563	779
2014	183,221	6,544	4,139	0.6	1,601	803
2015	187,304	6,689	4,233	0.6	1,626	829
2016	177,917	6,354	3,851	0.6	1,648	855
2017	182,686	6,524	3,976	0.6	1,670	878

2.13.7 Nitrous Oxide (N_2O)

N_2O emissions increased by 65% from 19,822 Gg CO_2-eq in the year 2000 to 32,614 Gg CO_2-eq in 2017 (Table 2.13). The AFOLU sector was the highest emitter of N_2O with more than 70% in all years of the time series.

Table 2.13 - N_2O emissions (Gg) by source category (2000 – 2017)

Year	Total emissions (Gg CO_2-eq)	Total	Energy	AFOLU	Waste
2000	19,822	74.8	8.9	53.2	12.7
2001	20,593	77.7	9.2	55.4	13.1
2002	20,906	78.9	9.5	56.0	13.4
2003	21,706	81.9	9.7	58.3	14.0
2004	21,835	82.4	9.7	58.1	14.6
2005	22,930	86.5	9.9	61.2	15.4
2006	23,681	89.4	10.0	63.6	15.8
2007	24,300	91.7	10.3	65.2	16.3
2008	25,186	95.0	10.4	67.7	17.0
2009	26,067	98.4	10.5	70.2	17.7
2010	27,124	102.4	10.7	73.0	18.7
2011	27,032	102.0	11.0	71.8	19.2
2012	27,907	105.3	11.3	74.3	19.7
2013	29,119	109.9	12.0	77.3	20.6
2014	29,623	111.8	12.2	78.2	21.4
2015	30,071	113.5	12.2	78.6	22.7
2016	31,245	117.9	12.5	82.2	23.3
2017	32,614	123.1	12.8	87.0	23.3

2.13.8 Trends in emissions of indirect GHGs and SO_2

Emissions of indirect GHGs (CO, NO_x and NMVOCs) and SO_2, have also been estimated and reported in the inventory. Indirect GHGs have not been included in national total emissions. Emissions of these gases for the period 2000 to 2017 are given in Table 2.14.

Emissions of NO_x increased from 275 Gg in the year 2000 to 495 Gg in 2017. CO emissions also increased from 7,693 Gg in 2000 to 10,959 Gg in 2017. Likewise, for NMVOCs from 1480 Gg in 2000 to 2031 Gg in 2017 whilst emissions of SO_2 varied between 41.6 Gg and 69.0 Gg during the same period.

Table 2.14 - Emissions (Gg) of indirect GHGs and SO_2 (2000 – 2017)

Year	NO_x	CO	NMVOC	SO_2
2000	274.9	7,693	1,480	41.6
2001	303.3	8,009	1,553	54.4
2002	315.1	8,223	1,584	53.0
2003	347.9	8,354	1,626	53.3
2004	316.4	8,431	1,639	47.4
2005	351.4	8,590	1,671	56.8
2006	324.9	8,669	1,665	48.4
2007	336.5	8,936	1,703	45.1

Year	NO_x	CO	NMVOC	SO_2
2008	355.4	9,001	1,717	52.3
2009	335.1	8,990	1,715	47.1
2010	346.5	9,084	1,771	50.2
2011	360.8	9,240	1,784	52.1
2012	370.7	9,381	1,822	52.6
2013	431.0	10,063	1,938	68.1
2014	458.4	10,430	1,983	68.1
2015	458.1	10,476	1,977	61.9
2016	474.5	10,735	1,989	64.3
2017	495.1	10,959	2,031	69.0

2.13.9 Oxides of nitrogen (NO_x)

Emissions of NO_x increased over the inventory period from 275 Gg in the year 2000 to 495 Gg in 2017 (Table 2.15). The principal source of NO_x emissions was the Energy sector. The Energy sector witnessed an increase of 82% and emitted some 95% of total emissions in all years of the time series. The Waste sector contributed about 4.8% of total national. AFOLU and IPPU contributions were insignificant with a maximum of 0.2%.

Table 2.15 - NO_x emissions (Gg) by source category (2000 – 2017)

Year	Total emissions	Energy	IPPU	AFOLU	Waste
2000	275	260	0.001	0.1	15.3
2001	303	288	0.001	0.1	15.6
2002	315	299	0.001	0.1	16.0
2003	348	331	0.001	0.1	16.4
2004	316	299	0.001	0.1	16.8
2005	351	334	0.000	0.2	17.2
2006	325	307	0.000	0.2	17.6
2007	336	318	0.000	0.2	18.0
2008	355	337	0.001	0.2	18.5
2009	335	316	0.001	0.2	18.9
2010	346	327	0.001	0.1	19.4
2011	361	341	0.001	0.1	19.5
2012	371	350	0.001	0.1	20.4
2013	431	410	0.001	0.1	20.9
2014	458	437	0.001	0.2	21.4
2015	458	435	0.001	0.2	22.5
2016	474	451	0.001	0.2	23.0
2017	495	471	0.001	0.2	23.6

2.13.10 Carbon monoxide (CO)

National CO emissions increased from 7,693 Gg in the year 2000 to 10,959 Gg in 2017. The major contributor of CO was the Energy sector with some 96% of national emissions for all years of the time series followed by the Waste sector with between 3.5% to 3.8% (Table 2.16). The AFOLU and IPPU sectors contributed the remainder which is less than 1%.

Table 2.16 - CO emissions (Gg) by source category (2000 – 2017)

Year	Total emissions	Energy	IPPU	AFOLU	Waste
2000	7,693	7,423	6.2E-05	2.8	267.9
2001	8,009	7,732	6.2E-05	2.9	274.3
2002	8,223	7,939	6.9E-05	3.7	280.7
2003	8,354	8,063	5.1E-05	3.9	287.4
2004	8,431	8,132	5.5E-05	3.9	294.3
2005	8,590	8,284	4.9E-05	4.1	301.4
2006	8,669	8,355	5.0E-05	4.2	309.0
2007	8,936	8,615	5.0E-05	5.1	316.4
2008	9,001	8,672	5.0E-05	5.4	324.2
2009	8,990	8,653	5.1E-05	5.2	332.3
2010	9,084	8,740	5.1E-05	3.6	340.6
2011	9,240	8,893	5.1E-05	3.7	342.8
2012	9,381	9,019	5.1E-05	4.4	357.9
2013	10,063	9,692	5.2E-05	4.3	366.9
2014	10,430	10,048	5.2E-05	5.6	376.1
2015	10,476	10,074	5.2E-05	6.2	395.4
2016	10,735	10,325	5.3E-05	6.4	403.5
2017	10,959	10,539	5.3E-05	6.3	414.1

2.13.11 Non-Methane Volatile Organic Compounds (NMVOCs)

In 2017, emissions of NMVOCs stood at 2,031 Gg compared to 1,480 Gg in the year 2000. Emissions of NMVOCs increased throughout the inventory period for all sectors. The main emission source was the Energy sector (Table 2.17) which increased from 1,460 in 2000 to 1,997 in 2017. Emissions from the Waste sector increased from 20.1 Gg to 33.6 Gg during the inventory period. A marginal increase of 0.6 Gg is observed over the 2000 emissions of 0.3 Gg of the IPPU sector.

Table 2.17 - Emissions of NMVOCs (Gg) by source category (2000 – 2017)

Year	Total emissions	Energy	IPPU	Waste
2000	1,480	1,460	0.3	20.1
2001	1,553	1,532	0.3	20.7
2002	1,584	1,563	0.3	21.3
2003	1,626	1,603	0.7	21.9
2004	1,639	1,615	0.7	22.5
2005	1,671	1,647	0.7	23.1
2006	1,665	1,640	0.7	23.8
2007	1,703	1,678	0.7	24.5
2008	1,717	1,691	0.7	25.3
2009	1,715	1,688	0.7	26.0
2010	1,771	1,743	0.7	26.8
2011	1,784	1,756	0.7	27.4
2012	1,822	1,793	0.8	28.4
2013	1,938	1,908	0.8	29.2

Year	Total emissions	Energy	IPPU	Waste
2014	1,983	1,952	0.8	30.1
2015	1,977	1,944	0.9	31.4
2016	1,989	1,956	0.9	32.2
2017	2,031	1,997	0.9	33.6

2.13.12 Sulphur dioxide (SO_2)

The energy sector remained nearly as the sole emitter of SO_2 (Table 2.18) during the full inventory period, its contribution fluctuating from 41.1 Gg in 2000 to 68.1 Gg in 2017. The Waste sector emitted an insignificant amount varying from 0.5 to 0.8 Gg during the inventory period.

Table 2.18 - SO_2 emissions (Gg) by source category (2000 – 2017)

Year	Total emissions	Energy	Waste
2000	41.6	41.1	0.5
2001	54.4	53.9	0.5
2002	53.0	52.5	0.6
2003	53.3	52.7	0.6
2004	47.4	46.8	0.6
2005	56.8	56.3	0.6
2006	48.4	47.8	0.6
2007	45.1	44.5	0.6
2008	52.3	51.7	0.6
2009	47.1	46.4	0.7
2010	50.2	49.6	0.7
2011	52.1	51.4	0.7
2012	52.6	51.9	0.7
2013	68.1	67.4	0.7
2014	68.1	67.3	0.7
2015	61.9	61.1	0.8
2016	64.3	63.5	0.8
2017	69.0	68.1	0.8

Table 2.19 - Short Summary – Inventory Year 2017

Categories	Emissions (Gg)			Emissions CO_2 Equivalents (Gg)				Emissions (Gg)				
	Net CO_2 (1)(2)	CH_4	N_2O	HFCs	PFCs	SF_6	Other halogenated gases with CO_2 equivalent conversion factors (3)	Other halogenated gases without CO_2 equivalent conversion factors (4)	NOx	CO	NMVOCs	SO_2
Total National Emissions and Removals	458340.931	6524.494	123.072	NE	NE	NE	NE	NE	495.105	10958.904	2031.493	68.957
1 - Energy	131196.320	3976.360	12.768	NA	NA	NA	NA	NA	471.316	10538.528	1996.990	68.141
1.A - Fuel Combustion Activities	126454.141	707.809	12.697	NA	NA	NA	NA	NA	459.468	10489.084	1674.573	65.616
1.B - Fugitive emissions from fuels	4742.179	3268.551	0.070	NA	NA	NA	NA	NA	11.848	49.444	322.417	2.525
1.C - Carbon dioxide Transport and Storage	NO	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2 - Industrial Processes and Product Use	11601.572	0.600	NE	NE	NE	NE	NE	NE	0.001	5.300E-05	0.900	0.000
2.A - Mineral Industry	5239.845	NO	NO	NA	NA	NA	NA	NA	NO	NO	NO	NO
2.B - Chemical Industry	1.727	NO	NE	NO	NO	NO	NO	NO	0.001	5.300E-05	NO	NO
2.C - Metal Industry	6360.000	0.600	NO	NO	NO	NO	NO	NO	NO	NO	0.900	NO
2.D - Non-Energy Products from Fuels and Solvent Use	NE	NO	NO	NA	NA	NA	NA	NA	NO	NO	NE	NO
2.E - Electronics Industry	NO	NO	NO	NO	NO	NO	NO	NO	NA	NA	NA	NA
2.F - Product Uses as Substitutes for Ozone Depleting Substances	NA	NA	NA	NE	NE	NA	NA	NA	NA	NA	NA	NA
2.G - Other Product Manufacture and Use	NO	NO	NE	NO	NE	NE	NO	NE	NA	NA	NA	NA
2.H - Other	NE	NE	NO	NA	NA	NA	NA	NA	NE	NE	NE	NE
3 - Agriculture, Forestry, and Other Land Use	315427.959	1669.820	87.037	NA	NA	NA	NA	NA	0.203	6.296	NE	NO
3.A - Livestock	NA	1327.769	5.278	NA	NA	NA	NA	NA	NA	NA	NE	NA
3.B - Land	319970.583	NA	0.000	NA	NA	NA	NA	NA	NO	NO	NO	NO
3.C - Aggregate sources and non-CO_2 emissions sources on land	NE	342.051	81.760	NA	NA	NA	NA	NA	0.203	6.296	NA	NA
3.D - Other	-4542.625	NO	NO	NA	NA	NA	NA	NA	NO	NO	NO	NO
4 - Waste	115.080	877.715	23.267	NA	NA	NA	NA	NA	23.585	414.079	33.603	0.816
4.A - Solid Waste Disposal	NA	281.940	NO	NA	NA	NA	NA	NA	NO	NO	24.481	0.000
4.B - Biological Treatment of Solid Waste	NA	NO	NO	NA	NA	NA	NA	NA	NO	NO	NO	NA
4.C - Incineration and Open Burning of Waste	115.080	48.209	0.634	NA	NA	NA	NA	NA	23.585	414.079	9.123	0.816
4.D - Wastewater Treatment and Discharge	NA	547.565	22.633	NA	NA	NA	NA	NA	NO	NO	NO	NO
4.E - Other (please specify)	NO	N0	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
5 - Other	NO	NO	NE	NO	NO	NO	NO	NO	NO	NO	NO	NO

Categories	Emissions (Gg)			Emissions CO_2 Equivalents (Gg)				Emissions (Gg)				
	Net CO_2 (1)(2)	CH_4	N_2O	HFCs	PFCs	SF_6	Other halogenated gases with CO_2 equivalent conversion factors (3)	Other halogenated gases without CO_2 equivalent conversion factors (4)	NO_X	CO	NMVOCs	SO_2
5.A - Indirect N_2O emissions from the atmospheric deposition of nitrogen in NO_X and NH_3	NA	NA	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA
5.B - Other (please specify)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Memo Items (5)												
International Bunkers	1246.484	0.015	0.035	NA	NA	NA	NA	NA	6.552	0.576	0.247	0.821
1.A.3.a.i - International Aviation (International Bunkers) (1)	1176.440	0.008	0.033	NA	NA	NA	NA	NA	4.776	0.410	0.187	0.373
1.A.3.d.i - International water-borne navigation (International bunkers) (1)	70.044	0.006	0.002	NA	NA	NA	NA	NA	1.776	0.166	0.061	0.448
1.A.5.c - Multilateral Operations (1)(2)	NE	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO

Table 2.20 - Long Summary – Inventory Year 2017

Categories	Emissions (Gg)			Emissions CO_2 Equivalents (Gg)				Emissions (Gg)				
	Net CO_2 (1)(2)	CH_4	N_2O	HFCs	PFCs	SF_6	Other halogenated gases with CO_2 eq conversion factors (3)	Other halogenated gases without CO_2 eq conversion factors (4)	NO_X	CO	NMVOCs	SO_2
Total National Emissions and Removals	458340.931	6524.494	123.072	NE	NE	NE	NE	NE	495.105	10958.904	2031.493	68.957
1 - Energy	131196.320	3976.360	12.768	NA	NA	NA	NA	NA	471.316	10538.528	1996.990	68.141
1.A - Fuel Combustion Activities	126454.141	707.809	12.697	NA	NA	NA	NA	NA	459.468	10489.084	1674.573	65.616
1.A.1 - Energy Industries	57052.162	12.146	1.589	NA	NA	NA	NA	NA	120.565	72.365	5.329	10.541
1.A.2 - Manufacturing Industries and Construction	14758.460	4.607	0.598	NA	NA	NA	NA	NA	41.983	89.030	47.921	3.871
1.A.3 - Transport	37646.979	14.353	1.615	NA	NA	NA	NA	NA	157.924	1476.259	273.636	9.595
1.A.4 - Other Sectors	16996.540	676.703	8.895	NA	NA	NA	NA	NA	138.997	8851.429	1347.688	41.609
1.A.5 - Non-Specified	NE	NE	NE	NA	NA	NA	NA	NA	NE	NE	NE	NE
1.B - Fugitive emissions from fuels	4742.179	3268.551	0.070	NA	NA	NA	NA	NA	11.848	49.444	322.417	2.525
1.B.1 - Solid Fuels	NE	0.758	NA	NA	NA	NA	NA	NA	NA	NA	44.204	NA
1.B.2 - Oil and Natural Gas	4742.179	3267.793	0.070	NA	NA	NA	NA	NA	11.848	49.444	278.213	2.525

Categories	Emissions (Gg)			Emissions CO_2 Equivalents (Gg)				Emissions (Gg)				
	Net CO_2 (1)(2)	CH_4	N_2O	HFCs	PFCs	SF_6	Other halogenated gases with CO_2 eq conversion factors (3)	Other halogenated gases without CO_2 eq conversion factors (4)	NO_X	CO	NMVOCs	SO_2
1.B.3 - Other emissions from Energy Production	NO	NO	NO	NA	NA	NA	NA	NA	NO	NO	NO	NA
1.C - Carbon dioxide Transport and Storage	NO	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1.C.1 - Transport of CO_2	NO	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1.C.2 - Injection and Storage	NO	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1.C.3 - Other	NO	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2 - Industrial Processes and Product Use	11601.572	0.600	NE	NE	NE	NE	NE	NE	0.001	5.300E-05	0.900	NE
2.A - Mineral Industry	5239.845	NO	NO	NA	NA	NA	NA	NA	NO	NO	NO	NO
2.A.1 - Cement production	5239.845	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2.A.2 - Lime production	NO	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2.A.3 - Glass Production	NO	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2.A.4 - Other Process Uses of Carbonates	NO	NA	NA	NA	NA	NA	NA	NA	NO	NO	NO	NO
2.A.5 - Other (please specify)	NO	NO	NO	NA	NA	NA	NA	NA	NO	NO	NO	NO
2.B - Chemical Industry	1.727	NO	NE	NO	NO	NO	NO	NO	0.001	5.300E-05	NO	NO
2.B.1 - Ammonia Production	1.727	NA	NA	NA	NA	NA	NA	NA	0.001	5.300E-05	NO	NO
2.B.2 - Nitric Acid Production	NA	NA	NE	NA	NA	NA	NA	NA	NE	NE	NE	NE
2.B.3 - Adipic Acid Production	NA	NA	NO	NA	NA	NA	NA	NA	NO	NO	NO	NO
2.B.4 - Caprolactam, Glyoxal and Glyoxylic Acid Production	NA	NA	NO	NA	NA	NA	NA	NA	NO	NO	NO	NO
2.B.5 - Carbide Production	NO	NO	NA	NA	NA	NA	NA	NA	NO	NO	NO	NO
2.B.6 - Titanium Dioxide Production	NO	NA	NA	NA	NA	NA	NA	NA	NO	NO	NO	NO
2.B.7 - Soda Ash Production	NO	NA	NA	NA	NA	NA	NA	NA	NO	NO	NO	NO
2.B.8 - Petrochemical and Carbon Black Production	NO	NO	NA	NA	NA	NA	NA	NA	NO	NO	NO	NO
2.B.9 - Fluorochemical Production	NA	NA	NA	NO	NO	NO	NO	NO	NO	NO	NO	NO
2.B.10 - Other (Please specify)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
2.C - Metal Industry	6360.000	0.600	NO	NO	NO	NO	NO	NO	NO	NO	0.900	NO
2.C.1 - Iron and Steel Production	6360.000	0.600	NA	NA	NA	NA	NA	NA	NO	NO	0.900	NO
2.C.2 - Ferroalloys Production	NO	NO	NA	NA	NA	NA	NA	NA	NO	NO	NO	NO
2.C.3 - Aluminium production	NO	NA	NA	NA	NO	NA	NA	NO	NO	NO	NO	NO
2.C.4 - Magnesium production	NO	NA	NA	NA	NA	NO	NA	NO	NO	NO	NO	NO
2.C.5 - Lead Production	NO	NA	NA	NA	NA	NA	NA	NA	NO	NO	NO	NO

