REPUBLIC OF NAMIBIA

Fourth Biennial Update Report (BUR4) to the United Nations Framework Convention on Climate Change

February 2021

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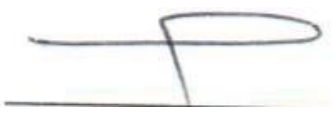
Foreword

On behalf of the Government of the Republic of Namibia, it is an honour and privilege for me to present Namibia's Fourth Biennial Update Report (BUR4), accompanied with the stand-alone fifth National GHG Inventory Report (NIR5), in fulfilment of its obligations as a Non-Annex I signatory Party to the United Nations Framework Convention on Climate Change (UNFCCC). The BUR4 has been prepared using the Guidelines adopted by Decision 2/CP.17 while quality of the NIR5 aims at meeting the Enhanced Transparency Framework of the Paris Agreement.

Namibia ratified the UNFCCC in 1995. Namibia was also one of the first countries to ratify to the Paris Agreement in 2016. As a signatory Party to the Convention, Namibia has prepared and submitted four National Communications: The Initial National Communication (INC) in 2002; the Second National Communication (SNC) in 2011; the Third National Communication (TNC) in 2015 and the fourth National Communication (NC4) in 2020. In compliance with the enhanced reporting requirements, Namibia was the first NAI country to submit its Biennial Update Report (BUR1) in 2014, followed with the second Biennial Update Report (BUR2) in 2016, and the Third Biennial Update Report (BUR3) in 2019. Furthermore, Namibia prepared and submitted its Nationally Determined Contributions (NDC), which is currently undergoing revision, in 2015.

Eager to stay complaint, Namibia has started the process of accessing resources to prepare its fifth Biennial Update Report (BUR5) and its Fifth National Communication (NC5) to be submitted in 2022 and 2024 respectively. BUR4 will be submitted with a stand-alone NIR covering the period 1990 to 2016, as per the recommendations from the International Consultation and Analysis (ICA) process. This report also provides an update on the National Circumstances including the institutional arrangements for the preparation of NCs and BURs, Mitigation actions and their effects, including the associated domestic Monitoring, Reporting and Verification (MRV) and Needs and Support received. Namibia has undergone three ICA processes from which areas of improvement and capacity building needs and gaps were identified and improved on.

At the national level, Namibia has made numerous strides to further engage itself to play its role in fighting climate change as outlined in the NDC. In 2014, the Cabinet of the Republic of Namibia approved the National Climate Change Strategy and Action Plan (NCCSAP). The NCCSAP, which is currently under review and paving the way for the transition to a low carbon economy, aims at facilitating the implementation of the National Climate Change Policy (NCCP), which was passed in 2011.



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Hon. Pohamba Shifeta
Minister of Environment, Forestry and Tourism

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- Namibia Airports Company
- Petroleum products dealers
- Namport
- Electricity Control Board
- Meatco Namibia

Table of Contents

List of Tables

List of Figures

Abbreviations and Acronyms

Acronym / Abbreviation	Definition
°C	degree Celsius
AD	Activity Data
AFOLU	Agriculture, Forest and Other Land Use
AIDS	Acquired Immune Deficiency Syndrome
AR	Assessment Report
BAP	Bali Action Plan
BAU	Business as usual
BTR	Biennial Transparency Report
BUR	Biennial Update Report
CBIT	Capacity Building Initiative for Transparency
CBNRM	Community Based Natural Resource Management
CBO	Community Based Organisation
CCSAP	Climate Change Strategy and Action Plan
CCU	Climate Change Unit
CDC	Centre for Disease Control and Prevention
CH_4	Methane
CNG	Compressed Natural Gas
CO	carbon monoxide
CO_2	carbon dioxide
COP	Conference of Parties
COVID	Corona Virus Disease
CS	Country-specific
CSIR	Council for Scientific and Industrial Research
CSO	Civil Society Organisation
CSP	Concentrated solar power
DE	Digestible Energy
DEA	Department of Environmental Affairs
DRFN	Desert Research Foundation Namibia
DSM	Demand Side Management
ECB	Electricity Control Board
EEA	European Environment Agency
EF	Emission Factor
EMEP	European Monitoring and Evaluation Program
ESKOM	Electricity Supply Commission
ETF	Enhanced Transparency Framework
FAO	Food and Agricultural Organisation
FOLU	Forestry and Other Land Use
G-CARP	Climate Ambitious Reporting Programme
GCF	Green Climate Fund
GDP	Gross Domestic Product
GEF	Global Environment Facility
GHG	GreenHouse Gas
GL	Guideline
GPG	Good Practice Guidance
GRN	Government of the Republic of Namibia
GVM	Gross Vehicle Mass
GWH	Gigawatt Hour