Categories	Emissions (Gg)			Emissions CO_2 Equivalents (Gg)				Emissions (Gg)				
	Net CO_2 (1)(2)	CH_4	N_2O	HFCs	PFCs	SF_6	Other halogenated gases with CO_2 eq conversion factors (3)	Other halogenated gases without CO_2 eq conversion factors (4)	NO_X	CO	NMVOCs	SO_2
2.C.6 - Zinc Production	NO	NA	NA	NA	NA	NA	NA	NA	NO	NO	NO	NO
2.C.7 - Other (please specify)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
2.D - Non-Energy Products from Fuels and Solvent Use	NE	NO	NO	NA	NA	NA	NA	NA	NO	NO	NE	NO
2.D.1 - Lubricant Use	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2.D.2 - Paraffin Wax Use	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2.D.3 - Solvent Use	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NE	NA
2.D.4 - Other (please specify)	NO	NO	NO	NA	NA	NA	NA	NA	NO	NO	NO	NO
2.E - Electronics Industry	NO	NO	NO	NO	NO	NO	NO	NO	NA	NA	NA	NA
2.E.1 - Integrated Circuit or Semiconductor	NA	NA	NA	NO	NO	NO	NO	NO	NA	NA	NA	NA
2.E.2 - TFT Flat Panel Display	NA	NA	NA	NA	NO	NO	NO	NO	NA	NA	NA	NA
2.E.3 - Photovoltaics	NA	NA	NA	NA	NO	NA	NA	NO	NA	NA	NA	NA
2.E.4 - Heat Transfer Fluid	NA	NA	NA	NA	NO	NA	NA	NO	NA	NA	NA	NA
2.E.5 - Other (please specify)	NO	NO	NO	NO	NO	NO	NO	NO	NA	NA	NA	NA
2.F - Product Uses as Substitutes for Ozone Depleting Substances	NA	NA	NA	NE	NE	NA	NA	NA	NA	NA	NA	NA
2.F.1 - Refrigeration and Air Conditioning	NA	NA	NA	NE	NA	NA	NA	NA	NA	NA	NA	NA
2.F.2 - Foam Blowing Agents	NA	NA	NA	NO	NA	NA	NA	NA	NA	NA	NA	NA
2.F.3 - Fire Protection	NA	NA	NA	NE	NE	NA	NA	NA	NA	NA	NA	NA
2.F.4 - Aerosols	NA	NA	NA	NE	NA	NA	NA	NA	NA	NA	NA	NA
2.F.5 - Solvents	NA	NA	NA	NE	NE	NA	NA	NA	NA	NA	NA	NA
2.F.6 - Other Applications (please specify)	NA	NA	NA	NO	NO	NA	NA	NA	NA	NA	NA	NA
2.G - Other Product Manufacture and Use	NO	NO	NE	NO	NE	NE	NO	NE	NA	NA	NA	NA
2.G.1 - Electrical Equipment	NA	NA	NA	NA	NE	NE	NA	NE	NA	NA	NA	NA
2.G.2 - SF_6 and PFCs from Other Product Uses	NA	NA	NA	NA	NE	NE	NA	NE	NA	NA	NA	NA
2.G.3 - N_2O from Product Uses	NA	NA	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA
2.G.4 - Other (Please specify)	NO	NO	NO	NO	NO	NO	NO	NO	NA	NA	NA	NA
2.H - Other	NE	NE	NO	NA	NA	NA	NA	NA	NE	NE	NE	NE
2.H.1 - Pulp and Paper Industry	NE	NE	NA	NA	NA	NA	NA	NA	NE	NE	NE	NE
2.H.2 - Food and Beverages Industry	NE	NE	NA	NA	NA	NA	NA	NA	NE	NE	NE	NE
2.H.3 - Other (please specify)	NO	NO	NO	NA	NA	NA	NA	NA	NO	NO	NO	NO

Categories	Emissions (Gg)			Emissions CO_2 Equivalents (Gg)				Emissions (Gg)				
	Net CO_2 (1)(2)	CH_4	N_2O	HFCs	PFCs	SF_6	Other halogenated gases with CO_2 eq conversion factors (3)	Other halogenated gases without CO_2 eq conversion factors (4)	NO_X	CO	NMVOCs	SO_2
3 - Agriculture, Forestry, and Other Land Use	315427.959	1669.820	87.037	NA	NA	NA	NA	NA	0.203	6.296	NE	NO
3.A - Livestock	NA	1327.769	5.278	NA	NA	NA	NA	NA	NA	NA	NE	NA
3.A.1 - Enteric Fermentation	NA	1266.914	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3.A.2 - Manure Management	NA	60.855	5.278	NA	NA	NA	NA	NA	NA	NA	NE	NA
3.B - Land	319970.583	NA	NO	NA	NA	NA	NA	NA	NO	NO	NO	NO
3.B.1 - Forest land	319970.583	NA	NA	NA	NA	NA	NA	NA	NO	NO	NO	NO
3.B.2 - Cropland	NE	NA	NA	NA	NA	NA	NA	NA	NO	NO	NO	NO
3.B.3 - Grassland	NE	NA	NA	NA	NA	NA	NA	NA	NO	NO	NO	NO
3.B.4 - Wetlands	NO	NA	NO	NA	NA	NA	NA	NA	NO	NO	NO	NO
3.B.5 - Settlements	NE	NA	NA	NA	NA	NA	NA	NA	NO	NO	NO	NO
3.B.6 - Other Land	NE	NA	NA	NA	NA	NA	NA	NA	NO	NO	NO	NO
3.C - Aggregate sources and non-CO_2 emissions sources on land	NE	342.051	81.760	NA	NA	NA	NA	NA	0.203	6.296	NA	NA
3.C.1 - Emissions from biomass burning	NA	0.191	0.007	NA	NA	NA	NA	NA	0.203	6.296	NA	NA
3.C.2 - Liming	NO	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3.C.3 - Urea application	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3.C.4 - Direct N_2O Emissions from managed soils	NA	NA	60.714	NA	NA	NA	NA	NA	NA	NA	NA	NA
3.C.5 - Indirect N_2O Emissions from managed soils	NA	NA	19.831	NA	NA	NA	NA	NA	NA	NA	NA	NA
3.C.6 - Indirect N_2O Emissions from manure management	NA	NA	1.208	NA	NA	NA	NA	NA	NA	NA	NA	NA
3.C.7 - Rice cultivations	NA	341.860	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3.C.8 - Other (please specify)	NA	NO	NO	NA	NA	NA	NA	NA	NA	NA	NA	NA
3.D - Other	-4542.625	NO	NO	NA	NA	NA	NA	NA	NO	NO	NO	NO
3.D.1 - Harvested Wood Products	-4542.625	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3.D.2 - Other (please specify)	NO	NO	NO	NA	NA	NA	NA	NA	NO	NO	NO	NO
4 - Waste	115.080	877.715	23.267	NA	NA	NA	NA	NA	23.585	414.079	33.603	0.816
4.A - Solid Waste Disposal	NA	281.940	NO	NA	NA	NA	NA	NA	NO	NO	24.481	NA
4.B - Biological Treatment of Solid Waste	NA	NO	NO	NA	NA	NA	NA	NA	NO	NO	NO	NA
4.C - Incineration and Open Burning of Waste	115.080	48.209	0.634	NA	NA	NA	NA	NA	23.585	414.079	9.123	0.816
4.D - Wastewater Treatment and Discharge	NA	547.565	22.633	NA	NA	NA	NA	NA	NO	NO	5.400E-05	NA

Categories	Emissions (Gg)			Emissions CO_2 Equivalents (Gg)				Emissions (Gg)				
	Net CO_2 (1)(2)	CH_4	N_2O	HFCs	PFCs	SF_6	Other halogenated gases with CO_2 eq conversion factors (3)	Other halogenated gases without CO_2 eq conversion factors (4)	NO_X	CO	NMVOCs	SO_2
4.E - Other (please specify)	NO	NO	NO	NA	NA	NA	NA	NA	NO	NO	NO	NO
5 - Other	NO	NO	NE	NO	NO	NO	NO	NO	NO	NO	NO	NO
5.A - Indirect N_2O emissions from the atmospheric deposition of nitrogen in NO_X and NH_3	NA	NA	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA
5.B - Other (please specify)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Memo Items (5)												
International Bunkers	1246.484	0.015	0.035	NA	NA	NA	NA	NA	6.552	0.576	0.247	0.821
1.A.3.a.i - International Aviation (International Bunkers) (1)	1176.440	0.008	0.033	NA	NA	NA	NA	NA	4.776	0.410	0.187	0.373
1.A.3.d.i - International water-borne navigation (International bunkers) (1)	70.044	0.006	0.002	NA	NA	NA	NA	NA	1.776	0.166	0.061	0.448
1.A.5.c - Multilateral Operations (1)(2)	NE	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO

3 Mitigation actions and their effects

Nigeria has been active in implementing mitigation actions for quite some time to honour its commitments as a signatory Party to the Convention. It implemented numerous Clean Development Mechanism projects under the Kyoto Protocol and national ones using its own resources. This is reflected in the decrease observed in the per capita emissions and GDP emissions index during the period 2000 to 2017 (Figure 3.1).

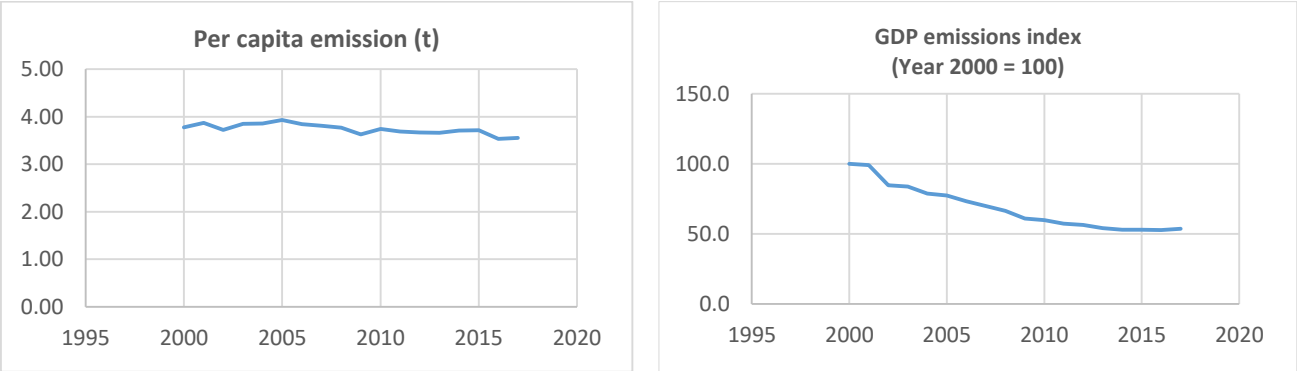

Figure 3.1 - Per capita GHG emissions and GDP emissions index

Nigeria's latest mitigation assessment is available in the TNC (Federal Republic of Nigeria, 2020). The mitigation assessment has been guided by the declared LCD agenda of the country in line with the various sectoral policies and plans developed within the framework of the NCCPRS. Given the urgency to curb maximum emissions as per the PA, Nigeria has privileged the highest emitting sectors, namely AFOLU and Energy, based on the KCA of the GHG inventory of the NC3 (Federal Republic of Nigeria, 2020). These two sectors contributed 94% of national aggregated (CO_2, CH_4 and N_2O) emissions in the year 2016, and in the latest inventory year 2017. In 2017, AFOLU headed the sectors with 389,790 Gg CO_2-eq (57.5%) of total aggregated emissions followed by Energy with 245,918 Gg CO_2-eq (36.3%), Waste 30,857 Gg CO_2-eq (4.5%) and the remaining 11,618 Gg CO_2-eq (1.7%) from IPPU. The mitigation analysis consisted in the evaluation of the emissions reduction potential of deliberate measures in the different socio-economic sectors of the economy.

The measures by socio-economic sector are given in Table 3.1.

Table 3.1 - Mitigation measures identified in Nigeria's TNC.

Economic sector	Measures
Energy (Energy Industries)	• Penetration of Renewable Energy to the electricity Grid
Energy (Oil and Gas production)	• Elimination of flaring of associated gas in the Nigerian oil and gas sectors
Energy (Industry and residential)	• Energy Efficiency Measures • Combined Heat and Power (CHP) Program • Penetration of Rooftop Solar PVs for Off-grid power generation • Cooking fuels switch • Efficient Fuelwood Cookstoves Program
Energy (Transport)	• BRT Transport Program
AFOLU (Land)	• Forest management (Afforestation, reforestation and reduction in wood removals)

The LEAP model was used to simulate and project emissions reductions for the year 2035 for the identified mitigation measures. The cumulative mitigation potential of the twelve measures evaluated in the mitigation assessment is estimated at 170 million tonnes CO_2-eq in the year 2035. The AFOLU (Land) sector is projected to contribute 110 million tonnes and the Energy sector the remaining 60 million tonnes. The mitigation potential of these measures is given in Table 3.2.

Table 3.2 - Mitigation potential of measures under LCD scenario in Nigeria's TNC

Sector and Category	Mitigation potential (Gg CO2 eq)
NATIONAL	**170,016.51**
ENERGY	60,002.18
Fuel Combustion	53,426.80
Energy Industries	45,248.40
Electricity Generation	45,248.40
Manufacturing Industries and Construction	405.30
Transport	4,897.90
Road Transportation	4,897.80
Other Sectors	2,875.20
Commercial/Institutional	-3,196.80
Residential	6,072.00
Fugitive Emissions (Oil & Natural Gas)	6,575.38
AFOLU	110,014.33
Land	110,014.33

More information about national policies, options and actions adopted by the Nigerian government to mitigate climate change are further detailed in tables that follow in this chapter. While fostering a low carbon development, these actions have significant sustainable development effects on Nigeria's economy.

The information on mitigation actions and their effects have been reported, to the extent possible, based on the guidelines for reporting in BURs as outlined in Decision 2/CP.17, Annex III, Section IV. However, due to the inexistence of a systematic archiving system in the country to track mitigation actions and record the outcomes, including a quantitative estimation of emissions avoided, this latter information has not always been provided. This situation resulted also from the fact that the country still lacks activity data and sufficient knowledge to construct baselines for quantifying emissions at different levels, notably at the facility or plant level. These barriers to reporting are presently being addressed but progress is quite slow due to the size of the country, the scope of activities and the lack of resources, including capacity. Nigeria is committed to strengthen existing systems to improve reporting of mitigation actions under the ETF of the PA agreement. In this context, capacity building has started for DCC staff and other concerned stakeholders within the framework of the preparation of this BUR2 with limited resources. It should be highlighted that the capacity building programme has been severely compromised by the COVID-19 pandemic. Nigeria intends to speed up capacity building and the setting up of appropriate systems for tracking mitigation actions for reporting in BTRs under the PA when funds become available under the CBIT project.

The information in this chapter is provided under five classes: Policies (Tables 3.3 to 3.20), Clean Development Mechanism projects (Tables 3.21 to Table 3.32), Programme of Activities supported by Nigerian stakeholders and/or other partners (Tables 3.33 to 3.39), with some of the latter addressing

regional mitigation, Projects under the Short Lived Climate Pollutant (SLCP) Action Plan (Tables 3.40 to 3.47) and Nigerian supported mitigation activities by action or group of actions, (Tables 3.49 to 3.61).

For the year 2019 under review, it is estimated that the CDM projects have resulted in an emissions reduction of the order of 6,967 thousand tonnes, the PoA projects to a reduction of 215 thousand tonnes while emissions avoided by the locally funded projects have not been exhaustively estimated and thus not quantified and presented here.

Policies

Table 3.3 - Policy – National Climate Change Policy Response and Strategy (NCCPRS)

Name of action	National Climate Change Policy Response and Strategy (NCCPRS)
Main objective	• Foster low-carbon high economic growth and build a climate resilient society
Description	• The plan includes concrete targets in specific areas (climate change adaptation, afforestation, and energy supply) to help meet challenges. Implement mitigation to promote low carbon sustainable high economic growth; enhance national capacity to adapt to climate change; Increase public awareness; involve private sector to address CC challenges; Strengthen national institutions and mechanisms for a suitable and functional CC Governance framework
Gases	• CO_2, CH_4, N_2O
Sector/Type	• Policy - Multi-sectoral
Status	• Adopted in 2012
Implementing entity	• Federal Executive Council
Progress indicators	• Comprehensive strategy, as well as a number of specific policies adopted
Steps taken / envisaged	• Comprehensive strategy and several specific policies adopted. • Awareness campaigns and public initiatives • CC mitigation efforts considered in policy plans and initiatives championed by several ministries, departments, and agencies.
Methodologies / Assumptions	• NA
Outcomes achieved	• NCCPRS implemented
Co benefits	• Sustainable development
GHG reductions (Gg)	• NA

Table 3.4 - Policy – The Nigerian National Biofuels Program

Name of action	The Nigerian National Biofuels Program
Main objective	• Production of Low Carbon intensive fuel
Description	• The Bio-fuel program constitutes a major and unique attempt to integrate the agricultural sector of the economy with the downstream petroleum sector though production of Biofuels (Ethanol and Biodiesel) for use as blends with Gasoline (E10) and Diesel (B20) as alternative fuel in the transport sector
Gases	• CO_2, CH_4
Type	• Policy – Energy Road Transportation
Status	• Ongoing

Name of action	The Nigerian National Biofuels Program
Implementing entity	• NNPC
Progress indicators	• New Feasibility studies in progress • Budgetary provision and funding for the projects provided by Federal Government. • Biofuel Policy approved by Federal Executive Council • ETHANOL: 5 bankable feasibility studies + 3 ESIA studies with favourable economics developed
Steps taken / envisaged	• Biofuel Policy approved by Federal Executive Council
Methodologies / Assumptions	• NA
Outcomes achieved	• 8 projects worked out
Co benefits	• A national biofuel program to reduce dependence on imported gasoline. • GHG emissions reduction for climate change mitigation • Promote job creation, rural and agricultural development and technology acquisition and transfer. • Better health through reduction of air pollutants
GHG reductions (Gg)	• To be determined (TBD)

Table 3.5 - Policy – National Energy Policy

Name of action	National Energy Policy
Main objective	• Ensure development of the nation's energy resources, diversify energy options, national energy security and efficient energy delivery with optimal energy mix.
Description	• Guarantee adequate, reliable, and sustainable energy supply at appropriate costs for various sectors of economic development. • Ensure a comprehensive, integrated, and well-informed energy sector plans and programmes for effective development. • Promote R&D in, and adoption of, sustainable low carbon and clean energy technologies to mitigate CC and environmental pollution • Promote efficiency, conservation and carbon management best practices in the energy supply chain • Ensure effective coordination of energy planning, programmes and policy implementation.
Gases	• CO_2
Type	• Policy – Energy Multisectoral
Status	• Under development
Implementing entity	• The Energy Commission of Nigeria
Progress indicators	• Policy drafted
Steps taken / envisaged	• Refer to objectives
Methodologies / Assumptions	• NA
Outcomes achieved	• Draft framework produced
Co benefits	• To promote gender sensitivity and special attention to rural energy needs. • To ensure effective coordination of national energy planning, programmes and policy implementation. • To foster international co-operation in energy trade and projects development
GHG reductions (Gg)	• NA

Table 3.6 - Policy – The Sustainable Energy for All (SE4ALL) Action Agenda

Name of action	The Sustainable Energy for All (SE4ALL) Action Agenda
Main objective	• The key objectives of the SE4ALL initiative globally are to ensure universal access to modern energy services; doubling the global rate of improvement in energy efficiency; and doubling the share of renewable energy in global energy mix by 2030 compared to 2010
Description	• By 2030: 90% of population access electricity; RE contribute about 30% in electricity mix, 20% households use efficient lighting by 2015, 40% by 2020, almost 100% by 2030
Gases	• CO_2
Type	• Policy–Sustainable Energy
Status	• 2012 - 2030
Implementing entity	• Inter-ministerial committee on Renewable energy and energy efficiency (ICREEE) National Council on power
Progress indicators	• Development of SE4ALL Action Agenda Followed by a high-level adoption meeting
Steps taken / envisaged	• In 2030: 90% population access electricity, RE is 30% of electricity mix and 40% households use efficient lighting
Methodologies / Assumptions	• NA
Outcomes achieved	• Agenda produced
Co benefits	• Emissions abated, better standard of living of population, improved health
GHG reductions (Gg)	• NA

Table 3.7 - Policy – National Renewable Energy and Energy Efficiency Policy

Name of action	National Renewable Energy and Energy Efficiency Policy
Main objective	• To strengthen penetration of renewable energy and improve energy efficiency (EE) in the country
Description	• NREEEP seeks to achieve the following: • A renewable electricity target of 16% by 2030 as opposed to the current 1.3% • Overall thrust is to optimize utilization of energy resources for development. • Produce guidelines on all key components of EE by 2020, • Ensure reduction in transmission/ distribution losses from 12-40% to under 10% by 2020, • Enact all relevant legislation for policy implementation by 2020, • Replace 40% (by 2020) and (by 2030) of old and inefficient appliances with energy efficient appliances • Replace all incandescent bulbs with LEDs/other energy saving ones • Reduce energy related GHG emissions by 15% of 2013 levels by 2025
Gases	• CO_2
Type	• Policy – Energy Efficiency
Status	• Approved
Implementing entity	• Federal Ministry of Power and Energy Commission
Progress indicators	• National Renewable Energy Action Plan (NREAP) and National Energy Efficiency Action Plan (NEEAP) formulated

Name of action	National Renewable Energy and Energy Efficiency Policy
	• Steering Committee/ ICREEE Meeting • Inception Meeting with Ministers of Power and Permanent Secretaries • Thematic Working Groups Meetings, • High Level Kick-Off of the AP and AA, • Stakeholder Meeting/ Validation Workshop, Development of Baseline Report, • Draft Baseline Report, NREAP, and NEEAP to ECREEE – 2014 • Backstopping Expert Review and Development of SE4ALL Action Agenda, Stakeholder Consultation Meeting • ICREEE adopted the NREAP, NEEAP & SE4ALL AA – 2015 • High Level Adoption/Validation 2016
Steps taken / envisaged	• Kick-off Meeting
Methodologies / Assumptions	• NA
Outcomes achieved	• Policy approved
Co benefits	• Security of energy supply • Cost competitiveness and environmental protection • Increase investment in the Renewable energy sub-sector • Improved standard of living and health benefits
GHG reductions (Gg)	• NA

Table 3.8 - Policy – The Renewable Energy Master Plan (REMP)

Name of action	The Renewable Energy Master Plan (REMP)
Main objective	• REMP aims to articulate a roadmap for the accelerated development and exploitation of renewable energy.
Description	• REMP seeks to increase the supply of RE from 13% of total electricity generation in 2015 to 23% in 2025 and 36% by 2030
Gases	• CO_2, CH_4
Type	• Policy – Renewable Energy
Status	• 2012 - yet to be approved
Implementing entity	• Energy Commission of Nigeria
Progress indicators	• Target set for power generation using biomass, solar, hydropower, and wind.
Steps taken / envisaged	• Increase RE electricity production from 13% in 2015 to 36% in 2030
Methodologies / Assumptions	• IPCC 2006 guidelines to estimate emissions avoided. - Develop new generation plants using RE instead of natural gas - 45 % generation efficiency for natural gas • - 95% generation efficiency and 70% availability of hydro.
Outcomes achieved	• Roadmap under approval process
Co benefits	• Stimulate economic growth and employment, Raise standard of living in rural areas, Prevent environment degradation, Reduce health risks of vulnerable groups
GHG reductions (Gg)	• 11,492 Gg CO_2-eq in 2030

Table 3.9 - Policy – Large Scale Hydro Power Project

Name of action	Large Scale Hydro Power Project
Main objective	• Enhance hydropower development through the construction and rehabilitation of dams for electricity generation
Description	1 - Zungeru project-700MW 2 - Mambilla Project-3,050MW 3 - Gurara II Project-360MW 4 - Gurara I Project-30MW 5 - Itisi Project - 40MW 6 - Kashimbilla Project-40MW 7 - Rehabilitate 33 dams, 27 small earth dams and 19 others with a total capacity of 3,557 MW
Gases	• CO_2
Type	• Energy – Renewable Energy
Status	• Ongoing
Implementing entity	• Federal Ministry of Power
Progress indicators	• 7 dams with a capacity of 2,269 million m^3 completed
Steps taken / envisaged	• 6 hydropower stations to be commissioned, • 7 dams rehabilitated or commissioned for a hydropower generation
Methodologies Assumptions	• IPCC 2006 guidelines to estimate emissions avoided. - Develop new generation plants using RE instead of natural gas - 45 % generation efficiency for natural gas • - 95% generation efficiency and 70% availability of hydro.
Outcomes achieved	• Sites identified and potential estimated
Co benefits	• Better standard of living of population, better health through improved environmental quality, job creation
GHG reductions (Gg)	• Projects 1-6: 12,237 Gg CO2 -eq/yr • Project 7: TBD

Table 3.10 - Policy – Production and use of biofuel

Name of action	Production and use of biofuel
Main objective	• Biofuel Production
Description	• Development of 11 biofuel production complexes in Ekiti state
Gases	• CO_2, CH_4, N_2O
Type	• Energy – Road transportation
Status	• Planned
Implementing entity	• Ministry of Environment and Global Biofuels Ltd
Progress indicators	• One site identified in Ekiti state and plans to establish same at Ondo, Kwara, Osun, Oyo, Kogi, Kaduna, Kano, Zamfara, Benue Plateau, Nasarawa
Steps taken / envisaged	• 11 biofuel plants to be developed
Methodologies / Assumptions	• NA
Outcomes achieved	• One site identified and potential remaining ones planned
Co-benefits	• Emissions reduction, job creation, better air quality
GHG reductions (Gg)	• NA

Table 3.11 - Policy – Production and use of Renewable Energy

Name of action	Production and use of Renewable Energy
Main objective	• Production of sugar for local use and export, ethanol and ultimately electricity
Description	• Develop sugarcane-based biofuel plants in Girei and Demsa
Gases	• CO_2, CH_4, N_2O
Type	• Energy – Road transportation and electricity production
Status	• Planned
Implementing entity	• RE Program Office, Adamawa State Government and Green Carbon Africa
Progress indicators	• 2 sites identified and 10 planned
Steps taken / envisaged	• This integrated project is replicated in ten other states of the country
Methodologies / Assumptions	• NA
Outcomes achieved	• 12 ethanol and sugar production plants to be developed
Co benefits	• Economic, job creation, better air quality
GHG reductions (Gg)	• NA

Table 3.12 - Policy – Production and use of Renewable Energy

Name of action	Production and use of Renewable Energy
Main objective	• Establish an integrated Rice Processing and Power Generating Facility
Description	• Large-scale rice production and self-generated power from rice-husk
Gases	• CO_2, CH_4, N_2O
Type	• Energy – Electricity production
Status	• Planned
Implementing entity	• RE Program Office, Carbon Quest and Adamawa State
Progress indicators	• Project development under way
Steps taken / envisaged	• Establish an integrated rice processing and power plant
Methodologies / Assumptions	• NA
Outcomes achieved	• State identified for project
Co benefits	• Economic, food security
GHG reductions (Gg)	• NA

Table 3.13 - Policy – Adopt clean cook stoves

Name of action	Adopt clean cook stoves
Main objective	• Reduce emissions via increased combustion efficiency of firewood using clean cook stoves
Description	• Through the Alliance for Clean Stoves, sensitization to change the mind-set of the average Nigerian to promote adoption of clean cook stoves
Gases	• CO_2, CH_4, N_2O
Type	• Energy Efficiency (Residential)
Status	• Ongoing
Implementing entity	• FME, Federal Ministry of Women Affairs and International Centre for Energy Environment and Development (ICEED)
Progress indicators	• Awareness campaign started

Name of action	Adopt clean cook stoves
Steps taken / envisaged	• Distribute 30 million clean and energy efficient cook stoves in 5 years
Methodologies / Assumptions	• IPCC 2006 guidelines to estimate emissions avoided. • - Improve efficiency from 15 to 30%
Outcomes achieved	• Sensitization partly done
Co benefits	• Improve health, cleaner environment, prevent deforestation and degradation
GHG reductions (Gg)	• 90,054 Gg CO_2-eq/yr as from 2025 when 30 million stoves distributed

Table 3.14 - Policy – Production and use of Renewable Energy

Name of action	Production and use of renewable energy
Main objective	• Provide energy from renewable sources to new housing schemes
Description	• Incorporate micro generation of electricity, mainly solar and Bioenergy in housing schemes
Gases	• CO_2, CH_4, N_2O
Type	• Energy (Residential)
Status	• Ongoing
Implementing entity	• FME and Aso Savings & Loans Plc
Progress indicators	• One project launched
Steps taken / envisaged	• First project launched in Kaduna with the prospect of containing 2000 Housing Units; other states to roll out similar housing schemes
Methodologies / Assumptions	• NA
Outcomes achieved	• One project launched
Co benefits	• Economic, cleaner environment, improve health
GHG reductions (Gg)	• NA

Table 3.15 - Policy – Adoption of renewable energy

Name of action	Adoption of renewable energy
Main objective	• Adoption of clean cook stoves and solar lighting systems
Description	• Widespread deployment of clean cook stoves and solar lighting systems
Gases	• CO_2, CH_4, N_2O
Type	• Energy (Residential)
Status	• Ongoing
Implementing entity	• MDGs and Federal Government of Nigeria's Transformation Agenda
Progress indicators	• More than 1.3 million women registered with Rural Women Energy Security (RUWES) provided with small off-grid lighting systems
Steps taken / envisaged	• Small off-grid lighting systems using light emitting diodes (LEDs) supplied
Methodologies / Assumptions	• NA
Outcomes achieved	• More than 1.3 million women supplied with systems
Co benefits	• Empowerment of rural women, improved health, better air quality
GHG reductions (Gg)	• NA

Table 3.16 - Policy – Adoption of renewable energy

Name of action	Adoption of renewable energy
Main objective	• Production of solar lighting systems in Nigeria through NAIJA LIGHT Solar Electrification Programme
Description	• Federal Ministry of environment has patented products under the RE Access Program (REAP) in partnership with the Indian Government
Gases	• CO_2
Type	• Energy
Status	• Ongoing
Implementing entity	• Federal Ministry of environment
Progress indicators	• RE products patented
Steps taken / envisaged	• Products patented and production to follow
Methodologies / Assumptions	• NA
Outcomes achieved	• Partnership developed with Indian government for producing patented products
Co benefits	• Economic, job creation, technology transfer
GHG reductions (Gg)	• NA

Table 3.17 - Policy – Nigeria Feed-in Tariff for Renewable Energy Sourced Electricity

Name of action	Nigeria Feed-in Tariff for Renewable Energy Sourced Electricity
Main objective	• Development and implementation of an optimal economic instrument to promote production of electricity from renewable energy sources.
Description	• Feed-in tariff for hydro schemes not exceeding 30MW, all biomass cogeneration power plants, solar and wind-based power plants, irrespective of their sizes.
Gases	• CO_2, CH_4, N_2O
Type	• Regulatory – Renewable Energy
Status	• Development of feed-in tariff ongoing
Implementing entity	• Nigerian Electricity Regulatory Commission
Progress indicators	• Electricity distribution companies (Discos) to source at least 50% of their total procurement from renewables and 50% from the Nigerian Bulk Electricity Trading Company
Steps taken / envisaged	• By 2020, a total of 2,000 MW generated through biomass, small hydro, wind and solar
Methodologies / Assumptions	• NA
Outcomes achieved	• 14 PPAs initiated for about 1,125 MW to the grid
Co benefits	• Economic, better air quality, improve health
GHG reductions (Gg)	• NA

Table 3.18 - UN-REDD Programme

Name of action	UN-REDD Programme
Main objective	• Reduce emissions from deforestation and forest degradation, and foster conservation, sustainable management of forests, and enhancement of forest carbon stocks

Name of action	UN-REDD Programme
Description	• The Nigeria REDD+ Readiness Program foresees a twin-track approach: (i) the development of institutional and technical capacities at Federal level, and (ii) carrying out intense institutional, strategy-building and demonstration activities in Cross River State.
Gases	• CO_2
Type	• AFOLU - REDD+
Status	• Ongoing
Implementing entity	• Forestry department (FME) & Cross River State
Progress indicators	• Two additional states (Nasarawa and Ondo States) have joined the REDD+ programme since its inception in 2009
Steps taken / envisaged	• Develop a National Strategy to reduce deforestation • Create a safeguard information system to help forest communities • Produce a draft "road map" for development of the National Strategy/Action Plan • Create a National Forest Monitoring System to track changes by MRV. Enhance capacity of relevant stakeholders at both federal and state levels
Methodologies / Assumptions	• NA
Outcomes achieved	• Training on Forest monitoring and MRV • Forest Carbon Inventory • Image processing and interpretation of satellite imagery; and • GHG Inventory for LULUCF
Co benefits	• Protection of forest ecosystems, improved livelihood of forest communities, improve forest ecosystems services
GHG reductions (Gg)	• NA

Table 3.19 - Federal Ministry of Environment: Solid Waste Program Interventions

Name of action	Federal Ministry of Environment: Solid Waste Program Interventions
Main objective	• Implement integrated solid waste management including medical waste, promote recycling and Construction of Integrated Waste Management Facilities in 11 states • Establishment of several Recycling interventions • Solid and Medical Waste Disposal intervention across the country
Description	• Construction of Integrated Waste Disposal & Management Facility in 13 states • Establish Scrap Metal Recovery Plant; Other Waste Recycling Facility • Multi-Purpose Plastic Recycling Plant; Pure Water Sachet Recycling Plant • Procurement and installation of: Community Based Solid Waste Management Scheme; Hospital waste intervention schemes; Bio-Medical Waste Incinerators; Waste Disposal Trucks
Gases	• CO_2, CH_4, N_2O
Type	• Waste – Solid waste management
Status	• Ongoing – 11 states out of 13 identified
Implementing entity	• FMENV in conjunction with municipalities and individual States
Progress indicators	• Projects for other states in the pipeline • Recycling activities promoted in informal sector, formal sector is increasingly becoming interested

Name of action	Federal Ministry of Environment: Solid Waste Program Interventions
	• Draft National Policy on Solid Waste Management
Steps taken / envisaged	• Project partly implemented • Recycling activities identified • Activities identified
Methodologies / Assumptions	• NA
Outcomes achieved	• Some facilities commissioned • Implementation under way • Action plan drafted
Co benefits	• Health benefits resulting from better air quality associated with Integrated Waste Management
GHG reductions (Gg)	• NA

Table 3.20 - Projects under the Lagos Waste Management Authority (LAWMA)

Name of action	Projects under the Lagos Waste Management Authority (LAWMA)
Main objective	• Integrated Waste Management
Description	• Ensure the achievement of effective and efficient management of solid waste services delivered to the population of Lagos.
Gases	• CO_2, CH_4, N_2O
Type	• Waste – Solid Waste Management
Status	• Partly implemented
Implementing entity	• LAWMA
Progress indicators	• 9 landfills completed; 4 being commissioned; and 4 planned
Steps taken / envisaged	1. Rehabilitation of infrastructure in landfill Olusosun 2. Rehabilitation and provision of infrastructure at EGBA Solous Abule 3. Supply and installation of Pollution Control Team - Olushosun Landfill Simpson 4. Renovation and improvement of waste Load Transfer Station 5. Stabilization Ewu-LP landfill road 6. Supply of 3 Tana Landfill Compactors 7. Environmental and social impact assessment of all solid waste landfills and 2 TLS (Olushosun, Abule Egba and Solous)
Methodologies / Assumptions	• NA
Outcomes achieved	• 9 landfills completed projects
Co benefits	• Improved health of population, cleaner environment
GHG reductions (Gg)	• NA

The following mitigation actions have been implemented under the Kyoto Protocol CDM financial mechanism. Details are available on the CDM website.

Clean Development Mechanism projects

Table 3.21 - CDM – Recovery of associated gas that would otherwise be flared at Kwale oil-gas processing plant, Nigeria

Name of action	Recovery of associated gas that would otherwise be flared at Kwale oil-gas processing plant, Nigeria
Main objective	• The capture and utilization of majority of associated gas previously sent to flaring at the Kwali Plant (Kwali OGPP).
Description	• CDM, project, Energy (Oil and Gas)
Gases	• CO_2
Type	• Energy – Reduce flaring
Status	• Ongoing, Registered 9 Nov 2006 ending 2015
Implementing entity	• Eni Nigeria Agip Oil Company
Progress indicators	• Project successful
Steps taken / envisaged	• Project completed and extended
Methodologies / Assumptions	• AM0009 ver.2
Outcomes achieved	• Recovered gas leading to emission reduction
Co benefits	• Emissions reduction, better air quality
GHG reductions (Gg)	• 1497

Table 3.22 - CDM – Pan Ocean Gas Utilization Project

Name of action	Pan Ocean Gas Utilization Project
Main objective	• To eliminate gas flaring at the Ovade - Ogharefe and the Obi - Anyima oil fields operated by Pan Ocean oil corporation in a joint venture partnership with NNPC
Description	• CDM, project, Energy (Oil and Gas)
Gases	• CO_2
Type	• Energy – Reduce flaring
Status	• Ongoing, Registered 01 Feb 2009 ending 2020
Implementing entity	• NNPC & Pan Ocean Corporation (Nigeria)
Progress indicators	• Project successful
Steps taken / envisaged	• Project to continue
Methodologies / Assumptions	• AM0009 ver.2
Outcomes achieved	• GHG emission avoided
Co benefits	• Emissions reduction, better air quality
GHG reductions (Gg)	• 2627

Table 3.23 - CDM – Efficient Fuel Wood Stoves for Nigeria

Name of action	Efficient Fuel Wood Stoves for Nigeria
Main objective	• To disseminate up to 12,500 efficient fuel wood stoves (SAVE80) and heat retaining polypropylene boxes in different states located in the Guinea Savannah Zone of Nigeria.
Description	• CDM, project, Energy (EE)
Gases	• CO_2

Name of action	Efficient Fuel Wood Stoves for Nigeria
Type	• Energy – Energy efficiency in residential sector
Status	• Ongoing, Registered 12 Oct 2009 ending 2019
Implementing entity	• Nigeria Developmental Association for Renewable Energies (DARE), the German NGO Lernen-Helfen-Leben e.V and the German carbon offset organization Atmosfair GMBh
Progress indicators	• Project successful
Steps taken / envisaged	• Project to continue
Methodologies / Assumptions	• AMS-II.G.
Outcomes achieved	• GHG emission avoided
Co benefits	• Emissions reduction, better air quality, forest preservation
GHG reductions (Gg)	• 31

Table 3.24 - CDM – Recovery and marketing of gas that would otherwise be flared at the Asuokpu / Umutu Marginal Field, Nigeria