Acronym / Abbreviation	Definition
GWP	Global Warming Potential
HFC	Hydrofluorocarbon
HIV	Human Immunodeficiency Virus
ICA	International Consultation Analysis
IEA	International Energy Agency
IHME	Institute for Health Metrics and Evaluation
INC	Initial National Communication
INDC	Intended Nationally Determined Contribution
IPCC	Intergovernmental Panel on Climate Change
IPP	Independent Power Producer
IPPU	Industrial Processes and Product Use
ITCZ	Inter-Tropical Convergence Zone
IWRM	Integrated Water Resources Management
KCA	Key Category Analysis
LPG	Liquefied Petroleum Gas.
MEFT	Ministry of Environment, Forestry and Tourism
MRV	Measuring, Reporting and Verification
MSW	Municipal Solid Waste
MW	MegaWatt
MWG	Mitigation Working Group
N_2O	Nitrous oxide
NACSO	Namibian Association of CBNRM Support Organisations
NAFIN	National Alliance for Improved Nutrition
NAMA	Nationally Appropriate Mitigation Action
NAMPHIA	Namibia Population-based HIV Impact Assessment
NAMREP	Namibian Renewable Energy Programme
NAP	National Agricultural Policy
NATIS	A subdivision of the Transport Information and Regulatory Services of the Namibian Road Authority
NC	National Communication
NCA	National Coordinating Agency
NCCC	National Climate Change Committee
NCCP	National Climate Change Policy
NCCSAP	National Climate Change Strategic Action Plan
NDA	National Designated Authority
NDC	Nationally Determined Contributions
NDP	National Development Plan
NEEP	Namibia Energy Efficiency Programme
NEI	Namibia Energy Institute
NGO	Non-Governmental Organization
NHIES	Namibia Household Income & Expenditure Survey
NIDS	Namibia Inter-censal Demographic Survey
NIE	NAMA Implementing Entity
NIIP	National Inventory Improvement Plan
NIR	National Inventory Report
NIRP	National Integrated Resource Plan
NMVOC	Non-Methane Volatile Organic Compound
NPC	National Planning Commission
NSA	Namibia Statistics Agency
NVDCP	National Vector-Born Disease Control Program
ODS	Ozone Depleting Substances

Acronym / Abbreviation	Definition
OGEMP	Off Grid Energy Master Plan
PA	Paris Agreement
PV	Photovoltaic
QA	Quality Assurance
QC	Quality Control
REEEI	Renewable Energy & Energy Efficiency Institute
SADC	Southern Africa Development Community
SAPP	South African Power Pool
SDG	Sustainable Development Goals
SF_6	sulphur hexafluoride
SME	Small and Medium Enterprises
SNC	Second National Communication
SO_2	Sulphur dioxide
TACCC	Transparency, Accuracy, Completeness, Consistency, Comparability
TB	Tuberculosis
TJ	Terajoule
TNC	Third national Communication
UN	United Nations
UNAIDS	Joint United Nations Programme on HIV/AIDS
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
USD	United States Dollar
WHO	World Health Organization
WMO	World Meteorological Organization
WTTC	World Travel & Tourism Council
ZESCO	Zambia Electricity Supply Corporation

Executive Summary

ES 1. National Circumstances

Introduction

Vision 2030, the document which guides Namibia's long-term development, aims at a high and sustained economic growth to create employment and move the country towards increased income equality. The current Fifth National Development Plan (NDP5), running over the period 2017/18 to 2021/22, translates this vision into strategies and plans for implementation. The objective of the vision is to have a prosperous and industrialized Namibia, developed by its human resources, enjoying peace, harmony, and political stability. The NDP5 rests on four pillars, Economic Progression, Social Transformation, Environmental Sustainability and Good Governance. Climate Change is one out of two of the areas to be addressed under the Environmental Sustainability pillar.

Convention Obligations

Namibia ratified the United Nations Framework Convention on Climate Change (UNFCCC) in 1995 as a Non-Annex 1 Party, and as such, is obliged to report certain elements of information in accordance with Article 4, paragraph 1 of the Convention. Namibia also became a Party to the Paris Agreement after its ratification in 2016. To meet its reporting obligations, Namibia has submitted four national communications (NCs); the initial national communication in 2002, the second national communication in 2011, the third in 2015 and the fourth in 2020. In line with decisions 1/CP.16 and 2/CP.17, Namibia has submitted three Biennial Update Reports (BURs), its BUR1 in 2014, the BUR2 in 2016 and the BUR3 in 2018. The BUR4 will be submitted in February 2021. As well, the INDC submitted in 2015, is presently under revision.

Institutional arrangements for implementing the Convention

The Cabinet of Namibia is the Government entity entrusted with the overall responsibility for the development of national policies, including those on climate change. The National Climate Change Committee (NCCC) oversees the implementation of the climate change policy, including the preparation of the reports for submission to the Convention and also plays an advisory role to Government on climate change issues. It comprises representatives from various ministries and other stakeholders such as the private sector and NGOs amongst others. The Ministry of Environment, Forestry and Tourism (MEFT), the official government agency acting as national focal point of the Convention, is responsible for coordinating and implementing climate change activities, including the preparation of both the NCs and BURs to enable the country to meet its reporting obligations. This is done through the Climate Change Unit (CCU) established within the Department of Environmental Affairs (DEA). Being a formalized and multi-sectoral committee, the NCCC advises and guides the CCU for sector-specific and cross-sector implementation and coordination of climate change activities.

Population profile

According to the Namibia Housing, Income and Expenditure Survey (NHIES) 2015/16 Report (NSA,2017), the population of Namibia was estimated at 2,280,716. The urban population outnumbered the rural one with 53.1 % living in towns, thus confirming the trend observed since 2009/10 of migration towards urban regions. The average number of persons per household decreased to 4.2 in 2016 from 4.7 in 2010. There were 1,172,440 women compared to 1,108,276 men in 2016. The segment aged less than 20 years represented 47 % of the population while 6.3 % of the population was aged 60 years and above. Women headed 44% of the households on average in the country.

Geographic profile

The Republic of Namibia is situated in the south-western region of the African continent and lies between latitude 17° and 29°S and longitude 11° and 26°E. The country covers a land area of 825,418 km^2 and has a coastline 1500 km long on the South Atlantic Ocean. Namibia shares borders with Angola in the North, Zambia in the north-east, Botswana in the east and South Africa in the south. Namibia consists of five geographical areas, namely, the central plateau, the Namib Desert, the Great Escarpment, the Bushveld and the Kalahari Desert.

Land cover and use is very diverse in Namibia. Apart from a substantial area being covered by the Namib Desert, there are vast expanses of Grasslands, itself sub-categorized into pure grassland, shrubland and savannahs. There are still forest areas sub-divided into Forestland and Woodland. The remainder of the territory is classified as Cropland, Wetlands and Settlement areas.

Despite its very dry climate, Namibia holds a remarkable variety of species, habitats and ecosystems ranging from deserts to subtropical wetlands and savannas. Namibia is one of the very few countries in Africa with internationally recognized “biodiversity hotspots”. Namibia’s most significant “biodiversity hotspot” is the Sperrgebiet, which is the restricted diamond mining area in the Succulent Karoo floral kingdom and shared with South Africa. The Succulent Karoo is the world’s only arid hotspot. It constitutes a refuge for an exceptional level of succulent plant diversity, shaped by the winter rainfall and fog of the southern Namib Desert. A large portion of its plants is endemic (MET, 2001).

Climate profile

Namibia is one of the biggest and driest countries in sub-Saharan Africa. It is characterized by high climatic variability in the form of persistent droughts, unpredictable and variable rainfall patterns, variability in temperatures and scarcity of water. Rainfall ranges from an average of 25 mm in the west to over 600 mm in the northeast. From a hydrological point of view, Namibia is an arid, water deficit country. High solar radiation, low humidity, and high temperature lead to very high evaporation rates, which vary between 3,800 mm per annum in the south to 2,600 mm per annum in the north. Over most of the country, potential evaporation is at least five times greater than average rainfall. The lowest temperatures occur during the dry season months of June to August. Mean monthly minimum temperatures do not, on average, fall below 0°C

Economic profile

According to the National Accounts compiled by the Namibian Statistics Agency (NSA) for 2019, the domestic economy slowed down, recording a decline of 1.6 % in real value as compared to a growth of 1.1 % in 2018. This decline was mainly attributable to the primary industries that recorded a contraction of 8.9 %. Furthermore, the secondary and tertiary industries recorded growth rates of 1.7 % and decline of 0.1 % compared to a growth of 1.0 % and a decline of 1.2 % in 2018, respectively. The main contributor to national GDP was the tertiary industries (58.3 %) followed by the secondary industries with 17.9 % and the primary industries with 16.4 % (NSA, Annual National Accounts-2019). GDP at current prices amounted to N$ 181,234 million in 2019 compared to N$ 181,009 million in 2018. At constant 2015 prices, the GDP was N$ 143,740 million in 2019 compared to N$ 146,151 million in 2014.

Energy

The most dominant energy source in Namibia is liquid fuel. It includes petrol and diesel and accounts for about 63 % of total net energy consumption, which is mainly used in the transport sector, followed by electricity with 17 % net consumption, coal with 5 % and the remaining 15 % from renewable sources such as hydro, solar, biomass and wind among others.

Currently, Namibia's electricity demand stands at 597 MW, and grows at an annual rate of 3 %. On the supply side, Namibia has currently only 3 major power generating stations, with an installed capacity of about 500 MW. The biggest one is the Ruacana Hydro Power station which generates about 332 MW of electricity, Van Eck Coal fuelled station generates about 120 MW and the Paratus and Anixas diesel power stations at the coast with 24 MW and 22.5 MW respectively (Konrad *et al*., 2013).

During the period 2015 to 2017, six solar power plants were commissioned with a total capacity of 29.5 MW. These are HopSol Otjiwarongo (5 MW) in Otjiwarongo, InnoSun Omburu (4.5 MW) in Omburu, HopSol Otjozondjupa (5MW) in Otjozondjupa, Ejuva I and Ejuva II (5 MW and 5 MW respectively) in Gobabis, and Rosh Pinah Power Plant (5 MW) in Rosh Pinah. Furthermore, in 2017 a proposal for a 5MW solar plant at Karibib was made by Mettle Solar (https://www.miga.org/project/karibib-solar-plant), and in 2019, a proposal for a 50 MW plant to be built in the town of Arandis by TeraSun Energy, a subsidiary or Natura Energy (https://www.afrik21.africa/en/namibia-natura-energy-to-build-50-mw-solar-power-plant-in-arandis/) were made.

The local supply still does not meet the demand and Namibia imports most of this difference from South Africa and other Southern Africa Development Community (SADC) member states. The present strategy aims at increasing the exploitation of local energy resources for electricity generation to reduce the country's dependence on foreign sources as well as for other purposes and to increase the share of renewable energy in the future energy mix. Namibia intends to tap solar and wind energy resources in the future while concurrently exploiting efficiently the invasive bush as a biomass energy source since the latter is proving so detrimental to the livestock sector by reducing the productivity of rangelands.

Transportation

Namibia's road network is regarded as one of the best on the continent with road construction and maintenance being at international standards. Namibia has a total road network of more than 64,189 km, including 5,477 km of tarred roads which link the country to the neighbouring countries Angola, Botswana, South Africa, Zambia, and Zimbabwe.