Name of action	Recovery and marketing of gas that would otherwise be flared at the Asuokpu / Umutu Marginal Field, Nigeria
Main objective	• Recovered gas that is currently and, in the future, would be flared at the Asuokpu / Umutu Marginal Field in Block OML 38 in Nigeria to deliver it to the domestic market for productive use as an energy product.
Description	• CDM, project, Energy (Oil and Gas)
Gases	• CO_2, CH_4
Type	• Energy – Reduce flaring
Status	• Ongoing, Registered 16 Oct 2010 ending 01 May 2021
Implementing entity	• Platform Petroleum Ltd and Newcross Petroleum Ltd and Carbon Limits AS
Progress indicators	• Project successful
Steps taken / envisaged	• Project to continue
Methodologies / Assumptions	• AM0009 ver.4
Outcomes achieved	• GHG emission avoided
Co benefits	• Emissions reduction, better air quality
GHG reductions (Gg)	• 257

Table 3.25 - CDM – Municipal Solid Waste (MSW) Composting Project in Ikorodu, Lagos State

Name of action	Municipal Solid Waste (MSW) Composting Project in Ikorodu, Lagos State
Main objective	• Provision of Environment Friendly waste disposal option and produce high quality compost for use in Nigeria Farms.
Description	• CDM, project, Waste
Gases	• CO_2, CH_4, N_2O
Type	• Waste – Solid waste management
Status	• Ongoing, Registered 15 Dec 2010 ending 2017
Implementing entity	• EarthCare Nig Ltd; International Bank for Reconstruction and Development as the trustee for the Carbon Fund for Europe (CFE); Ministry of Sustainable Development and Infrastructure; Department of the Environment, Community and Local Government; Viaamse Gewest; Statkraft Carbon Invest AS

Name of action	Municipal Solid Waste (MSW) Composting Project in Ikorodu, Lagos State
Progress indicators	• Project successful
Steps taken / envisaged	• Project to continue
Methodologies / Assumptions	• AM0025 ver.11
Outcomes achieved	• GHG emission avoided
Co benefits	• Emissions reduction, better environment
GHG reductions (Gg)	• 282

Table 3.26 - CDM – LFG project in Nigeria

Name of action	LFG project in Nigeria
Main objective	• To build, operate and maintain a landfill gas collection and flaring system on three landfills in Lagos, Nigeria at Abule Egba, Solous & Olushosun.
Description	• CDM, project, Waste (waste handling and disposal)
Gases	• CH_4
Type	• Waste – Solid waste management
Status	• Ongoing, Registered 12 Jul 2012 ending 2023
Implementing entity	• Lagos Waste Management Authority; & Ably Carbon
Progress indicators	• Project successful
Steps taken / envisaged	• Project to continue
Methodologies / Assumptions	• ACM0001 ver.12
Outcomes achieved	• GHG emission avoided
Co benefits	• Emissions reduction, better environment
GHG reductions (Gg)	• 130

Table 3.27 - CDM – Afam Combined Cycle Gas Turbine Power Project

Name of action	Afam Combined Cycle Gas Turbine Power Project
Main objective	• To produce a 650MW grid - connected combined - cycle gas turbine CCGT fuelled by natural gas.
Description	• CDM, project, Energy (renewable sources
Gases	• CO_2
Type	• Energy – Energy efficiency in electricity generation
Status	• Ongoing, Registered 29 Oct 2012 ending 2022
Implementing entity	• Shell Petroleum Development Corporation (SPDC)
Progress indicators	• Project successful
Steps taken / envisaged	• Project to continue
Methodologies / Assumptions	• AM0029 ver.3
Outcomes achieved	• GHG emission avoided
Co benefits	• Economic, better air quality, Technology transfer
GHG reductions (Gg)	• 550

Table 3.28 - CDM - Lafarge WAPCO Partial Substitution of Alternative Fuels in Cement Facilities Project in Nigeria

Name of action	Lafarge WAPCO Partial Substitution of Alternative Fuels in Cement Facilities Project in Nigeria
Main objective	• To partially replace fossil fuel used in pyro processing with lower carbon alternative fuels, primarily biomass residue, thus resulting in measurable reductions of GHG emissions in Nigeria.
Description	• CDM, project, Energy (Manufacturing Industries)
Gases	• CO_2
Type	• Energy – Manufacturing industries
Status	• Ongoing, Registered 18 Dec 2012 ending 2022
Implementing entity	• Lafarge Cement WAPCO Nig Ltd; Carbon Limits Nig. Ltd; & Lafarge S.A.
Progress indicators	• Project successful
Steps taken / envisaged	• Project to continue
Methodologies / Assumptions	• ACM0003 ver.7
Outcomes achieved	• GHG emission avoided
Co benefits	• Better air quality
GHG reductions (Gg)	• 167

Table 3.29 - CDM – Recovery and Utilization of Associated Gas from the Obodugwa and neighbouring oil fields in Nigeria

Name of action	Recovery and Utilization of Associated Gas from the Obodugwa and neighbouring oil fields in Nigeria
Main objective	• To implement the infrastructure to allow for the utilization of the associated gas that is currently flared from two oil fields in OML56 In Delta State Nigeria thereby reducing the flaring of associated gas and thus emission of CO2 into the atmosphere.
Description	• CDM, project, Energy (Oil and Gas)
Gases	• CO_2
Type	• Energy – Reduce flaring
Status	• Ongoing, Registered 24 Dec 2012 ending 2024
Implementing entity	• Xenergi Oilfield Services Limited; Midwestern Oil & Gas Company Plc; & Carbon Limits Nigeria Limited
Progress indicators	• Project successful
Steps taken / envisaged	• Project to continue
Methodologies / Assumptions	• ACM0009. ver 5
Outcomes achieved	• GHG emission avoided
Co benefits	• Improve air quality, health
GHG reductions (Gg)	• 288

Table 3.30 - CDM - Kainji Hydropower Rehabilitation Project, Nigeria

Name of action	Kainji Hydropower Rehabilitation Project, Nigeria
Main objective	• Rehabilitation of Kainji Unit 5,6 & 12 to provide additional power supplies to the grid and also to ensure that the incremental power is generated from renewable sources.
Description	• CDM, project, Energy industries (renewable)

Name of action	Kainji Hydropower Rehabilitation Project, Nigeria
Gases	• CO_2, CH_4, N_2O
Type	• Energy – Renewable energy
Status	• Ongoing, Registered 28 Dec 2012 ending 2024
Implementing entity	• PHCN; International Bank for Reconstruction and Development; & Swedish Energy Agency
Progress indicators	• Project successful
Steps taken / envisaged	• Project to continue
Methodologies / Assumptions	• ACM0002 ver.12
Outcomes achieved	• Emission Reduction and improved power generation
Co benefits	• Economic, better air quality, improve livelihood
GHG reductions (Gg)	• 873

Table 3.31 - CDM – OML58 IPP Gas Fired Generation Project

Name of action	OML58 IPP Gas Fired Generation Project
Main objective	• The construction of a combined cycle, gas powered independent power plant in the Niger Delta region in Nigeria to provide sustainable electricity to the Nigerian national grid on an on -going, reliable basis.
Description	• CDM, project, Energy industries (energy generation)
Gases	• CO_2, CH_4, N_2O
Type	• Energy – Electricity generation
Status	• Ongoing, Registered 16 Dec 2014 ending 2025
Implementing entity	• Nigeria National Petroleum Corporation NNPC; & Total E & P Nigeria Ltd
Progress indicators	• Project successful
Steps taken / envisaged	• Project to continue
Methodologies / Assumptions	• AM0029. ver.3
Outcomes achieved	• Emission Reduction
Co benefits	• Improve livelihood, technology transfer
GHG reductions (Gg)	• 265

Table 3.32 - CDM – Ofon-2 Upstream Emission Reduction project

Name of action	Ofon -2 Upstream Emission Reduction project
Main objective	• Recovery and Utilization of Associated Gas from the Ofon 2 oil fields in Nigeria
Description	• Gas flare capture and utilization project, Energy (Oil and Gas)
Gases	• CO_2
Type	• Energy – Reduce flaring
Status	• Ongoing
Implementing entity	• NNPC / Total Exploration and Production Nigeria (TEPNG)
Progress indicators	• Complete
Steps taken / envisaged	• Captured Gas flare and send gas to NLNG
Methodologies / Assumptions	• AM0009 version 7
Outcomes achieved	• GHG emission reduction

Name of action	Ofon -2 Upstream Emission Reduction project
Co benefits	• Economic (Deliver 1 million SCM/day of gas to NLNG), improve health, better air quality
GHG reductions (Gg)	• 379. 224 Gg /yr

Programme of activities supported by Nigerian stakeholders and/or other partners

The following mitigation actions are implemented under the Programme of Activities.

Table 3.33 - PoA – Cable Propelled Mass Transit Projects in Nigeria

Name of action	Cable Propelled Mass Transit Projects in Nigeria
Main objective	• To reduce carbon emissions relative to road transport in heavily trafficked urban areas in Nigeria by the introduction of innovative cable propelled mass transit that reduces CO2 emissions per passenger
Description	• Energy (Transport), Nigeria
Gases	• CO_2, CH_4, N_2O
Type	• Energy – Transport
Status	• Ongoing, registered 18 Mar 2016 ending 2041
Implementing entity	• Ropeways Transport Ltd Nigeria
Progress indicators	• Project successful
Steps taken / envisaged	• Project to continue
Methodologies / Assumptions	• AMS-III.U.
Outcomes achieved	• Emission Reduction
Co benefits	• Improved air quality, Health benefits
GHG reductions (Gg)	• 24

Table 3.34 - PoA – Distribution of Improved Cook Stoves in Sub-Saharan Africa

Name of action	Distribution of Improved Cook Stoves in Sub-Saharan Africa
Main objective	• The promotion and distribution/installation of fuel - efficient cook stoves in different countries in Africa.
Description	• Energy (EE) Senegal, Ghana, Nigeria
Gases	• CO_2
Type	• Energy – Energy efficiency in residential sector
Status	• Ongoing, registered 25 Apr 2013 ending 2040
Implementing entity	• C - Quest Capital Malaysia Global Stoves Limited
Progress indicators	• Project successful
Steps taken / envisaged	• Project to continue
Methodologies / Assumptions	• AMS-II.G. ver.4
Outcomes achieved	• Emission Reduction
Co benefits	• Improved air quality, Health benefits
GHG reductions (Gg)	• 39

Table 3.35 - PoA – EE of Nigeria's Residential Lighting Stock by distributing up to 40 million Compact Fluorescent Lamps (CFLs) to households

Name of action	EE of Nigeria's Residential Lighting Stock by distributing up to 40 million Compact Fluorescent Lamps (CFLs) to households
Main objective	• To replace incandescent bulbs with quality long life compact fluorescent lamps used in most grid connected residential households in Nigeria.
Description	• Energy (EE), Nigeria
Gases	• CO_2
Type	• Energy efficiency - Residential
Status	• Ongoing, registered 31 Dec 2012 ending 2041
Implementing entity	• ICIMI Ltd
Progress indicators	• Project successful
Steps taken / envisaged	• Project to continue
Methodologies / Assumptions	• AMS-II.J ver.4
Outcomes achieved	• Emission reduction, energy efficiency
Co benefits	• Improved air quality, Health benefits
GHG reductions (Gg)	• 29

Table 3.36 - PoA – African Improved Cooking Stoves PoA

Name of action	African Improved Cooking Stoves PoA
Main objective	• The dissemination of improved cooking stoves in the Federal Republic of Nigeria.
Description	• Energy (EE), Ghana, Nigeria, Liberia
Gases	• CO_2
Type	• Energy – Energy efficiency in residential sector
Status	• Ongoing, registered 06 Dec 2012 ending 2039
Implementing entity	• NA
Progress indicators	• Project successful
Steps taken / envisaged	• Project to continue
Methodologies / Assumptions	• AMS-II.G. ver. 3
Outcomes achieved	• Emission Reduction
Co benefits	• Improved air quality, Health benefits
GHG reductions (Gg)	• 15

Table 3.37 - PoA – Reduction of emission from non-renewable fuel from cooking at household level

Name of action	Reduction of emission from non-renewable fuel from cooking at household level
Main objective	• Replace non-renewable fuel with renewable fuel for household cooking that voluntarily want to take part in the CPA project through the lease or buying of an ethanol or biogas stove, household water purifying kit or buying water from community-based water purification systems
Description	• Energy (EE), Nigeria and 18 other African countries
Gases	• CO_2, CH_4, N_2O
Type	• Energy - Residential

Name of action	Reduction of emission from non-renewable fuel from cooking at household level
Status	• Ongoing, registered 30 Nov 2012 ending 2040
Implementing entity	• Green Development AS
Progress indicators	• Project successful
Steps taken / envisaged	• Project to continue
Methodologies / Assumptions	• AMS-I.E. ver.4
Outcomes achieved	• Emission Reduction
Co benefits	• Improved air quality, Health benefits
GHG reductions (Gg)	• 51

Table 3.38 - PoA – Distribution of fuel-efficient improved cooking stoves

Name of action	Distribution of fuel-efficient improved cooking stoves
Main objective	• To promote, distribute and sell fuel - efficient improved cooking stoves in Nigeria.
Description	• Energy (EE), Nigeria
Gases	• CO_2
Type	• Energy – Energy efficiency in residential sector
Status	• Ongoing, registered 07 Nov 2012 ending 2040
Implementing entity	• C - Quest Capital LLC
Progress indicators	• Project successful
Steps taken / envisaged	• Project to continue
Methodologies / Assumptions	• AMS-II.G. ver.3
Outcomes achieved	• Emission Reduction
Co benefits	• Improved air quality, Health benefits
GHG reductions (Gg)	• 47

Table 3.39 - PoA – Improved Cooking Stoves for Nigeria PoA

Name of action	Improved Cooking Stoves for Nigeria PoA
Main objective	• To enhance the penetration of efficient cooking stoves by offering cost effective efficient stoves.
Description	• Energy (EE), Nigeria
Gases	• CO_2
Type	• Energy – Energy efficiency in residential sector
Status	• Ongoing, registered 10 Nov 2011 ending 2039
Implementing entity	• Atmosfair GmbH
Progress indicators	• Project successful
Steps taken / envisaged	• Project to continue
Methodologies / Assumptions	• AMS-II.G. ver.3
Outcomes achieved	• Emission Reduction

Name of action	Improved Cooking Stoves for Nigeria PoA
Co benefits	• Improved air quality, Health benefits
GHG reductions (Gg)	• 9

Projects under the Short-Lived Climate Pollutant (SLCP) Action Plan

Nigeria joined the Climate and Clean Air Coalition (CCAC) in 2012. Being a member of the coalition, the country embarked on a program for reducing climate pollutants commonly known as Short Lived Climate Pollutants (SLCP). Nigeria identified 8 groups of actions to make up for a total of 22 measures having dual benefits as the implementation of these measures will also result in the reduction of GHG emissions. The National Action Plan for the SLCP was approved by the council of ministers in 2019. Various ministries are presently incorporating the different actions in their program of activities with funding to be provided partly within the national budget and completed with support from the international community. The coordination and implementation of the plan rests with the DCC. The actions under the SLCP programme are:

Table 3.40 - SLCP – National SLCP Plan - Transport

Name of action	National SLCP Plan
Main objective	• Reduction of SLCPs
Description of group of actions	• 1. Renewal of urban bus fleet in Lagos 2. Adoption of CNG Buses in Nigeria 3. Introduction of low sulphur Diesel and Petrol 4. Elimination of high emitting vehicles that do not meet vehicle emission standards 5. Reduction of vehicles journeys by car through transport model shifts
Gases	• CO_2, CH_4, N_2O
Type	• Energy - Transport
Status	• Under implementation
Implementing entity	• Federal Ministry of Transportation, Lagos State Ministry of Transport
Progress indicators	• 5000 new buses in Lagos complete, 50 ppm diesel fuel introduced in 2019
Steps taken / envisaged	• All Danfo buses fully replaced by 2021, 25% all other buses converted to CNG by 2030, 150 ppm petrol introduced in 2021, Euro IV limits met by all vehicles by 2030 and 500,000 daily journeys shifted from road to rail & waterways
Methodologies / Assumptions	• LEAP-IBC
Outcomes achieved	• Inclusion into national budget, International funding
Co benefits	• Better air quality, improve health, better livelihood
GHG reductions (Gg)	• Total reduction for all groups of actions under SLCP program provided in Table 3.48

Table 3.41 - National SLCP programme for the Residential sector

Name of action	National SLCP Plan
Main objective	• Reduction of SLCPs
Description of group of actions	• 1. Increase in population using modern fuels for cooking (LPG, electricity, kerosene, biogas, solar cookers; 2. Replacement of traditional biomass cookstoves with more efficient improved biomass stoves 3. Elimination of Kerosene lamp

Name of action	National SLCP Plan
Gases	• CO_2, CH_4, N_2O, NMVOC
Type	• Energy - Residential
Status	• Under implementation
Implementing entity	• Federal Ministry of Environment
Progress indicators	• Number of HH using modern fuels, number of traditional cook stoves replaced, number of kerosene lamps eliminated
Steps taken / envisaged	• 80% of H/H using modern fuels for cooking in 2030, 20% H/H using improved biomass stoves for cooking in 2030 and All Kerosene lighting replaced by solar lamps by 2022.
Methodologies / Assumptions	• LEAP-IBC
Outcomes achieved	• Inclusion into national budget, International funding
Co benefits	• Better air quality, improve health, better livelihood
GHG reductions (Gg)	• Total reduction for all groups of actions under SLCP program provided in Table 3.48

Table 3.42 - SLCP – National SLCP Plan – Oil and Gas

Name of action	National SLCP Plan
Main objective	• Reduction of SLCPs
Description of group of actions	• 1. Elimination of gas flaring 2. Fugitive emissions/leakages Control 3. Methane Leakage Reduction
Gases	• CH_4
Type	• Energy - Oil and Gas
Status	• Implementation
Implementing entity	• NNPC, DPR, Ministry of Petroleum Resources
Progress indicators	• Volume of gas not flared, Amount of methane emissions avoided
Steps taken / envisaged	• 100% of gas flaring eliminated by 2020, 50% Methane Reduction in fugitive emissions/leakages control by 2030 and 50% Methane leakages reduction by 2030
Methodologies / Assumptions	• LEAP-IBC
Outcomes achieved	• Inclusion into national budget, International funding
Co benefits	• Better air quality, improve health, better livelihood
GHG reductions (Gg)	• Total reduction for all groups of actions under SLCP program provided in Table 3.48

Table 3.43 - SLCP – National SLCP Plan – Manufacturing industries

Name of action	National SLCP Plan
Main objective	• Reduction of SLCPs
Description of group of actions	• Improved Energy Efficiency in industrial Sector
Gases	• CO_2, CH_4, N_2O
Type	• Energy – Manufacturing industries
Status	• Under implementation
Implementing entity	• Ministry of Industry
Progress indicators	• Rate of improvement in energy efficiency

Name of action	National SLCP Plan
Steps taken / envisaged	• 50% improvement in energy efficiency by 2050
Methodologies / Assumptions	• LEAP-IBC
Outcomes achieved	• Inclusion into national budget, International funding
Co benefits	• Better air quality, improve health, better livelihood
GHG reductions (Gg)	• Total reduction for all groups of actions under SLCP program provided in Table 3.48

Table 3.44 - SLCP – National SLCP Plan – Electricity and renewable energy

Name of action	National SLCP Plan
Main objective	• Reduction of SLCPs
Description of group of actions	• 1. Expansion of National Electricity Coverage 2. Increase share of electricity generated in Nigeria from renewables
Gases	• CO2, CH4, N2O
Type	• Energy - Electricity and RE
Status	• Under implementation
Implementing entity	• Federal Ministry of Power
Progress indicators	• Electrification rate and share of RE in electricity production
Steps taken / envisaged	• 90% of the Population have access to electricity grid by 2030 and 30% electricity generated using renewable energy in 2030
Methodologies / Assumptions	• LEAP-IBC
Outcomes achieved	• Inclusion into national budget, International funding
Co benefits	• Better air quality, improve health, better livelihood
GHG reductions (Gg)	• Total reduction for all groups of actions under SLCP program provided in Table 3.48