The country has two ports handling imported and exported merchandise and servicing the fishing industry. The only deep-sea harbour is Walvis Bay in the Erongo Region. The other harbour is Luderitz in the Karas Region. The Port of Walvis Bay receives approximately 3,000 vessels each year and handles about 5 million tonnes of cargo.

The railway network comprises 2,382 km of narrow-gauge track with the main line running from the border with South Africa via Keetmanshoop to Windhoek, Okahandja, Swakopmund and Walvis Bay. Omaruru, Otjiwarongo, Otavi, Tsumeb and Grootfontein are connected to the northern branch of the railway network.

Manufacturing industry

Namibia's manufacturing sector is constrained by its small domestic market, dependence on imported goods, limited availability of local capital, widely dispersed population, small skilled labour force with high relative wage rates, and subsidized competition from South Africa. The manufacturing sector, a priority sector under the NDP5 contributed 13.2% to national GDP in 2019. This performance was supported mainly by the following six sub-sectors - Other food products, Beverages, Basic non-ferrous metals, Grain Mill products, Diamond processing, Meat Processing, and Chemicals and related products which together accounted for 81.8% of the manufacturing share of GDP in 2019 despite the contribution to the GDP remaining at a relatively flat 11-12% from 2015 to 2019.

Waste

Namibia, as a medium income country with a growing wealthy urban middle class and significant urban drift, is feeling the pressure of amounts of waste generated on its facilities throughout the country and more especially in the urban areas. Solid municipal waste in dumped in landfills or open dumps while almost all urban settlements are connected to reticulated wastewater treatment systems. Management of the landfills and dumps are not at the highest standards and very often, the waste is burnt in the open dumps to reduce the volume or eliminate health risks. The general trend for regular collection of waste has been for an increase from 30.9% in 2001 to 36.1% in 2014 with roadside dumping decreasing from 14.7% to 9.7% during the same period. Namibia is projecting to add value to waste through conversion to energy which will also contribute to reducing GHG emissions.

Agriculture and forestry

Agriculture's share of the GDP grew steadily from 3.9% in 2014 up to 5.4% in 2018, before falling back to 4.5% in 2019 (NSA, Annual National Accounts 2014 and 2019). Despite its modest contribution in the country's GDP, agriculture impacts directly on the livelihood of 70% of the population. The production of white maize, wheat, pearl millet and livestock including cattle, goat and sheep is divided in the intensive commercial production units and the extensive communal production system. The commercial sector, though occupying 44% of land, involves only 10% of the population while the communal sector occupies 41% of the land and involves 60% of the population. Approximately 48% of Namibia's rural households depend on subsistence agriculture as their main source of income (NDP4).

Forests play an important role in the livelihood of the Namibian. Most rural communities (particularly in the higher rainfall areas of the north) depend directly on forest resources for use as fuel wood, building materials, fodder, food, and medicine. At the end of 2012, there were 32 registered community forests in Namibia. The use of all indigenous plant resources is regulated by the Directorate of Forestry (DoF) presently housed within the MEFT. Additionally, communal-area conservancies manage 158,247 km^2 which is about 19.2% of Namibia. This systematic management and sustainable use of forest resources strategy has contributed significantly to reduce deforestation and forest degradation with increasing removals of GHGs from the atmosphere.

Water Resources

Namibia is the driest country in Southern Africa. Water is a scarce resource and one of the major primary limiting factors to economic development. The effects of climate change, rapid population growth, and rural exodus pose additional challenges and threaten people's livelihoods as well as the balance of the ecosystems. Namibia's rainfall is skewed, with the north-east getting more that the west and south-western parts of the country. Of the water received by Namibia as precipitation, it is estimated that 2% ends up as surface run-off and a mere 1% becomes available to recharge groundwater. The balance of 97% is lost through direct evaporation (83%) and evapotranspiration (14%). Rainfall often evaporates before it reaches the ground. Another source of moisture comes from fog in the cooler coastal regions where it is an extremely valuable source of moisture to desert animals and plants.

The primary sources of water supply are perennial rivers, surface and groundwater (alluvial) storage on ephemeral rivers, and groundwater aquifers in various parent rocks. Additionally, unconventional water sources have been adopted to augment the limited traditional sources. About 45% of Namibia's water comes from groundwater sources, 33% from the border rivers, mainly in the north, and about 22% from impoundments on ephemeral rivers (Christelis and Struckmeier, 2001).

Fisheries

Namibia has one of the most productive fishing grounds in the world, primarily attributed to the Benguela Current. The up-welling caused by the current brings nutrient-rich waters up from the depths that stimulate the growth of microscopic marine organisms. These in turn support rich populations of fish, which form the basis of the marine fisheries sector. As is the case in other up-welling systems, relatively few species dominate, and their abundance can vary greatly in response to changing environmental conditions. Over 20 commercially important fish species are landed using various fishing techniques. The offshore commercial fishery represents the largest component of the fishing industry.

The sector is a substantial export earner, with over 85% of Namibia's fish output destined for international markets. After a sustained drop from a 4.5% contribution to GDP in 2005 to 2.8% in 2014, the fishing sector's contribution fell further to 2.6% in 2015, before stabilizing around 2.6-2.8% through to 2019 (NSA, Annual National Accounts 2014 and 2019). The stabilisation is due to harsher regulations to protect and manage the stocks through the issuance of fishing quotas.