Table 3.45 - SLCP – National SLCP Plan – Refrigeration and air cooling

Name of action	National SLCP Plan
Main objective	• Reduction of SLCPs
Description of group of actions	• Elimination of HFC Consumption
Gases	• HFCs
Type	• IPPU – Refrigeration and Air conditioning
Status	• Under implementation
Implementing entity	• Federal Ministry of Environment
Progress indicators	• Rate of phasing out of HFCs
Steps taken / envisaged	• 10% of HFCs phased out by 2030, 50% by 2040 and 80% by 2045
Methodologies / Assumptions	• LEAP-IBC
Outcomes achieved	• Inclusion into national budget, International funding

Name of action	National SLCP Plan
Co benefits	• Better air quality, improve health, better livelihood
GHG reductions (Gg)	• Total reduction for all groups of actions under SLCP program provided in Table 3.48

Table 3.46 - SLCP – National SLCP Plan – Agriculture

Name of action	National SLCP Plan
Main objective	• Reduction of SLCPs
Description of group of actions	• 1. Increased adoption of intermittent aeration of rice paddy fields (AWD) 2. Reduce open field burning of crop residues 3. Anaerobic Digestion (AD) 4. Reduce Methane emissions from enteric fermentation
Gases	• CH_4
Type	• Agriculture
Status	• Implementation
Implementing entity	• Federal Ministry of Agriculture
Progress indicators	• Area of rice paddy aerated, reduction rate of burning of crop residues, anaerobic emissions avoided, rate of reduction of emissions from enteric fermentation
Steps taken / envisaged	• 50% cultivated land adopt AWD management system by 2030, 50% reduction in the fraction of crop residue burned in fields by 2030, 50% reduction by 2030 in anaerobic digestion and 30% reduction of methane emission from enteric fermentation
Methodologies / Assumptions	• LEAP-IBC
Outcomes achieved	• Inclusion into national budget, International funding
Co benefits	• Better air quality, improve health, better livelihood
GHG reductions (Gg)	• Total reduction for all groups of actions under SLCP program provided in Table 3.48

Table 3.47 - SLCP – National SLCP Plan – Solid and liquid waste

Name of action	National SLCP Plan
Main objective	• Reduction of SLCPs
Description of group of actions	• 1. Reduction Methane emission and open burning of waste at open dumpsites through adoption of digesters at dump sites 2. Septic Sludge collection 3. Sewerage Systems and Municipal wastewater treatment plant
Gases	• CH_4
Type	• Waste Management
Status	• Implementation
Implementing entity	• Abuja Environmental Protection Board
Progress indicators	• Rate of recovery of methane, amount of waste open burned, amount of sludge collected and treated, increase in wastewater collection and treatment
Steps taken / envisaged	• 50% Methane recovered from landfills by 2030, 50% reduction in open burning of waste by 2030, Promote Septic sludge collection, treatment and recycling in 37 municipalities and Establish, expand Sewerage System and municipal wastewater treatment plants in Lagos, Kano and Port Harcourt
Methodologies / Assumptions	• LEAP-IBC

Name of action	National SLCP Plan
Outcomes achieved	• Inclusion into national budget, International funding
Co benefits	• Better air quality, improve health, better livelihood
GHG reductions (Gg)	• Total reduction for all groups of actions under SLCP program provided in Table 3.48

The potential reductions of the SLCP program are calculated by the LEAP-IBC software and a summary of these emissions reductions is given in Table 3.48.

Table 3.48 - Summary of emissions reductions from SLCP program

Type of emission	2030 baseline	2030 SLCP Plan
Methane emissions	4614 kt	-62%
Carbon dioxide emissions	251 Mt	-13%

Nigerian supported mitigation activities by action or group of actions

Apart from those actions falling under the aegis of various international collaboration/financing initiatives, Nigeria has also implemented mitigation actions as per following:

Table 3.49 - Installation of Solar Power Off-Grid at Bayero, Kano State (NW)

Name of action	Installation of Solar Power Off-Grid at Bayero, Kano State (NW)
Main objective	• To provide electricity access to University Community round the clock for a total of capacity of 50 MW
Description	• National Project to all the 36 States
Gases	• CO_2, CH_4, N_2O
Type	• Energy – Institutional / Renewable Energy
Status	• 2018-2022/ Commission in June 2019
Implementing entity	• FMPW&H, FMENV
Progress indicators	• 3 projects sites commissioned
Steps taken / envisaged	• Increase RE Mix by 30%, 6 Universities form 2018-2020, 2nd and 3rd round to cover the remaining universities
Methodologies / Assumptions	• TBD
Outcomes achieved	• Enhanced access to electricity round the clock
Co benefits	• Energy security, Health, improve livelihood
GHG reductions (Gg)	• TBD

Table 3.50 - Installation of Solar Street Lightings - 36 States of the Federation

Name of action	Installations of Solar Street Lightings - 36 States of the Federation
Main objective	• To provide street Lighting to energize community and enhance security; Pole-mounted Automatic Solar Street lights are installed are installed along Roadsides to provide illumination in the night 120 MW (Cumulative)
Description	• Energy
Gases	• CO_2, CH_4, N_2O

Name of action	Installations of Solar Street Lightings - 36 States of the Federation
Type	• Energy – Institutional
Status	• Started in January 2018
Implementing entity	• Rural Electrification Agency, State Government
Progress indicators	• Project under implementation
Steps taken / envisaged	• Increase Renewable Energy Mix towards Low carbon development
Methodologies / Assumptions	• TBD
Outcomes achieved	• 2500 Solar street units installed
Co benefits	• Better air quality, improve livelihood
GHG reductions (Gg)	• TBD

Table 3.51 - Solar Mini-Grids for selected Federal Government Buildings

Name of action	Solar Mini-Grids for selected Federal Government Buildings
Main objective	• Substitute fossil energy electricity with solar from mini grids
Description	• Installation of solar mini grids to supply 0.75 MW electricity to a number of federal government buildings
Gases	• CO_2, CH_4, N_2O
Type	• Energy – Institutional / Renewable Energy
Status	• Planned
Implementing entity	• NA
Progress indicators	• Project development
Steps taken / envisaged	• Identification of government buildings
Methodologies / Assumptions	• NA
Outcomes achieved	• Draft project document
Co benefits	• Better air quality, energy security
GHG reductions (Gg)	• 867.24

Table 3.52 - Establishment of Acacia Plantations Bungudu & Zurmi LG Areas in Zamfara State (NW)

Name of action	Establishment of Acacia Plantations Bungudu & Zurmi LG Areas in Zamfara State (NW)
Main objective	• Preserve biodiversity and ecological balance, prevent soil erosion
Description	• Afforestation of 5 hectares in 3 locations
Gases	• CO_2
Type	• AFOLU - Afforestation
Status	• 2018-2040
Implementing entity	• FMEnv
Progress indicators	• 2500 units of Acacia species planted and maintained
Steps taken / envisaged	• Conservation of Biological Diversity through rehabilitation of degraded land/Increase Forest Cover
Methodologies / Assumptions	• TBD
Outcomes achieved	• Increased shelter belts, Micro-Climate created

Name of action	Establishment of Acacia Plantations Bungudu & Zurmi LG Areas in Zamfara State (NW)
Co benefits	• Job creation, Improve environment
GHG reductions (Gg)	• TBD

Table 3.53 - Powering boreholes using solar energy

Name of action	Powering boreholes using solar energy
Main objective	• Improve water supply to the communities
Description	• Installation of Solar Powered Boreholes All LGAs in the 36 States
Gases	• CO_2, CH_4, N_2O
Type	• Energy – Renewable energy
Status	• Planned
Implementing entity	• LGAs
Progress indicators	• Number of boreholes powered using solar
Steps taken / envisaged	• 774 Units to be installed
Methodologies / Assumptions	• TBD
Outcomes achieved	• Installation of Solar Powered Boreholes All LGAs in the 36 States
Co benefits	• Improve livelihood, empowerment of communities, food security
GHG reductions (Gg)	• TBD

Table 3.54 - National Biofuel Development Nation wide

Name of action	National Biofuel Development Nation wide
Main objective	• To reduce total dependency on fossil fuel and diversify the economy through use of Biofuel blends for transport and domestic purposes
Description	• Blending of 10% fuel ethanol with 90% Petrol (PMS) to produce E10 and Blending of 20% Biodiesel with 80% petroleum diesel (AGO) to produce B20
Gases	• CO_2, CH_4, N_2O
Type	• Policy - Energy – Transport and residential
Status	• Projects at development stage
Implementing entity	• NNPC
Progress indicators	• Draft Policy document, Feasibility studies/ESIA for 7 Projects, approved national quality Standards for Fuel Ethanol, E10, Biodiesel, B20, MOU with State Governments and prospective Investors
Steps taken / envisaged	• Stakeholder engagement
Methodologies / Assumptions	• TBD
Outcomes achieved	• NA
Co benefits	• Better air quality, improve health and livelihood
GHG reductions (Gg)	• TBD

Table 3.55 - Energy Efficiency Nationwide

Name of action	Energy Efficiency Nationwide
Main objective	• Reduce GHG emission through adoption of energy efficiency by replacing inefficient components in the electricity generators
Description	• Retrofitting
Gases	• CO_2, CH_4, N_2O
Type	• Energy – Electricity generation
Status	• Planned
Implementing entity	• ECN, FMEnv
Progress indicators	• Number of generators retrofitted
Steps taken / envisaged	• NA
Methodologies / Assumptions	• TBD
Outcomes achieved	• NA
Co benefits	• Economic, better air quality, energy security
GHG reductions (Gg)	• TBD

Table 3.56 - National waste to wealth Program States of Abia, Borno, Cross River, Gombe & Ondo

Name of action	National waste to wealth Program States of Abia, Borno, Cross River, Gombe & Ondo
Main objective	• Deploy technology to fast-track box-type digester for treating waste and promote socio-economic development
Description	• Waste management
Gases	• CO_2, CH_4, N_2O
Type	• Waste – Solid waste management
Status	• 2016-2020
Implementing entity	• FMST. Council for Entrepreneurs for Africa (COEFA), Canada
Progress indicators	• Land acquired
Steps taken / envisaged	• Public-private partnership
Methodologies / Assumptions	• TBD
Outcomes achieved	• Construction of pilot sites
Co benefits	• Better air quality, improve health
GHG reductions (Gg)	• TBD

Table 3.57 - Solar PV Power Solutions for 12 NNPC Retail Mega Stations

Name of action	Solar PV Power Solutions for 12 NNPC Retail Mega Stations
Main objective	• Replace fossil fuel electricity generators with renewable sources of energy
Description	• Provide renewable energy as an alternative to grid supply, reduce use of diesel generators, and operational cost
Gases	• CO_2, CH_4, N_2O
Type	• Energy – Electricity generation
Status	• Planning stage

Name of action	Solar PV Power Solutions for 12 NNPC Retail Mega Stations
Implementing entity	• NNPC
Progress indicators	• Evaluative of Tender completed
Steps taken / envisaged	• EPCIC contracts
Methodologies / Assumptions	• TBD
Outcomes achieved	• NA
Co benefits	• Improve livelihood, better air quality, health, energy security
GHG reductions (Gg)	• TBD

Table 3.58 - Escravos-Lagos Gas Pipeline System II (ELPS II)

Name of action	Escravos-Lagos Gas Pipeline System II (ELPS II)
Main objective	• Reduce flaring and provide natural gas for energy generation
Description	• Expansion of the Escravos-Lagos Gas Pipeline System ELPS to transport additional 1 billion SCF of gas to utilize gas that would otherwise be flared
Gases	• CO_2
Type	• Energy – Reduce flaring
Status	• Under construction
Implementing entity	• NNPC
Progress indicators	• Reduction in amount of gas flared
Steps taken / envisaged	• EPC
Methodologies / Assumptions	• TBD
Outcomes achieved	• NA
Co benefits	• Improved livelihood, better air quality, health, energy security
GHG reductions (Gg)	• TBD

Table 3.59 - Trans Nigeria Gas Pipeline (TNGP)

Name of action	Trans Nigeria Gas Pipeline (TNGP)
Main objective	• Reduce flaring and use natural gas for energy production
Description	• Capture and utilize about 2.7 billion SCFPD (SCF per day) gas across southern Nigeria up to the Northern parts of the country (Ajaokuta-Kaduna-Kano (AKK) & Calabar-Ajaokuta Pipelines)
Gases	• CO_2
Type	• Energy – Reduce flaring
Status	• Planning stage
Implementing entity	• NNPC
Progress indicators	• Reduction in amount of gas flared
Steps taken / envisaged	• NA
Methodologies / Assumptions	• TBD
Outcomes achieved	• NA
Co benefits	• Improve livelihood, better air quality, health, energy security
GHG reductions (Gg)	• TBD

Table 3.60 - Commissioning of new electricity generation plants

Name of action	Commissioning of new electricity generation plants
Main objective	• Improve access to electricity
Description of group of actions	• Abuja IPP – 1,350 MW • Kaduna Power Plant – 1,000 MW • Kano Power Plant – 1,000 MW • NNPC / Mobil JV Qua-Iboe JV IPP – 540 MW • NNPC / Total JV Obite IPP – 420 MW • NNPC / NAOC JV Phase 2 Okpai IPP – 450 MW • Ogidigben IPP – 450 MW
Gases	• CO_2, CH_4, N_2O
Type	• Energy – Residential, Institutional, Commercial
Status	• Planned
Implementing entity	• NNPC, IPPs
Progress indicators	• Number of plants commissioned
Steps taken / envisaged	• Generation capacity per plant worked out
Methodologies / Assumptions	• TBD
Outcomes achieved	• Financing mechanism/ Implementing entity identified
Co benefits	• Improve livelihood, economic
GHG reductions (Gg)	• TBD

Table 3.61 - Commission an additional LNG Train

Name of action	Commission an additional LNG Train
Main objective	• Improve the capacity of supply of LNG
Description	• Develop an additional LNG train to reduce pressure on the existing 6 trains
Gases	• CO_2
Type	• Energy – Reduce flaring
Status	• Under implementation
Implementing entity	• Nigerian Liquefied Natural Gas
Progress indicators	• Advancement in project implementation
Steps taken / envisaged	• FID taken in December 2019 and EPC contract awarded in May 2020
Methodologies / Assumptions	• TBD
Outcomes achieved	• To utilize about 390 billion cubic feet of gas per annum
Co benefits	• Better air quality, improve livelihood, health benefits
GHG reductions (Gg)	• TBD

4 Information on domestic Measurement Reporting and Verification System

4.1 Introduction

The Bali Action Plan, adopted by the COP as Decision 1/CP.13, launched a comprehensive process to enhance implementation of the Convention to limit the global temperature increase to less than 2 ^{o}C. It introduced the principle of Measurement, Reporting and Verification (MRV) for both developed and developing country Parties towards enhancing action at the international and national levels to mitigate climate change. Decision 1/CP.13 of the Bali Action Plan states, in its operative paragraph 1(b), that "enhanced national/international action on mitigation of climate change" would include consideration of, inter alia for developing country Parties:

"Nationally appropriate mitigation actions by developing country Parties in the context of sustainable development, supported and enabled by technology, financing and capacity-building, in a ***measurable, reportable and verifiable*** *manner;"*

Paragraphs 61 and 62 of decision 1/CP.16 made it mandatory for non-Annex I Parties to also Measure, Report and Verify domestically and internationally supported mitigation actions with the latter also subject to international MRV. MRV promotes transparency and accuracy of mitigation information while enabling tracking of emissions reduction, and support received and needed for implementing mitigation actions. Furthermore, Article 13 of the PA established the ETF for all Parties and highlights the importance of having an operational MRV system in the shortest possible timeframe to enable reporting to the set standards.

4.2 General procedures, principles and requirements for MRV

Under the Convention, Parties are encouraged to establish the following general procedures to optimize limited resources for domestic MRV:

- Designate a single entity responsible for overall coordination of domestic MRV.
- Assign roles and responsibilities for implementation of the domestic MRV system, and to entities for collection, management, and submission of quality-controlled source/relevant data.
- Construct timelines and work plans within the UNFCCC reporting framework that establish the different steps of MRV while ensuring that sufficient time and resources are available to enable entities follow best practices.
- Collect sufficient activity data, process information and emission factors, and/or other metrics (source/relevant data) that are necessary to enable the quantification of emissions and removals, to track the effects of emissions reduction activities, and to subsequently report and allow for verification of the method adopted, assumptions used and the reported impacts.
- Measure emissions/removals and follow progress through well-defined indicators on implemented NAMAs and other mitigation actions, gauge progress of those actions to guide development of enhanced mitigation actions along with needs for support, and
- Consider ways and means to develop and implement an appropriate QA/QC plan to guarantee the quality of data and other information collected and feeding these into the MRV system.

When developing and implementing its MRV system, Nigeria is ensuring that the five IPCC reporting principles for compiling GHG inventories, which are consistency, transparency, comparability,

completeness, and accuracy of information (UNFCCC, 2009) are embedded in it. Nigeria also intends to develop its MRV system to suit the ETF of the PA and reporting standards of the BTRs.

4.3 Development of the MRV system of Nigeria

MRV demands for the measurement, reporting and verification of countries' emissions in a sustainable manner to enable reporting every 2 years in BTRs as set out by the COP (Decision 18/CMA.1). Provision of information regularly on its emissions profile enables evaluation of progress on emissions reduction stemming from the implementation of the country's NDC, allows future emissions reduction to be targeted more effectively and enables the country to meet its obligations on reporting to the COP of the UNFCCC. Additionally, MRV demonstrates to donors and the international community how the LCD policy and programmes are being implemented in a cost-effective manner. This can serve to secure their continued support for enhancing Nigeria's transition to a low carbon economy.

The development and operationalisation of a domestic MRV system represents a serious challenge to Nigeria as a non-Annex I country as it is new and adds additional responsibilities on the DCC and other collaborating institutions within the framework of preparation of BTRs as from 2024. Nigeria has some initiatives and existing capabilities within its present monitoring and evaluation system that is serving as basis for the development of the domestic MRV system after the necessary improvements and modifications. Institutionalization of the MRV system will enable use of existing resources in lieu of accessing additional ones. Institutionalization will guarantee the contribution of the wide range of stakeholders forming part of the MRV system for their collaboration in a continuous and systematic manner instead of on an ad-hoc basis.

The preliminary analysis, performed in view of the development of the domestic MRV system for tracking emissions, mitigation activities, and support needed and received, uncovered numerous constraints, gaps, and barriers that the country needs to overcome before the full development, establishment and operationalization of the MRV system. Key activities to consider for the development, implementation, and operationalization of the MRV system are:

- An in-depth assessment of the existing institutional arrangements and, monitoring and evaluation system to identify weaknesses that need to be addressed to transform it into the MRV one.
- Identification of stakeholders to form part of the MRV system and assigning them their roles and responsibilities.
- Identification of data and information that need to be collected on a regular basis.
- Setting up of an appropriate data collection network, management of this network, databasing and archiving all data and information collected.
- Develop and adopt the necessary legislations for appropriation of data and information in a sustainable way and overcome confidentiality issues.
- Establishment of a QA/QC system to guarantee the integrity of information and data collected.
- Identify capacity building needs and establish a training programme to develop the required capacity within the scheduled time for the operationalization of the MRV system, and
- Access the necessary resources to complete the above activities by 2024 to allow for reporting in the BTRs as required for the ETF of the PA.