Tourism

Namibia's unique landscapes and biodiversity support a rapidly developing tourism sector. Over the years, tourism has been developing into an important sector, contributing both directly and indirectly to national GDP. In 2019, a total of 1,6 million tourists visited Namibia, representing a 2.5% increase on arrivals recorded in 2018. Tourism also generates an important number of jobs, often in rural areas where it is otherwise difficult to obtain an employment. The sector also plays an important role in the reduction of poverty in rural areas through employment and income injection, especially in conservancies. Being reliant on the wildlife and scenery potential of Namibia, the tourism industry is thus vulnerable to the adverse impacts that climate change may have on these natural resources.

Health

Namibia's provision of health services is shared between the public and the private sector, the latter focusing on urban areas. The leading causes of disease burden (disability and premature mortality) in Namibia in 2013 (IHME, 2016) were: (i) HIV/AIDS, (ii) tuberculosis and (iii) lower respiratory infections. Between 1990 and 2004 life expectancy for males and females decreased by 9 and 12 years, respectively, mainly due to the HIV/AIDS epidemic, while between 2004 and 2013 the trend has reversed, life expectancy rising by 11 years for females and by 6 years for males. Infant and child mortality is comparatively low, but the maternal mortality ratio has increased, even though over 70% of births are delivered in hospitals. Malnutrition levels in children under the age of five years are as high as 38% in some regions.

2020 has added another serious challenge health wise to the country with the appearance of the COVID-19 pandemic. Namibia resisted well during the past year through the application of the recommendations of the World Health Organisation coupled with strict control of its borders, relative to arrivals and departures of citizens from severely affected countries. This pandemic is presently viewed with much concern by the health authorities because of the limits of the health services to cope with an extensive blowout of the pandemic. The pandemic is also seriously impacting the economy negatively.

Mitigation priorities

The key sectors and areas identified for mitigation span over all development sectors of the economy and the four IPCC sectors. Emphasis is laid on those sectors and categories responsible for the highest emissions as well as sink potentials as per the key category analysis and development strategies of Namibia. However, other win-win situations such as mitigation in the waste sector which is expected to

result in improvements in the health of the population has not been neglected despite its low contribution to national emissions. The main mitigation avenues are:

- Increasing the share of renewables in electricity generation.
- Increased energy efficiency and other DSM activities.
- Improved passenger and freight transport to reduce fossil fuel use.
- Reforestation and afforestation.
- Restoration of grasslands and rangeland.
- Promoting alternatives to reduce wood removals from forests and grasslands.
- Improved livestock husbandry practices.
- Enhancing soil carbon storage through improved agricultural practices.
- Conversion of solid waste to energy; and
- Improved solid and liquid waste management.

Adaptation priorities

Namibia, as one of the driest countries in sub-Saharan Africa, is dependent on development sectors highly sensitive to climate. Primary economic sectors which are natural resource based such as agriculture, fisheries, and mining account for about one third of the total GDP. More than half of the population depends on subsistence agriculture and in drought years, food shortages are a major concern in rural areas. Namibia is therefore highly vulnerable to climate change. The predicted temperature rise, and evaporation increase as well as higher rainfall variability will exacerbate the situation that Namibia is facing. The potential effects of these climatic changes could prove catastrophic to the communities, population, and economy at large. Thus, adaptation is of prime importance to the country and is high on the government's agenda to guarantee the welfare of the people while reducing risks and building resilience. Adaptation is thus an obligation for the country to fulfil within the international context.

Broad avenues for adaptation to climate change are:

- Improving technical capacity at the national and sub-national levels to develop a greater understanding of climate change and its impacts.
- Developing and implementing appropriate responses and adaptation strategies to reduce the impacts of floods, low rainfall and high temperatures on people, crops, livestock, ecosystems, infrastructure, and services.
- Implementing soil and water conservation policies and practices.
- Improving ecosystem management, protection, and conservation; and
- Developing common goals and facilitating better integration of different policies and practices in vulnerable sectors.

ES 2. National Greenhouse Gas Inventory

Introduction

In line with articles 4 and 12 of the UNFCCC, 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.

To provide the latest information on its GHG emissions, Namibia has submitted four national communications (NCs), three Biennial Update Reports, and presented its last four inventories as stand-alone reports NIR1 to NIR4 for maximizing transparency as advocated under the Paris Agreement. Thus, Namibia has to-date submitted eight GHG inventories detailing its emissions and sinks as components of its national communications and Biennial Update Reports.

Institutional arrangements for producing GHG inventories

Namibia consolidated the in-house production of its GHG inventory except for the support from a company's services for computation of emissions and report writing and an independent international consultant for performing the QA and capacity building to meet the enhanced transparency and higher standards of reporting due to lack of financial resources to maintain permanent staff for a full institutionalization of the process. The upfront segment of the process is a laborious exercise also as sufficient financial resources to support adequate human capacity remains a prominent limiting factor. Another factor is the numerous changes in the working groups following staff movements, promotions, and resignations.

The Climate Change Unit (CCU) of the MEFT monitors and coordinates the production of reports to the Convention, including the GHG inventories as National Focal Point of the Convention. The same framework adopted for the previous inventory (NIR4) compilation was followed. Collaboration with data providers, institutions, and organizations to support derivation of national emission factors and enable movement to Tier 2 were consolidated. Capacity building of the inventory working group members continued.

Coverage (Scope, Period and Gases)

This NIR5 covers the full territory of the country for the recommended time series 1990 to 2016 and the results are presented at the national level. The inventory addressed all the IPCC sectors Energy, Industrial Processes and Product Use (IPPU), Agriculture, Forestry, and Other Land Use (AFOLU) and Waste and categories subject to Activity Data (AD) availability. The gases covered in this inventory are the direct gases carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O) and hydro-fluorocarbons (HFCs) as well as the indirect gases nitrogen oxides (NO_x), carbon monoxide (CO), non-methane organic volatile compounds (NMVOCs) and sulphur dioxide (SO_2).

Methods and GWPs

The present national GHG inventory has been prepared in accordance with the latest *2006 IPCC Guidelines for National Greenhouse Gas Inventories* and using the IPCC Inventory Software version 2.691 for the compilations. As the IPCC 2006 Guidelines do not extensively cover all GHGs for all categories, it has been supplemented with the European Monitoring and Evaluation Program/European Environment Agency (EMEP/EEA) air pollutant emission inventory guidebook of 2016 for compiling estimates for nitrogen oxides (NO_x), carbon monoxide (CO), non-methane volatile organic compounds (NMVOCs) and sulphur dioxide (SO_2). Global Warming Potentials (GWP) as recommended by the IPCC have been used to convert GHGs other than CO_2 to the latter equivalent. Based on decision 17/CP.8, the values adopted were from the IPCC Second Assessment Report for all direct GHGs

Completeness

The completeness of the inventory was reviewed and one more sub-category within the Energy sector, namely Manufacture of Solid Fuels has been added for the full time series, bringing the coverage of categories to more than 99%. The survey being conducted to address emissions of SF_6 was not completed within the timeframe of this inventory and is continuing.

Activity Data and Emission Factors

Country-specific AD are readily available as a fairly good statistical system exists since 2003 whereby data pertaining to most of the socio-economic sectors are collected, verified and processed to produce official national statistics reports. Additional and/or missing data, and those required to meet the level of disaggregation for higher than the Tier 1 level, were sourced directly from both public and private sector operators by the working groups and coordinator. Data gaps were filled through personal contacts with

the stakeholders by the national experts and/or from results of surveys, scientific studies and by statistical modelling as per the splicing techniques recommended by IPCC. All the data collected during the inventory process have been stored in the software database and other information documented in worksheets and in the NIRs.

Country EFs were derived for the Tier 2 estimation of GHGs for some animal classes for enteric fermentation. Similarly, the same exercise was performed for the Land sector where stock factors have been derived to suit national circumstances. This is Good Practice towards enhancing the quality of the inventory and especially as these activity areas were major emitters based on previous inventory results. Additionally, default IPCC EFs for the remaining source categories were screened for their appropriateness before adoption, based on the situations under which they were developed and the extent to which these were representative of the national circumstances.

QA/QC procedures

QC and QA procedures, as defined in the *2006 IPCC Guidelines (IPCC, 2006)* have been implemented during the preparation of the inventory. Whenever there were inconsistencies or possible transcription errors made apparent during QC processes, the responsible institution was queried, the problem discussed and solved as far as possible. QA was undertaken by the independent international consultant who was not involved with the preparation of the inventory.

However, even if QA/QC procedures have been followed throughout the inventory process by the inventory compilers of the different IPCC sectors and the QA officer, a QA/QC plan has yet to be developed to fit within the domestic Measure, Report and Verify system under development. Thus, systematic records as per the *2006 IPCC Guidelines* are still to be developed under a dedicated QA/QC coordinator. This resulted from the lack of permanent personnel on the establishment, insufficient capacity and since the inventory management system is still being developed and implemented in the country.

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. The uncertainty in total emissions was estimated using the IPCC tool incorporated in the IPCC Inventory Software for individual years of the time series and the trend with the addition of one year at a time as from 1990 to 2016. Uncertainty levels (+/-) for the individual years of the period 1990 to 2016 varied from 26.8% to 29.4% while the trend assessment when adding one successive year on the base year 1990 for the years 1991 to 2016 ranged from 37.2% to 51.8%.

National Emissions

Aggregated national and sectoral emissions

Namibia remained a net GHG sink over the period 1990 to 2016 as the Land category removals exceeded emissions from the other categories. The net removal of CO_2 increased by 50% over these 27 years from 70,329 Gg in 1990 to 105,428 Gg in 2016. During the same period, the country recorded an increase of 8% in emissions, from 19,692 Gg CO_2-eq to 21,260 Gg CO_2-eq. The trend for the period 1990 to 2016 indicates that the total removals from the Land category increased from 90,021 Gg CO_2-eq in 1990 to 126,688 Gg CO_2-eq in 2016 (Figure ES1).