4.4 Institutional arrangements for implementing and reporting to the Convention

Nigeria resorted to consultants for the preparation of its First, Second and Third NCs as well as the first BUR. There was no management system to oversee and coordinate the activities for the preparation of the

reports for the different thematic areas/chapters of the NCs and BURs, including the compilation of the GHG which remains the backbone for tracking emissions and mitigation actions. This arrangement worked well for the ad-hoc preparation of reports in the past but no longer suited the context of enhanced reporting as per Decisions 1/CP.16, 2/CP.17 and the PA. It was not sustainable. Conscious of the situation, Nigeria reviewed its approach to reporting. It expanded the institutional arrangements by including more stakeholders in the process, with special consideration given to women for striking the proper gender balance and ensuring they play their role in the climate change process. Nigeria also invested in the consolidation of the DCC within the FME to fill this new requirement of the reporting framework.

The present institutional framework of Nigeria for implementing the Convention is depicted in Figure 4.1. The inter-ministerial committee provides a common coordination platform to harness the numerous relevant stakeholders from the different MDAs for collaboration in implementing climate change activities, tracking progress, and reporting thereon. The committee meets regularly to receive reports from all MDAs. The role of the Inter-Ministerial Committee is to collect and provide information on implementation of the mitigation activities to the DCC for inclusion in the UNFCCC reports. DCC can thus integrate the required stakeholders in the information collection network through working groups and liaise with them for data and information to track and report on emissions and other outcomes of the activities.

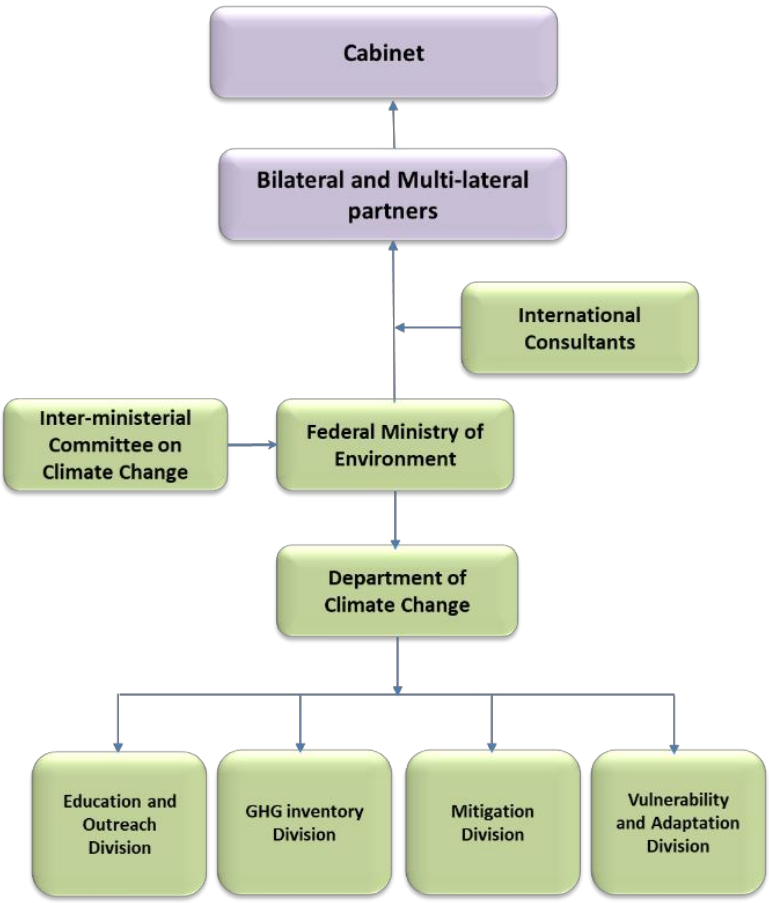

Figure 4.1 - Institutional arrangements of Nigeria for implementing the Convention

The FME spearheads the reporting system and collaborates with the representatives of other Federal Ministries and State government in the Inter-Ministerial Committee. The Ministry of Women Affairs and Social Development as a member of the Inter-Ministerial Committee safeguard the interests of women, indigenous people, and the disadvantaged. The DCC of the FME is the focal entity to coordinate and supervise all climate change activities through its four technical divisions, themselves overseeing the development and implementation of the MRV system for the specific thematic area under their control.

The DCC divisions have created working groups which comprise representatives of the MDAs, state governments, private sector, research institutions, universities, NGOs, CSOs and CBOs.

The legal framework underpinning Nigeria's MRV system should consider the following to increase system efficiency:

- Reduce bureaucratic bottlenecks and enhance close collaboration through regular meetings of the working groups.
- Establish clear guidelines, deadlines, and QA/QC procedures in the system to ensure credibility of the reported data and information.
- Companies and industries must be encouraged to provide the data and information needed to support a national MRV system on a voluntary basis.
- Legislations governing confidentiality of data and their capture must be enacted as necessary.
- Design and operationalize a robust information management system to monitor, manage and archive MRV data and information over time.

The activities of the different elements of the reporting cycle for NCs and BURs that will range from planning through to submission of reports are depicted in Table 4.1.

Table 4.1 - Activity cycle to track mitigation projects

Activity	Description
Planning	Identify collaborating institutions, Secure collaboration through appointment of representatives, Assign roles and responsibilities, Establish coordination mechanisms, Agree on the approval process, Plan funding allocation and budget, and Identify and plan capacity building
Preparation	Hold inception meeting, Identify and Consult with other stakeholders, Agree on outputs, milestones and timelines, Hold check-in meetings, Collect and Quality Control relevant data
Reporting	Process, quality assure, finalize and validate all data and information, Compute emissions, Prepare draft report, Edit and produce final report
Documentation and archiving	Establish procedures to ensure regular and systematic documentation and archiving to enhance transparency and ensure sustainability
Evaluation	Perform independent QA/QC, Identify lessons learned, strengths, weaknesses and opportunities for improvement, Prepare an improvement plan for implementation during next round of reporting
Consultation process	Validate reports through consultation with national stakeholders
Approval and submission	Government authority approves and submits report to the COP

Source: Adapted from UNFCCC. Toolkit for Non-Annex I Parties on Establishing and Maintaining Institutional Arrangements for Preparing National Communications and Biennial Update Reports.

It should however be pointed out that this set-up is not yet operational, namely at the lowest level due of lack of sufficient resources and capacity at various levels. Nigeria is hopeful that soon it will tap funds under the Capacity Building Initiative for Transparency from the GEF to strengthen the institutional arrangements and improve the functionality of the existing MRV systems which are described further in this chapter to meet the higher standards of the Convention reports.

4.5 GHG inventory management system

MRV of emissions seeks to measure, report, and verify quantifiable emissions data at national, regional and plant levels for activities falling under the four IPCC sectors. Institutionalization of the MRV system is deemed essential to improve the flow of information, to monitor emissions for primarily meeting the

reporting requirements and to inform and support national planning, implementation and coordination of mitigation activities.

Good quality GHG inventories from signatory Parties are vital to provide the most updated information required to the COP of the UNFCCC for assessing progress towards meeting the ultimate objective of the Convention. As for the NCs and BURs, the GHG inventories submitted as chapters of these reports were below the required standards to meet the IPCC principles for Transparency, Accuracy, Completeness, Consistency and Comparability. Additionally, good quality inventories also serve to support and inform policy decisions with respect to appropriate response measures within the LCD development adopted by Nigeria.

Decision 18/CMA.1 demands for NIRs on a stand-alone basis or as a chapter of the BTR from countries for compliance with the ETF of the PA. Paragraph 18 of the Annex to Decision 18/CMA.1 states "*Each Party should implement and maintain national inventory arrangements, including institutional, legal and procedural arrangements for the continued estimation, compilation and timely reporting of national inventory reports in accordance with these MPGs. National inventory arrangements can vary by Party depending on their national circumstances and preferences and change over time."* In practice, these arrangements form part of a GHGIMS and guarantee the sustainable production of GHG inventories through the MRV of emissions system. To enhance implementation of this requirement, the UNFCCC secretariat has been conducting QA assessments of GHG inventories of developing countries on a voluntary basis and Nigeria availed itself of this opportunity in 2018. Among the recommendations made, the top priority was to develop and implement a robust GHGIMS.

Additionally, the secretariat has contracted two international consultants to support the development and implementation of robust GHGIMS to those countries which went through the process. Nigeria is benefiting from this support presently.

Following the decision to shift from outsourcing to inhouse production of national reports to the UNFCCC and this recommendation, Nigeria started the development and implementation of its GHGIMS within the framework of the preparation of the inventory of its BUR2. The GHG inventory division within the DCC of the Federal Ministry of Environment was consolidated and capacity building commenced as the major barrier stood as serious lack of capability. This division has been entrusted with the responsibility for producing good quality GHG inventories that are compliant and of the standard required by IPCC. In this role, the GHG Division is also responsible for implementing the GHGIMS. The components of the GHGIMS are provided below along with the roles and responsibilities of institutions within it.

- Institutional Arrangements
  FME through DCC manages the institutional arrangements to keep it dynamic and suitable for the sustainable compilation of GHG inventories.
- Method and Data Documentation
  DCC oversees and collaborates in this process through the four working groups created for the IPCC sectors.
- QA-QC procedures
  QA/QC are applied at different stages of the inventory cycle in line with IPCC Good Practices. DCC will act as coordinator to ensure the QA/QC process is implemented in line with IPCC Guidelines. Thus, the final QA/QC is performed by independent experts or consultants. The upfront QA/QC for all the steps leading to the NIR is undertaken by the four working groups.
- Archiving

To ensure a foolproof system without risk of loss of documentation on previous GHG inventories, this responsibility will be shared by DCC and NBS with a third copy stored with central government.

- Key Category Analysis
  This analysis falls under the responsibility of the working groups for the four sectors and DCC central compiler for the national level.
- National Inventory Improvement Plan
  DCC to generate the detailed plan from contributions of the working groups and the recommendations of the Technical Team of Experts (TTE) from the ICA process for sharing and implementation by relevant MDAs through the FME and the Inter-Ministerial Committee.

Nigeria kick-started the in-house production of the GHG inventory of the BUR2 through the GHG inventory division of DCC in collaboration with other institutions concerned with the compilation of the inventory. An international company was contracted to provide support and backup on the development and implementation of the GHGIMS as well as on the compilation process while providing capacity building to staff of the GHG inventory division and other national experts on the technical aspects of the inventory. The transition was not fully successful, but some progress has been recorded in the development and implementation of the GHGIMS. The key achievement is the mapping of institutions to ensure completeness of the inventory. The results led to their integration in the newly created sectoral working groups Energy, IPPU, AFOLU and Waste.

4.6 MRV of emissions

FME, as focal point of the UNFCCC, has tasked DCC with collating and integrating information on climate change implementation across all MDAs under the supervision of the Inter-ministerial Committee. Consequently, the GHG Division of the DCC oversees all activities of the system for MRV of emissions. The National Bureau of Statistics supports DCC GHG inventory Division for collecting the bulk of activity data required from public institutions and private sector companies. Most line ministries, including Departments under their purview, State and local governments and the civil society also contributes as suppliers of data as members of the working groups. The sectoral working groups are responsible to compile and generate emissions. Thus, they are responsible for QA/QC of all activity data, entering these in the software including the associated level of uncertainties, analyse emission factors and choose the most appropriate ones along with their uncertainty levels, estimate emissions, perform KCA, Uncertainty Analysis and identify constraints, gaps and needs for inclusion in the NIIP. Sectoral working groups are also responsible for documenting the whole process and reporting for their respective sector. Research organizations and universities support in the assessment of the appropriateness of emission factors and their improvement to better suit national circumstances and for estimation of key categories. DCC takes charge of compilation at the national level and the preparation of the report, its review by stakeholders, approval, and submission to the COP. A description of the arrangements for MRV emissions is depicted in Figure 4.2

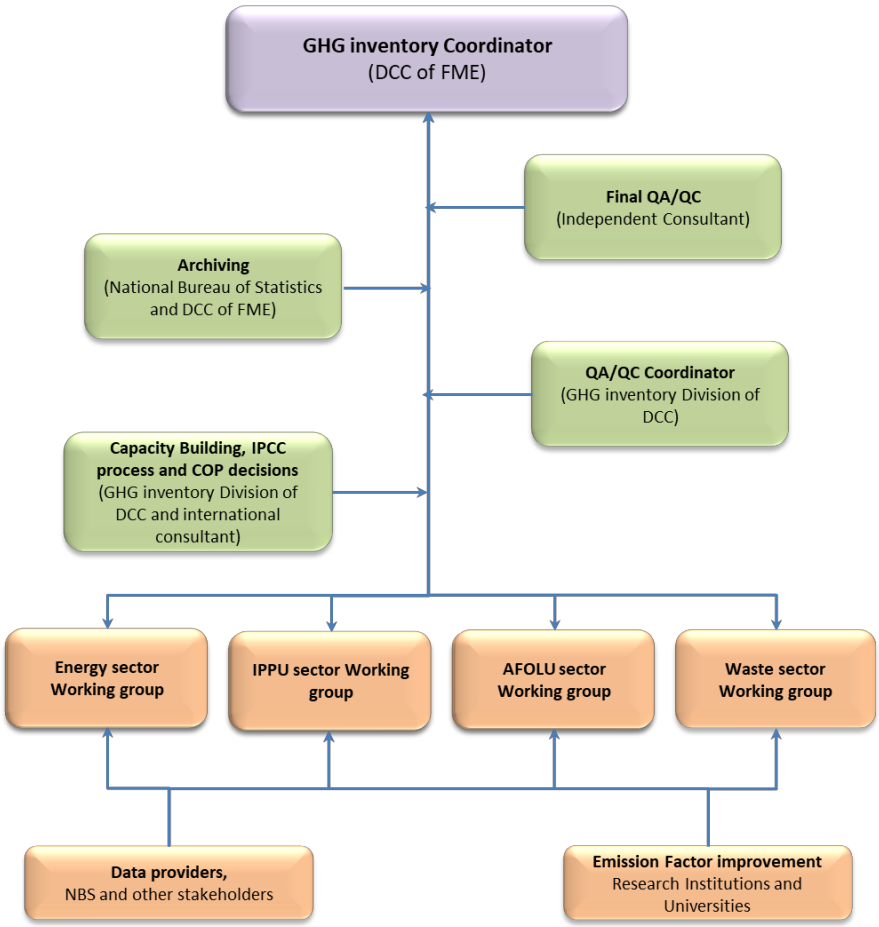

Figure 4.2 - GHGIMS cum MRV emissions

The development and implementation of the institutional arrangements for the MRV of emissions is still in its infancy. The major challenge for the smooth operationalization of the MRV emissions system is the serious lack of capacity of the members of the four working groups as well as of staff of the GHG inventory Division of DCC. Capacity building started during the framework of the preparation of the BUR2 but there is still a long way to go for it to run smoothly. It is expected that this will be completed after another 3-4 rounds of preparing GHG inventories. Another key shortcoming is the absence of a legal framework to guarantee an annual flow of activity data to render the process sustainable. There will be a continuous assessment and enhancement of these institutional arrangements to ensure methodologies and activity data collection for GHG inventories are applied for making best estimates of emissions and removals, proper documentation to guarantee reports compliant with the ETF of the PA, preparation of a NIIP and archiving to enable follow-up and improvement. The legal framework will be reviewed to address the problem of annual flow of activity data. The MRV of emissions are incorporating best practices from IPCC and UNFCCC.

4.7 MRV mitigation including NAMAs

While Nationally Appropriate Mitigation Actions (NAMAs) constitute the central instrument within the UNFCCC framework to support developing countries' efforts in achieving their GHG emissions reduction targets during the transition to a low carbon economy, other ongoing and new mitigation actions not falling under NAMAs cannot be neglected. MRV of NAMAs and other mitigation actions are essential to track progress and allow for backstopping of mitigation actions. In addition, MRV cycles help to inform, understand, and correct deviations between projected and real performance, therefore triggering the necessary learning process.

Measuring for NAMAs and other mitigation projects should primarily enable the country to compute GHG emissions reductions and removals depending on their nature. As well, measurements to follow progress, record impacts, ascertain the assumptions adopted in the actions, compare different mitigation actions and pave the way for improvements or raising ambitions are essential. The MRV mitigation component will also track, and record support received and investments made during implementation of the NAMA or other mitigation action. The framework should also conform with good practices and be flexible enough to accommodate adjustments and changes with time to ensure successful implementation of the action.

Reporting for NAMAs or other mitigation action comprises quantification of the emissions reduction, updated data on assumptions, baselines and methodologies, and other key performance data and indicators related to implementation as well as resources invested. This component will be reported at different levels depending on the complexity and the means of implementation, objectively on an individual basis for mitigation action and NAMA. Supported NAMAs need detailed reporting, consequently requiring the responsible unit to work closely with the actual implementing entity of the NAMA. Reporting on a NAMA should be at least annually for all institutions involved. This information would then be integrated every 2 years into the BUR or BTR for the UNFCCC.

Verifying NAMAs serves to build trust and confidence among stakeholders involved. In the case of supported NAMAs, it will serve as a safety standard for support provided and received. Verification enables opportunities for improvement on measurement and reporting and will be helpful when comparing different NAMAs. This component will focus on the method and assumptions adopted, activity data, emission factors, estimated emissions and other benefits, progress achieved, and financial resources to guarantee the soundness of the reported information. In case of supported and credited NAMAs, verification will be expected to comply with international guidelines and standards whereas for unilateral NAMAs, the host country might assign verification to a national body conversant with verification procedures and standards. As far as possible, the frequency of verification of NAMAs should be aligned with the production of the BUR or BTR but preferably be on an annual basis.

The overall responsibility of the MRV system for mitigation, including NAMAs will rest with the FME through the Mitigation Division of the DCC supported by the GHG Inventory Division. The Mitigation Division will track and follow the different steps of the MRV system depicted in Figure 4.3 while estimation of emissions reductions or removals stemming from the mitigation activity will be computed by the inventory team of the GHG inventory Division. The Measurement component will be under the responsibility of the Executing Entity (EE) which will also prepare regular monitoring reports and submit to the NAMA implementing Entity for follow-up. The latter will then submit to the NAMA Coordinating Agency, namely the Mitigation Division of the DCC for verification and approval for further transmission to the appropriate authority for verification. Once the latter process is satisfactorily completed, the final report will be commissioned and submitted to the NAMA Donor or other collaborating/supporting partner depending on the type of NAMA. Other mitigation activities will follow a similar process. The implementation details, support received, emission estimates and other benefits derived from the activity will then be included in the next BUR or BTR for submission to the UNFCCC.