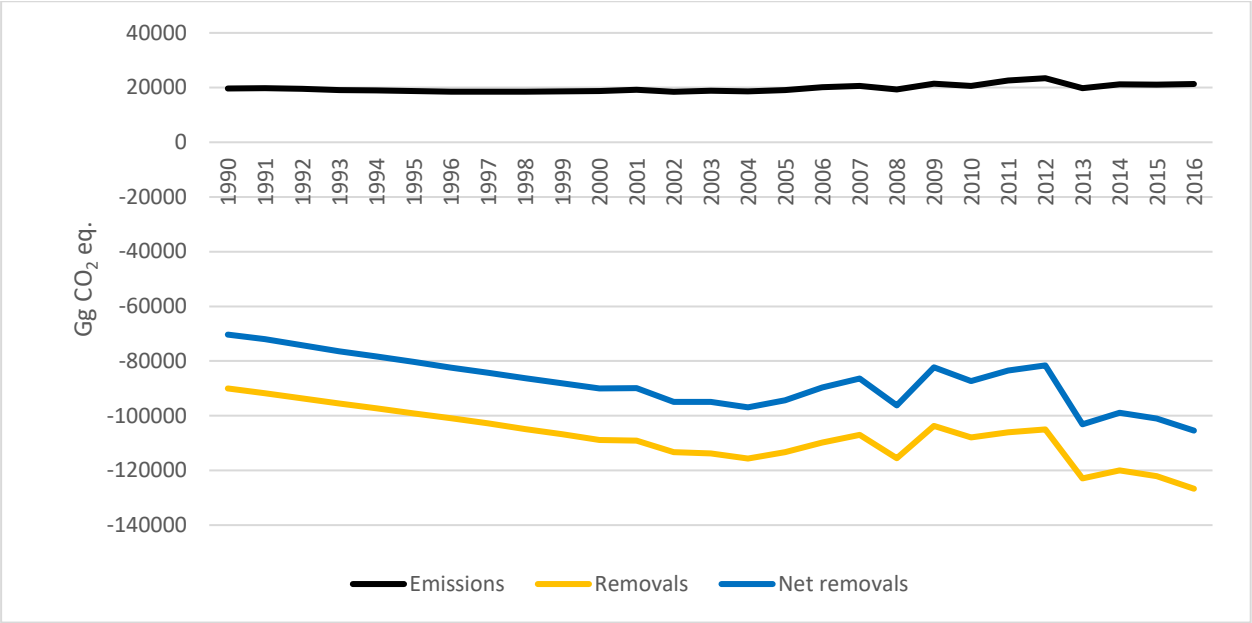

Figure ES1 - National emissions, removals and net removals (Gg CO_2-eq) (1990 – 2016)

Per capita emissions of GHG decreased gradually from 13.4 tonnes CO_2-eq in 1990 to reach 9.1 tonnes in 2016 (Figure ES2). The GDP emission index decreased almost steadily from 100 in the year 1990 to 35 in 2016 (Figure ES3).

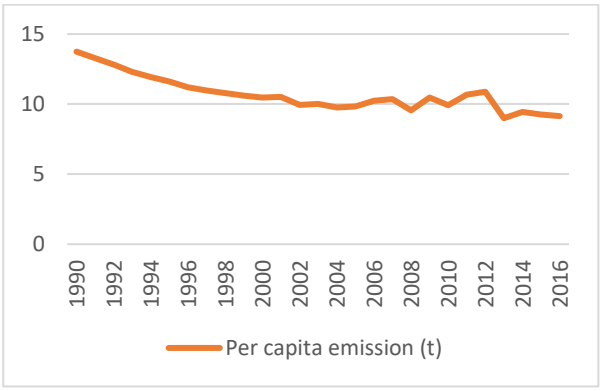

Figure ES2 - Per capita GHG emissions (1990 - 2016)

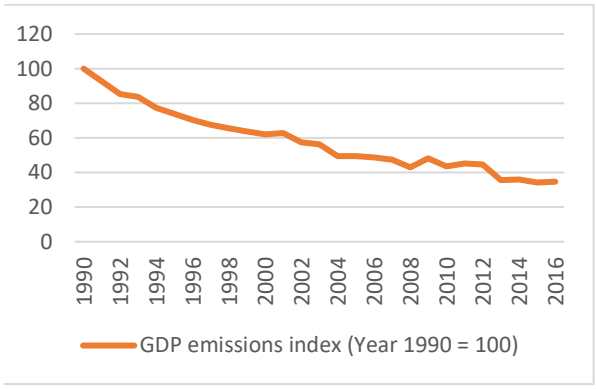

Figure ES3 - GDP emissions index (1990 - 2016)

National and sectoral emissions are presented in Table ES1. The AFOLU sector remained the leading emitter throughout this period followed by Energy, for all years under review. Following the setting up of new industries, the IPPU sector took over as the third emitter in lieu of the Waste sector as from the year 2005. Emissions from the AFOLU sector regressed by 9% from 18,481 Gg CO_2-eq in 1990 to 16,856 Gg CO_2- eq 2020, with highs and lows attributable to irregular extents of natural wildfires between the years. The share of GHG emissions from the AFOLU sector out of total national emissions regressed from 94% in 1990 to 81% in 2016 following the adoption of mitigation measures. Energy emissions increased from 1,117 Gg CO_2-eq (6.0%) of national emissions in 1990 to 3,791 Gg CO_2- eq (18%) in 2016 as depicted in Table ES1. During the period 1990 to 2016, emissions more than tripled, result of increased national demand. The contribution of the IPPU sector in total national emissions increased from 21 Gg CO_2-eq in 1990 to a peak of 482 Gg CO_2-eq in 2015 to regress to 401 Gg CO_2-eq in 2016 (Table ES1). The very sharp increase in GHG emissions in the IPPU sector is due to the commencement of the production of Zinc in 2003 and cement in 2011. Waste emissions on the other hand increased steadily but slowly over this period, from the 1990 level of 73 Gg CO_2-eq to 167 Gg CO_2-eq in 2016, representing a 130% increase.

In 2016, Energy contributed 18% of emissions, IPPU 2%, AFOLU 79% and Waste 1%.

Emissions by gas

The share of emissions by gas did not change during the period 1990 to 2016. The main contributor to the national GHG emissions remained CO_2 followed by CH_4 and N_2O. However, the share of CO_2 increased while those of CH_4 and N_2O regressed over the time series. Halogenated gases crept in as from 1993 with a slight increase over the period under review. In 2016, the share of the GHG emissions was as follows: 64% CO_2, 22% CH_4, 13% N_2O and 1% halogenated gases.