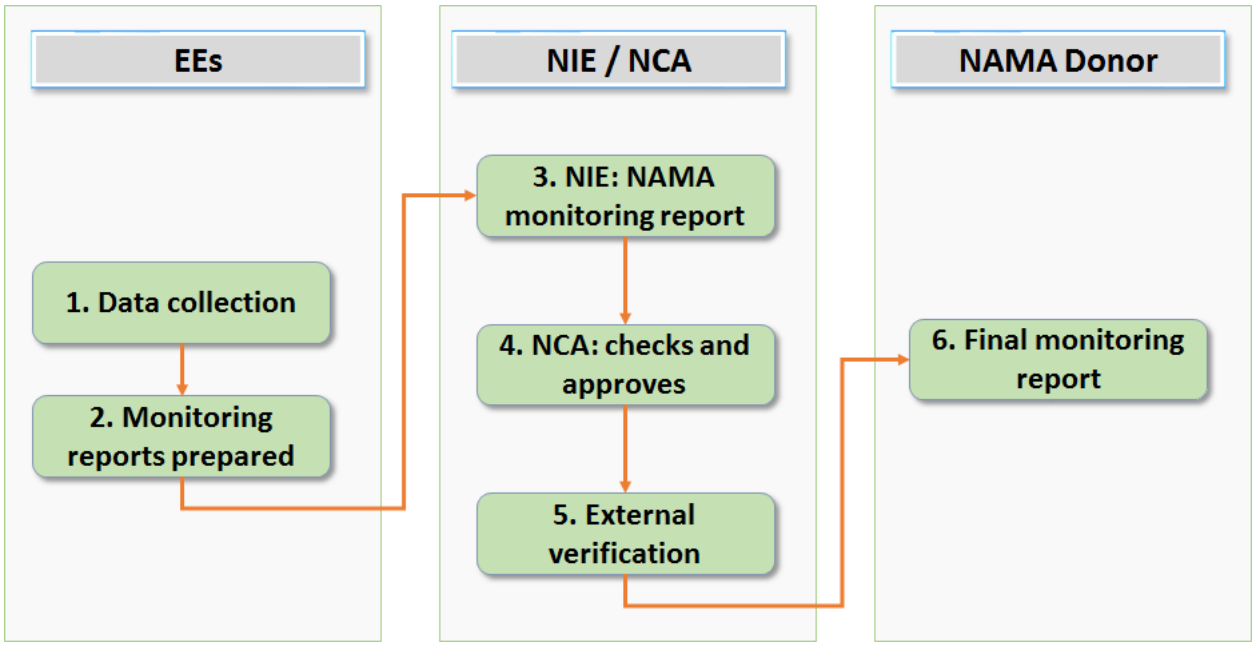

Figure 4.3 - Mitigation (NAMA and other activities) MRV process

Source: UNDP 2015. EE: Executing Entity; NCA: Nama coordinating Agency; NIE: NAMA Implementing Entity

Implementation of the MRV for NAMAs in Nigeria faces numerous constraints, gaps and barriers in capacities, technical skills and data availability in all sectors. These challenges were addressed within the framework of the preparation of the BUR2 but progress has been very slow due to the serious lack of capacities and understanding of the process. Thus, these constraints, gaps and barriers (Table 4.2) must be taken into consideration when developing and implementing the MRV mitigation system.

Table 4.2 - Identified MRV Gaps in All Sectors (A- Available, PA – Partly Available, NA – Not Available)

Elements	Sectors			
	Energy	IPPU	AFOLU	Waste
Templates for reporting raw data for GHG estimation	A	A	A	A
Templates for reporting GHG emissions	A	A	A	A
Availability of trained staff for activity data collection	A	PA	PA	PA
Training of staff for GHG estimation	PA	PA	PA	PA
A system for reporting raw data relevant to GHG estimation	PA	PA	PA	PA
A system for reporting GHG emissions	A	A	A	A
Availability of procedures for the regular flow of data	NA	NA	NA	NA
Clear roles and responsibilities of different stakeholders	PA	PA	PA	PA
QA/QC system for the reports	NA	NA	NA	NA
Documentation of data sources, assumptions, and calculation methodologies	PA	PA	PA	PA
Others				
Social Barrier	Given the socially accepted use of traditional sources of energy consumption, the introduction of new technologies in energy for instance could be a barrier			

Elements	Sectors			
	Energy	IPPU	AFOLU	Waste
Economic Barrier	Any MRV system with a high investment cost and long pay-back period is likely to receive very low buy-in from government and other stakeholders.			
Technology barrier	Very limited technologies exist for setting up innovative MRV system			

Source: Adapted from Mike Bess, Assen Gasharov, 2016: Climate MRV for Africa-Phase 2: Capacity Building Plan for Nigeria. Presented at Inception workshop at Shehu Musa Yar'adua Centre (25/10/2016)

As for MRV emissions, Nigeria commenced the implementation of the MRV mitigation system within the context of the preparation of its BUR2. FME through the mitigation division of DCC has developed and consolidated four sectoral working groups, one each on the Energy, IPPU, AFOLU and Waste sectors. These working groups comprise staff of the mitigation working group, representatives of the MDAs, the private sector, NGOs, CBOs and CSOs. The working groups oversee the data collection process mainly for non-NAMA activities since these are implemented by a wide range of stakeholders. The working groups are supported by the climate change desk officers of the line Ministries and States. This start-up was quite laborious due to the serious lack of capacity of the working group members. Capacity building has started for the working groups and the States Desk officers, but progress has been slow due to insufficient resources. The programme was further constrained by the COVID-19 pandemic that led to closure of borders, and cancellation of flights which prevented the international consultant to effectively hold more training sessions. Virtual sessions were avoided due to unreliable internet connectivity for all potential participants. Nigeria hopes that the sanitary situation will improve as well as improved availability of resources if it can access the funds under the CBIT programme for enhancing the capacity building of the national experts.

4.8 MRV of support

Direct support from bilateral and multi-lateral partners for climate change activities have been of financial, technical, and technological nature notwithstanding capacity building of national experts on various thematic areas since Nigeria ratified the Convention. Climate Change expenditure has hardly been a dedicated sub-head in the past national budgets, while climate change related activities are generally embedded into other development projects under several MDAs. However, Nigeria invested indirectly from its annual budget since it created a dedicated department, the DCC, within the FME. DCC has been further consolidated with the recruitment of additional staff to enable it deliver on the enhanced reporting requirements, including the ETF of the PA. Similarly, although the FME is the focal point for activities falling under the UNFCCC and the international climate regime, nothing precluded other MDAs from cooperating and receiving support for their mandated activities that are climate related. This creates a situation of multiple inflows in the forms of grants or other type of support to several MDAs without a centralized tracking network. Even where there are budgetary allocations for climate related activities, the legislative oversight for ensuring monitoring and accountability is weak because of the lack of capacity and absence of a dedicated system for the monitoring and evaluation of climate public expenditure.

The Nigerian private sector is quite robust and with the adoption of sustainability principles in critical economic sectors, market-based inflows are flowing in, yet without a system to aggregate the inflows. The Ministry for Budget and National Planning coordinates all international development assistance and could provide the necessary framework, but that has not been a top priority up to now.

This situation clearly depicts the absence of a dedicated system to MRV support received except in the case of CDM and GEF funded projects which can be traced from the respective focal points and

international databases. Nigeria is thus called upon now to develop and implement an appropriate MRV system to track support received. The FME provided for the establishment of a Climate Public Expenditure and Institutional Review (CPEIR) in its 2017 budget. The purpose of this review was to develop a framework that would identify, report, monitor, evaluate and account for all climate related financial expenditures. If this is successfully undertaken, it would address some of the shortcomings identified and reported in this BUR.

Given the new reporting context of the Convention and the need to track and monitor all support received, Nigeria is conscious that to face this new challenge, it must work on rapidly developing and establishing a sustainable system for MRV of support. Existing institutional arrangements aimed at monitoring climate change activities could be exploited after appropriate changes and improvements to meet the challenges for MRV of support. The personnel involved with CDM and GEF projects could be reorganized into a division within DCC, with tracking of support received and needed for reporting in BTRS as mandate. The Inter-Ministerial Committee on Climate Change can act as the platform for collating all information pertaining to support for climate change related activities from all Federal Ministries. The latter can themselves collect the same information from the State Governments and the private sector under their jurisdiction. The information provided as per an agreed template can then be processed, documented, and archived by the DCC of the Federal Ministry of Environment for retrieval when preparing the BTRs.

5 Constraints and gaps, and related financial, technical and capacity needs, including a description of support needed and received

5.1 Introduction

Nigeria is still facing poverty and other crucial development issues, including social unrests, in its endeavour to improve the welfare of its population. Environmental challenges are numerous, climate change being the driver in most cases. Lack of resources has been the major factor impeding development and this has been compounded by the COVID-19 pandemic and its negative impact on the economy since more than a year now. Nigeria has made its utmost to meet its commitments as a developing country signatory Party to the UNFCCC. The country is grateful to bilateral and multilateral partners which has so far supported it to implement the Convention and report thereon. However, it is apparent that the level of support received to-date has not been enough to enable Nigeria to play a more active role as it would have wished. The country is highly vulnerable, and its priority has been to invest national resources available for adaptation rather than for mitigation to guarantee the well-being of the population, namely the more vulnerable groups such as women, the disabled and indigenous people.

Nigeria is not prepared yet to cope with the challenges of climate change which are constraining the country's development. Nevertheless, in its quest to support the international community to tackle global warming and the resulting climate change, Nigeria has embarked on a low emissions development route. Reporting requirements are more demanding now and the country is not yet ready to fulfil the ETF of the PA. Notwithstanding reporting, implementation of measures to mitigate, and adapt to climate change represents another challenge. There still exists numerous constraints and gaps of financial, technical, and technological nature that the country needs to urgently address in addition to capacity building to be able to cope with climate change while contributing to the international agenda. In this regard, Nigeria seriously hopes that the PA will be implemented within the shortest possible timeframe to enable all developing countries implement their NDCs and contribute fully to the achievement of the objectives of the Convention for the benefit of mankind. This chapter provides the best available up to date information which will be improved in future communications to the secretariat.

5.2 Constraints and gaps

5.2.1 GHG inventory

Apprising the COP with the best information on the country's emissions regularly and sustainably is the backbone for decision-making on curbing GHG emissions towards stabilizing the GHG level in the atmosphere to limit global warming and its effects. Thus, all signatory Parties should prepare good quality GHG inventories reflecting the TACCC principles of IPCC on a sustainable basis. Nigeria has embarked on inhouse reporting including the preparation of the national GHG inventory within the framework of the preparation of the BUR2. In line with inhouse compilation of the GHG inventory, the DCC has been consolidated with the creation of various divisions, one of them being the GHG inventory Division which was given this task of inventory compilation. Staff of this Division lacked the appropriate capacity to perform the compilation on their own and training was provided to them on various aspects of the preparation of the GHG inventory, including on the IPCC 2006 Guidelines and software. The transition was difficult but considered essential for reporting to the Convention and implementing the NDC to support the development of the country's low carbon development strategy. The major constraint faced in the estimation of GHGs emissions for the four IPCC sectors was the lack of good quality activity data. Available data are relatively inconsistent for all IPCC sectors. Lack of consistent activity data and process information resulted in heavy reliance on international data sources and generation of missing activity

data to fill the gaps when estimating GHGs emissions and sinks within the country. This increased the uncertainty level and prevented the adoption of the more accurate higher tier methods as advocated in Decision 18/CMA.1 of the COP. National emission factors more appropriate to suit national circumstances for use with the higher tier methods were not available also. Nigeria also lacks a proper GHG inventory management system with robust institutional arrangements for sustainable production of inventories. The situation is exacerbated by the lack of a pool of national experts able to compute GHG inventories at the facility, sectoral, regional, state, and national level.

To remedy this situation, Nigeria started the development and implementation of a robust GHGIMS with the support of the secretariat based on the latter recommendations from a QA exercise of the inventory of the BUR1. More details on the development of the GHGIMS is provided in the MRV chapter under MRV of emissions. However, there is still a long way to go for Nigeria to have its robust GHGIMS in place and functioning smoothly.

5.2.2 Mitigation

Nigeria is geared to enhance mitigation of GHG emissions in all areas of development to meet its low carbon development strategy. Already, the country implemented several CDM projects under the Kyoto Protocol. More recently, the country identified and reported clear mitigation opportunities for the medium term in its NDC, presently under revision to make it more ambitious. Nigeria is yet to develop its first NAMA due to lack of capacity, a well-computed inventory at facility level with proper baselines due to constraints and gaps reported associated with the GHG inventory. Thus, apart from the CDM projects, mitigation is in its early stages. It is noted that in preparing the section on 'Mitigation Action and Their Effects' for this BUR2, numerous gaps and constrains were identified. Overall, information on mitigation actions and their effects are scarce and limited. While there is tremendous effort made to mitigate the effects of climate change, this information is either unavailable or in most cases non-existent, as there is no centralized system of reporting or data collection on mitigation in the country. Information on climate change policies and larger national actions are usually available. However, this information only contains the basic elements like program name, implementation agency, and objective, with little to no information outlining the effects of the mitigation actions, emissions avoided, and benefits reaped.

With such an information gap on mitigation actions and their effects, it is challenging to report on key aspects such as: progress indicator, steps taken or envisaged, progress on implementation, and results achieved. Table 5.1 provides an overview of the gaps and constraints regarding availability of information for reporting in the BUR as per the guidelines contained in Decision 2/CP.17, Annex III, Section I V. It should however be noted that some progress has been recorded moving from the BUR1 to the BUR2 and that efforts are ongoing to further improve on the existing situation.

Table 5.1 - Availability of information for reporting on mitigation actions as per Decision 2/CP.17

Information	Multi-Sector	Energy Sector	Forest Sector	Waste Sector	Agriculture Sector	Transport Sector
Name and description of the mitigation action, including information on the nature of the action, coverage (i.e., sectors and gases)	A	A	A	A	A	A
Quantitative goals and progress indicators	NA	PA	PA	PA	PA	A
Methodologies and assumptions	NA	NA	NA	NA	NA	NA
Objectives of the action and steps taken or envisaged to achieve that action	A	A	A	A	PA	A

Information	Multi-Sector	Energy Sector	Forest Sector	Waste Sector	Agriculture Sector	Transport Sector
Progress of implementation of the mitigation actions and the underlying steps taken or envisaged	A	PA	A	PA	PA	A
Results achieved, such as estimated outcomes (metrics depending on type of action) and estimated emission reductions, to the extent possible	NA	PA	PA	PA	PA	PA

A: Available, NA: Not Available, PA: Partly Available

5.2.3 Measurement, Reporting and Verification

Measure, Report and Verify is a new concept to better track implementation and effects of mitigation actions that Non-Annex I Parties must develop and implement within the framework of BUR reporting. Nigeria, as most of the developing countries, is building on existing systems to meet this requirement. It is proposed to institutionalize the MRV system for good quality reporting in the future. The key limitation of the present monitoring and evaluation system is the absence of systematic collection of data along with proper documentation and archiving. DCC been entrusted with the responsibility to develop and establish the domestic MRV system. The development and implementation of the domestic MRV system will need to integrate various ministries, other government institutions, the private sector, and the civil society. Additionally, there will be the need to develop the appropriate human, technical and technological capabilities to make the process a success. Nigeria on its own may meet difficulties to successfully develop and implement the domestic MRV system and relies on the urgent support of the international community to accomplish this task and make the country ready for the preparation of the BTRs as from 2024 in accordance with Article 13 of the PA. In this regard, it will be important to address existing constraints and gaps and make good for them when developing and implementing the system. Capacity building of sufficient national experts will be first and foremost in the development and implementation of the domestic MRV system. The salient challenges and potential solutions are provided in Table 5.2.

Table 5.2 - Key gaps and potential solutions

Key Gaps	Key activities to address the Gaps
MRV activities must be aligned across different levels of government institutions/ministries for effective coordination and consolidation	• Department of climate change serving as the DNA will enable better institutional coordination among relevant ministries working on mitigation actions and GHG inventories • Allocation of roles and responsibilities of relevant ministries contributing to the implementation of MRV emissions, mitigation, and support received and needed • Regular monitoring and evaluation of government's progress in coordinating climate change activities will enable better MRV performance and result • Department of Forestry with its experience in implementing REDD+ MRV activities, could significantly contribute to the development of the future domestic MRV system
MRV infrastructure must be developed to enable relevant agencies and institutions to pool their resources together	• Lessons learned with inhouse reporting to the UNFCCC could serve as basis for further development and implementation of MRV in Nigeria • Establishment of an MRV institution in Nigeria which will be responsible for the consolidation of the MRV system.
MRV **emissions** must be established in a robust and sustainable manner	• Consolidation of the process for the institutionalization of the GHG inventory preparation

Key Gaps	Key activities to address the Gaps
	• Capacity building for government institutions and other relevant stakeholders to prepare GHG inventory as per TACCC principles for meeting the ETF of the PA
MRV **mitigation** must be established in a robust and sustainable manner	• The linkage between MRV of funds and mitigation projects must be further elaborated • Standardized and commonly agreed methodologies and indicators are needed to monitor and report on mitigation actions • Enhancement of institutional capacities in sectoral ministries and states for monitoring mitigation actions under their responsibility

5.2.4 Technology transfer

Successful technology transfer is of utmost importance when tackling climate change issues. Nigeria still lacks an in-depth technology needs assessment and transfer to address climate change problems. Constraints and gaps relating to technology transfer in the context of mitigation and adaptation to climate change exist and will have to be corrected. The main features relating to technology transfer along with a few lessons learned are listed below.

- Lack of awareness of the available technologies.
- Limited human and financial capabilities to adopt new technologies.
- Poor organizational skills and capacities to coordinate transfer and flow of new technologies.
- Intellectual property rights often act as obstacles to the transfer of technology.
- Tariffs and Taxes are often problematic. When import duties on items needed for specific technological development are too high, relevant transfer are inhibited.
- The success of technology transfer within the framework of CDM projects could serve as a model for the transfer of other technologies; and
- Studies of CDM projects show that technology transfer is more prevalent in some sectors than in others, depends on the domestic availability of certain technologies, and occurs more frequently in large-scale projects than in smaller ones.

5.2.5 Others

- GHG estimation should be encouraged on a yearly basis.
- Need to build technical capacity of staff of relevant MDAs to strengthen inventory processes.
- Need for the country to move some sectors, especially key categories from Tier 1 to Tier 2 for enhanced transparency in reporting.
- Need to pursue and consolidate in-house inventory to build capacity of working groups members within various MDAs.
- Need for women to be active players in the oil and gas sector.
- Need for detailed sectoral gender analysis taking cognizance of region and location specific needs e.g. north-south, and/or rural-urban differences.
- Community buy-in: Social and cultural norms around appropriate types of work can restrict women's participation in the digital economy.
- Existing MRV system should be strengthened to track progress made in implementing mitigation and adaptation measures.
- The co-benefits of mitigation actions should be identified and reported.
- Harmonizing GHG inventory data collection through templates for all government institutions, the private sector and other relevant stakeholders.
- Need for signed Memorandum of Agreement (MoA) or other legal document between DCC and all data providers for an annual automatic flow of data.

- An online data collection portal should be set up for national collation of all data for MRV systems.

5.3 Support received and needed

There exists no efficient system for recording support received or needed by the country to implement the Convention presently. As laid out under MRV in this chapter, Nigeria lacks systematic tracking and documentation in most areas, including support received and needed.

5.3.1 Information on support received

Where such related support has been received by any MDA, the information is hardly available in the public domain. The difficulty for locating such information is because most of the support is non-monetary and little weight is attached to it for national accounting purposes, resulting in insufficient motivation to record, report and account for them. Thus, this chapter contains non-exhaustive information on the climate change financial flows to Nigeria as from 2015 only. They are categorized according to domestic and external sources, the former consisting primarily of budgetary allocations by the Nigerian government, and the latter from external and or international sources from bilateral and multilateral partners, including the GEF channel. The information is provided by agency for each activity area, including mitigation, adaptation, the sector and amount of funds as available.

Most of the available information relates to financial inflows going to the Federal Government. Disbursements to state governments are not fully captured due to paucity of information resulting from the inexistence of the appropriate system to track climate change activities. Efforts of more progressive state governments that have committed significant resources to climate related issues are highlighted when such information is available. The data was collected from information available in the public domain, including budgets from the website of the Nigerian Budget Office and of international organizations, and from donors. Some information was also obtained from DCC.

Projects with insufficient details and or inadequate information and those less than $50,000 have been excluded, based on the limit set by the GEF Small Grant Projects as benchmark. According to the DCC, Nigeria has so far leveraged nearly $3 billion worth of multilateral funds for climate change projects. Historically, billions of Naira have also been allocated to climate change counteraction measures, both explicitly and incidentally by the Federal government. Details of these are categorized and discussed below. Where the purposes are explicit, they have been classified according to whether they are mitigation or adaptation activities, the latter including projects geared at preserving the environment.

Nigeria's commitment to addressing the climate change challenge is demonstrated through the budgetary allocations made on an annual basis to Federal MDAs and in some cases, as counter-part funding of bilateral or multilateral financing. This section highlights instances of budgetary allocations directly linked to environmental protection or providing for climate change in Nigerian budgets, notwithstanding those elements that are not clearly defined but could have been reprogrammed for climate change including baseline surveys, data collection and general research. The bulk of allocations during the tracking period went to adaptation activities including building climate efficient infrastructure. These allocations are provided in an updated Table 5.3 compared to the one in the BUR1. It has also been amended to retain only supported projects ongoing or implemented as from the year 2015 to-date.

Table 5.3 - Summary of bilateral and multilateral financial flows including GEF

Source	Description	Sector	Objective	Duration	Co-funding	Amount
Henrich Boll Stiftung (HBS)	Grant - Capacity Building for energy transition	Energy	Mitigation	2012-2016	NA	EUR 849,019

Source	Description	Sector	Objective	Duration	Co-funding	Amount
Henrich Boll Stiftung (HBS)	Grant - Support for various mitigation projects	Energy Future campaign	Mitigation	2012-2016	NA	EUR 637,662
Henrich Boll Stiftung (HBS)	Grant - Various adaptation projects on climate resilience	Climate change	Adaptation	2012-2016	NA	EUR 423,320
World Bank / GEF / Special Climate Change Fund (NEWMAP)	Loan / grant - Addressing erosion challenges in eight states	Energy / agriculture	Adaptation / Mitigation	2012-2018	Each state N500m ($1,515,15)	$509,500,000
DFID	Grant	Climate Change	Adaptation / Mitigation	2014-2015	NA	£17,000
German Ministry of Cooperation & Development	Grant - Promoting clean energy investment through Ministry of Power and five states (NESP)	Energy	Mitigation	2013-2018	NA	$27,000,000 or EUR 24,000,000
DFID	Grant - Support for private sector solar projects	Energy	Mitigation	2014-2020	NA	$22,000,000
European Development Fund	Grant - Overarching support for national priorities including Vision 2020 via EU / Nigeria National Indicative Program	Energy, Agriculture and water	Mitigation/ Adaptation	2014-2020	NA	$686,000,000
Solar Nigeria	Technical Assistance	Energy	Mitigation	2014-2020	NA	£40,734,781
EU	Assistance	Health, Energy, Governance	Mitigation	2014-2020	NA	£512,000,000
Global Environment Facility (GEF)	Grant - Assessment of organic persistent pollutants	Minamata Convention	Mitigation	2014	$182,000	$1,000,000
Global Environmental Facility (GEF)	Technical and financial support - Preparation of First BUR	UNFCCC compliance	Climate change	2015	$482,250	$352,000
Global Environmental Facility (GEF)	Technical and financial support - Preparation of second BUR	UNFCCC compliance	Climate change	2018	$482,250	$352,000
Global Environmental Facility (GEF)	Grant - Support for various national and regional projects	Energy and agriculture	Adaptation/ mitigation	2015	NA	$374,071,385
Global Environmental Facility (GEF)	Grant - Support for various national and regional projects	Agriculture	Adaptation	2015	NA	$13,407 408
Global Environmental Facility (GEF)	Part Co-financing - Various national projects land degradation	Agriculture, climate change	Adaptation / mitigation	2015	NA	$85,815,932
Global Environment Facility (GEF)	Grant - Land management	Agriculture	Mitigation / adaptation	2015	$57,000,000	$7,139,450
NEPAD / German Government	Grant - various national adaptation projects	Agriculture	Adaptation	2015	NA	$110,000 and EUR 100,000

Source	Description	Sector	Objective	Duration	Co-funding	Amount
USAID	Investment - Research and Development	Agriculture, Health, Environment & Governance	Mitigation	2015	NA	£425,000,000
IFC / DFID	Grant - RE generation	Energy	Mitigation	2016	NA	$2,500, 000
The Green Climate Fund	Investment fund - Universal Green Energy Access Program (UGEAP) - Multiple countries	Energy	Mitigation	2016	NA	$16,000,000
Global Environment Facility (GEF)	Grant	Mining sector	Mitigation	2016	$373,000	$500,000
Global Environment Facility (GEF)	Grant - Environmental Management	Environment	Mitigation	2016	$34,666,612	$6,930,000
Global Environment Facility (GEF	Grant - Sustainable fuelwood management	Energy	Mitigation	2016	$16,400,000	$4,410,000
Green Climate Fund (GCF	Investment Fund - Acumen Resilient Agricultural Fund - Multiple countries	Agriculture/ Finance	Adaptation	2031	Co-finance provided	$22,500,000
Green Climate Fund (GCF	Grant & Loan - Programme for Integrated Development and Adaptation to climate change in the Niger Basin (PIDACC) Multiple countries	Water	Cross cutting	2025	Co-finance provided	$67,710,000
Green Climate Fund (GCF)	Grant & Loan - Transforming Financial Systems for Climate Multiple countries	Energy / Finance	Cross cutting	2026	Co-finance provided	$245,900,000
Green Climate Fund (GCF)	Investment fund - Climate Investor One Multiple countries	Energy	Mitigation	2039	Co-finance provided	$186,000,000
Green Climate Fund (GCF)	Loan - Nigeria Solar IPP Support Programme	Energy	Mitigation	Yet to commence implementation	Co-finance required	$100,000,000
Green Climate Fund (GCF)	Readiness support Grant- National Adaptation Plans	Environment	Adaptation	2022	N/A	$3,000,000
Green Climate Fund (GCF)	Readiness support Grant - CTCN - Technology Needs Assessment	Various sectors	Mitigation	2021	N/A	$397,143

Conscious of the importance of all to contribute of the fight against climate change, the Nigerian private sector also has invested on mitigation. A few of the actions, implemented in 2016, that have been tracked are given in Table 5.4.

Table 5.4 - Some examples of private sector funding

Source	Description	Sector	Objective	Duration	Amount
C40 Cities Climate Leadership Group	Grant to Lagos State - Reduce GHG emission	NA	Mitigation	2016	$3,000,000
Fidelity Bank	Loan to Delta State - Climate change projects	Multiple	Mitigation	2016	$1,515,152
World Bank	Grant to Akwa - Ibom State Climate change projects	Multiple	Mitigation	2016	$2,000,000

5.3.2 Information on support needed

An in-depth assessment with respect to finance, technical assistance, technology transfer and capacity building needs of Nigeria to implement fully all identified mitigation and adaptation actions has not been made and documented in a central database. The absence of a duly completed needs assessments also compounds the difficulty in a precise determination and presentation of support needed qualitatively and quantitatively.

That notwithstanding and not being exhaustive, according to the INDCs[3] and a few other sources, the main intervention areas requiring support are depicted in Table 5.5. The extent of financial assistance required is not provided and it is planned to start work on this aspect and provide the information as far as possible in the next BUR.

Table 5.5 - Intervention areas and type of support needed

Type of support	Purpose	Description of support
Financial and Capacity Building	• Produce quality up to date NCs and BURs	• Improve capabilities for reporting to the Convention
Financial and Technical Assistance	• Reduce deforestation and emissions while increasing sinks	• Stop charcoal use
Financial, Technical Assistance and Capacity Building	• Avoid emissions, sustainable agricultural production and Food Security	• Climate smart agriculture
	• Improve quality of GHG inventories and quantify emissions avoided	• Develop a sustainable GHG inventory management system
	• Produce baselines for developing mitigation actions	• Develop emissions database
Financial, Technical Assistance, Technology Transfer and Capacity Building	• Curb deforestation to avoid emissions and increase sink capacity	• Review and implement the National Forest Policy
	• Improve access to electricity	• Multi-cycle power stations and scalable power station 20-50 MW
	• Improve access to electricity and reduce emissions	• Develop Gas-to-Power Plants at Gas Flare Sites (micro grid)
	• Increase accessibility to electricity	• Improve electricity grid
	• Increase sink capacity through sequestration of CO2	• Reforestation
	• Increase the share of renewable energy, particularly decentralized systems	• Development of renewable energy technologies, power projects and management
	• Reduce emissions	• Blending transportation fossil fuels with biofuels
	• Reduce emissions, improve quality of environment and life	• Promote use of natural gas in lieu of liquid fossil fuels

[3] Nigeria's Intended Nationally Determined Contribution to the UNFCCC, available at<http://www4.unfccc.int/Submissions/INDC/Submission%20Pages/submissions.aspx>

Type of support	Purpose	Description of support
	• Reduce fossil fuel consumption and emissions	• Develop urban transit systems • Modal shift from air to high-speed rail • Moving freight to rail • Upgrade roads
	• Reduce liquid fossil fuel consumption and emissions	• Increase use of CNG and LPG for transport
Technical Assistance	• Empower the population to mitigate and adapt through alleviation of high unemployment rates and economic stability	• Diversification of the economy
Technical Assistance and Capacity Building	• Construct methane capture systems on existing landfills and ensure that new sites will have this facility installed	• Establish a Landfill gas capture technology for existing and new sites
	• Reduce consumption of fossil fuels and emissions	• Adoption of energy efficiency • Adoption of green technology in industry • Benchmark industrial energy usage against international best practices
	• Reduce emissions	• Improve enforcement of gas flaring restrictions
	• Reduce fossil fuel consumption and emissions	• Reform petrol subsidies • Toll roads/ road pricing
	• To improve energy efficiency in buildings and reduce use of fossil fuel	• Develop a guide for net-zero carbon building in Nigeria
	• To reduce dependence on international generic figures and improve the accuracy of national inventory data	• Develop National emission factor for various sectors
Technology and Capacity Building	• Emissions reduction	• Gas flare capture and utilization technologies

6 Information on the level of support received to enable the preparation and submission of biennial update reports

6.1 Financial

The Global Environment Facility (GEF) provided USD 352,000 to support Federal Republic of Nigeria prepare its BUR2 for the fulfilment of its obligations under the UNFCCC, through the UNDP country office which acted as the implementing agency. The government of Nigeria through its FME, DCC contributed USD 50,000 in kind to complement the funding required to complete this BUR2 project.

6.2 Capacity building

Capacity building has been a recurrent feature during the preparation of the inventory of the BUR2 project through training meetings and workshops delivered by international consultants. This partially filled up the capacity building needs to produce BURs. Nigeria benefited from support provided by the UNFCCC through an international consultant to improve the existing GHGIMS to render it fully operational and sustainable.

7 Any other information relevant to the achievement of the objective of the Convention and suitable for inclusion in its Biennial Update Report

7.1 Introduction

Nigeria has been actively engaged in international climate policy negotiations since it became a Party to the UNFCCC in 1994. Nigeria also adhered to the Kyoto Protocol and ratified the PA, thereby volunteering to fully collaborate with the international community for curbing down GHG emissions in view of limiting global warming and its impacts. Nigeria has submitted three NCs, one BUR and its INDC to meet its requirements following its adherence to the Convention, its protocol and other mechanism. The BUR2 is presently in the completion stage and the INDC is being updated to make it more ambitious. Nigeria is host to several Clean Development Mechanism projects, as well as projects financed by the Adaptation Fund. In September 2012, the Federal Executive Council approved the NCCPRS which paved the way for enhanced action on climate change by the country.

7.2 National climate change strategies and plans

The sustainable development of Nigeria is guided by two strategic documents, Vision 2020 adopted in 2010 and the more recent Economic Sustainability Plan approved in 2020.

Vision 2020 seeks to reduce the impact of climate change on development processes and the environment. It aims at (i) strengthening environmental governance; (ii) promoting environmental education; and (iii) optimising economic benefits from sustainable environmental management.

The Economic Sustainability Plan has among several objectives, the prioritisation of solar power. The plan aims at developing a solar power strategy which will create 250,000 jobs while powering 5 million households at an estimated cost of 240 billion Naira by encouraging private sector investment. Incentives will be in the form of low-cost financing through development finance institutions and the central bank of Nigeria.

Within Vision 2020, Nigeria developed, enacted and adopted several legislations and plans to translate it into the wider policies, plans and action. The main one, the NCCPRS, adopted and implemented in 2012, envisions a climate change-resilient Nigeria ready for rapid and sustainable socio-economic development. Its mission is to strengthen national initiatives to adapt to and mitigate climate change, and involve all sectors of society, including the poor and other vulnerable groups (women, youth, disabled, indigenous) within the overall context of advancing sustainable socio-economic development. The principal objectives of the NCCPRS are:

(i) Implement mitigation measures that will promote sustainable and high economic growth within a low carbon development agenda.
(ii) Strengthen national capacity to adapt to climate change.
(iii) Enhance climate change-related science, technology and R&D to a level that will allow the country to better participate in international scientific and technological co-operation on climate change.
(iv) Significantly increase public awareness and involve the private sector in addressing the challenges of climate change.
(v) Strengthen national institutions and mechanisms (policy, legislative and economic) to establish a suitable and functional framework for climate change Governance.

Some of the other policies and regulations passed to support mitigation and adaptation and adopted in addition to those presented in the mitigation chapter of this report are:

The Nigerian Biofuels and Incentives Policy - 2007

The objective of this policy is to help develop the biofuel industry to gradually reduce the dependence on imported gasoline, reduce GHG emissions while promoting economic development. The policy includes the establishment of a Biofuel Energy Commission and Biofuel Research Agency and a target that by 2020 all biofuels consumed in the country will be produced nationally. Various incentives and measures were introduced for promoting the realisation of the policy.

The National renewable Energy and Energy Efficiency Policy (NREEEP) 2015

This document defines the government's position on how to strengthen renewable energy and energy efficiency in the country. The National Energy Efficiency Action Plans 2015-2030 were released in 2016 to implement this policy.

Regulations on Feed-In Tariff for renewable energy sourced electricity in Nigeria – 2015

The feed-in tariff regulation builds on the Electric Power Sector Reform Act 2005 that opened up the sector to competition and supports small producers. Its goal is to tap Nigeria's vast potential for renewable energy through the stimulation of private investment. The objective is to have a total of 1,000 MW and 2,000 MW generated and connected to the grid by 2018 and 2020 respectively through renewables such as biomass, small hydropower, wind and solar. The power distribution companies should source a minimum of 50 % of their total supply from renewables.

The National Gas policy - 2017

The National gas policy aims at setting goals and implementing an institutional framework for the gas sector. The document notably insists on encouraging the use of Liquefied Petroleum Gas (LPG) as an alternative to fuelwood to reduce emissions from deforestation while improving air quality for better community health.

The Economic Recovery and Growth Plan - 2017

The Economic Recovery and Growth Plan aims at fostering sustainable economic development in Nigeria over the period 2017 to 2020. It is a transversal strategic document that edicted detailed measures, notably in the sectors of climate change adaptation, renewable energy production and use, energy efficiency and land degradation and desertification.

The flare gas regulations - 2018

The flare gas regulations complemented the National Gas policy by establishing the legal framework to pursue the objectives of the Federal Government for the reduction of GHG emissions from flaring and venting of natural gas.

7.3 Climate change adaptation

7.3.1 Impacts and Vulnerability

The 2014 World Climate Change Vulnerability Index, published by the global risk analytics company Verisk Maplecroft, classified Nigeria as one of the ten most vulnerable countries in the world. The vulnerability and adaptation assessment of the NC3 confirmed this finding. It underlined the general south-north divide to vulnerability. Generally, the Southwest and Southeast are relatively less vulnerable than other parts of

the country. The three northern zones showed higher vulnerability than those in the south, the Northeast being the most vulnerable region.

The high vulnerability of the country and the need for adaptation in various sectors of the economy has been highlighted in the NC3. Priority sectors are Agriculture, Livestock, Water Resources, Health, Infrastructure, Forest, Forestry and Desertification, and Tourism. Additionally, certain socio-economic and demographic groups are particularly vulnerable to the brunt of climate change. These include women and female heads of household, children and the elderly, the chronically sick and indigenous people. It is recognized now, based on studies, that women in developing societies are more vulnerable to environmental change because they are very often socially excluded and lack equal access to resources, culture, and mobility. These groups, which form part of the Nigerian social fabric, also typically have a low adaptive capacity through high levels of dependence on others for their living, including their food security, mobility, and access to information. Another critical issue which is very likely to stem from climate change is violence and conflicts in the regions with poor adaptive responses, typically found in the northern regions of the country. Climatic shifts can result in shortages and hence competition for natural resources such as land and water, two primordial needs responsible for sustainable livelihood of the communities of these regions. Shortages are followed by negative secondary impacts, such as more sickness, hunger, and joblessness which are potential causes for fuelling conflicts.

Nigeria attaches significant importance to adaptation to climate change. It developed the National Adaptation Plan Framework in 2020 to facilitate the management of the medium- and long-term adaptation needs of the country in a coherent and coordinated manner. Specifically, the objectives of the NAP Framework are to:

- Clarify the country's approach to its NAP process. This includes articulating the country's vision of climate change adaptation, its adaptation objectives, the principles that will guide adaptation actions, roles, and responsibilities among relevant stakeholders. It is also a reference point for bringing together various adaptation planning efforts from different sectors and scales of decision-making (i.e., national, states, and local governments).

- Align the NAP process with existing policies (e.g., Economic Recovery & Growth Plan [ERGP], NASPA-CCN, National Climate Change Policy Response and Strategy [NCCPRS]), strategies, and adaptation research.

- Focus on specific themes that are particularly relevant and/or unique to Nigeria's context.

The NAP Framework also provides for the implementation structure. The coordination, under the responsibility of DCC, will involve identification of adaptation priorities for each sector as well as monitoring the implementation of the programmes and projects. The framework also proposes an institutional arrangement that follows the broader climate change governance in the country. Implementation will thus involve multiple sectors and agencies as well as the private sector, working at the national, state, and local government levels. This will require stronger collaboration among MDAs to enable experience sharing, reduce overlap and avoid unnecessary duplications in the programmes and projects. The NAP will facilitate the alignment of the programs and projects with the country's overall development agenda. The NAP will be gender-responsive and adopt, where appropriate, community-based and ecosystem-based approaches. It will also facilitate multiple co-benefits and manage trade-offs arising from the implementation of programmes and projects.

Key elements of the NAP process include:

(i) Building appropriate capacity for adaptation action.
(ii) Defining adaptation options at the various levels of governance.
(iii) Creating an enabling environment for effective adaptation.
(iv) Designing a coherent approach to fund mobilization for effective climate change adaptation.
(v) Developing suitable strategies for engaging the private sector.
(vi) Developing effective communication strategies in the various phases of the adaptation process; and
(vii) Developing an effective monitoring and evaluation plan to facilitate implementation.

Climate change adaptation affects every aspect of Nigeria's socio-economic development. Numerous adaptation actions are on-going as autonomous development initiatives. However, to meet the objectives of the NAP successfully, adaptation requires much more attention than what is being done presently. The costs are no doubt daunting because of the numerous actions and since most of them are of crucial importance. Inadequate commitment to address the much-needed investment now will transcribe into a dangerous future which will demand for much more resources. Consistent in-depth studies to estimate the costs of the impacts on the economy are yet to be conducted. A study by the Department for International Development (DFID) in 2009 estimated the cost to be between 6% and 30% of Nigeria's GDP by 2050, amounting to between USD 100 billion and USD 460 billion if appropriate adaptation measures are not implemented now. Nigeria is therefore counting on the support of the international community and intends to take advantage of the opportunities offered by the Adaptation Fund under the UNFCCC for its adaptation programme.

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