Key Category Analysis

There are four key categories in the quantitative level assessment for the year 2016, three of these from the AFOLU sector, of which enteric fermentation from Agriculture, the other two from Forestry and Other Land Use (FOLU) being Forest land Remaining Forest land and the last one is Road Transportation from the Energy sector. The results change quite drastically when considering the trend assessment covering the period 1990 to 2016. There are now nine key categories compared to the level assessment with four only. The four key categories under level assessment recur in the trend assessment also (Table ES1).

Table ES1 - Summary of Key Categories for level (2016) and trend (1990 to 2016) assessments

Number	IPCC category code	IPCC category	GHG	Identification criteria	Comment
1	3.B.1.a	Forest land Remaining Forest land	CO_2	L1,T1	Quantitative
2	3.B.3.b	Land Converted to Grassland	CO_2	L1,T1	Quantitative
3	3.A.1	Enteric Fermentation	CH_4	L1,T1	Quantitative
4	1.A.3.b	Road Transportation	CO_2	L1,T1	Quantitative
5	3.B.1.b	Land Converted to Forest land	CO_2	T1	Quantitative
6	3.C.1	Emissions from biomass burning	CH_4	T1	Quantitative
7	3.C.4	Direct N_2O Emissions from managed soils	N_2O	T1	Quantitative
8	3.C.1	Emissions from biomass burning	N_2O	T1	Quantitative
9	1.A.4	Other Sectors - Liquid Fuels	CO_2	T1	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.

Constraints and Gaps

Namibia has made significant progress in reporting on its emissions considering the four stand-alone NIRs produced. The country is still facing some challenges to track implementation of the Convention and generate reports of the required standard. To reduce uncertainties and aim at producing an inventory in line with TACCC principles and the Enhanced Transparency Framework of the Paris Agreement, Namibia is currently reviewing its national GHG inventory management system and institutional arrangements with support from the Secretariat. Namibia also welcomes the support received from the GEF to implement its Capacity Building Initiative for Transparency project that will further enable removal of constraints and gaps.

National GHG Inventory Improvement Plan

Challenges and shortcomings encountered during the preparation of the GHG inventory were noted and incorporated into the National Inventory Improvement Plan. This has been a recurrent exercise since at least the compilation of the past 5 inventories. Most of the least costly and resource demanding improvements have been made up to now. However, no detailed action plan to implement all the actions of the NIIP has been done because of lack of resources, namely insufficient funds.

ES 3. Mitigation actions and their effects

The Republic of Namibia, a non-Annex I country, initially had no obligation to reduce its GHG emissions as a signatory Party to the Convention. However, as per decisions 1/CP.19 and 1/CP.20 of the Conference of

the Parties, Namibia prepared and submitted its Intended Nationally Determined Contributions (INDC) to the UNFCCC. Since then, the Government of Namibia has reviewed and updated various policies and strategies to change its development agenda into a green low carbon economic pathway within the framework of the Sustainable Development Goals (SDG). Namibia has over the years reviewed and updated various important legislations and regulations in line with the new low carbon development strategy and has embarked on various projects and activities to reduce its emissions and increase its sink capacity.

Energy is a strategic resource for Namibia and in addition to renewable resources such as hydro, wood/bush biomass and charcoal, the country continues to rely on imports of oil and gas to meet its energy needs. Namibia still imports a significant portion of its electricity which is generated using coal mainly from South Africa. Namibia is moving towards electricity self-sufficiency through the adoption of a cleaner fuel mix for generation, by implementing programmes to generate electricity from renewable sources such as solar (PV, CSP and thermal), wind plants through Independent Power Producers (IPPs) and biomass from the invasive bush.

In addition to the deployment of renewable energy resources, energy efficiency is a key emission mitigation strategy. This will require consumers and businesses to be more energy conscious and adjust their daily activities, choices, and processes. To encourage energy efficiency, Namibia prices fuel and electricity according to market supply and demand, and do not subsidize energy costs.

As part of its comprehensive strategy to promote energy efficiency, Government has identified the following areas for action:

- Promoting the adoption of energy-efficient measures, standards, and technologies by addressing market barriers to energy efficiency.
- Investigating options to reduce, restrict or levy the import and sale of consumables and appliances not meeting set energy efficiency standards.
- Building capabilities to sustain and drive energy efficiency initiatives and developing the local knowledge base and expertise in energy management.
- Raising awareness by reaching out to the public and businesses for the promotion of energy-efficient behaviour and practices.
- Support research and development to enhance Namibia's capabilities to adopt energy-efficient technologies.

Namibia is committed to move ahead with its mitigation programme in the different sectors. In the building sector, the objective is to reach at least 80% of the total gross floor area meeting Green Buildings standards by 2030. In the transport sector, the country has a high public transport mode share. To further encourage the use of public transport, Namibia will increase its rail network from the present 230 km to 360 km by 2030. This will enable more households to be within a ten-minute walk of a train station. Namibia also has one of the most stringent and innovative system to control vehicle ownership and usage, through a vehicular quota and road pricing system. Since February 2018, the permissible growth rate of private vehicle population has been reduced to zero per cent, from 0.25%, effectively capping the growth of private vehicles. In 2013, a system of rebates and surcharges was introduced to encourage car buyers to purchase low-emission cars. In the same vein and in 2016, Namibia implemented a carbon tax starting at N$40 per g/km of CO_2 emitted to apply between 2016 and 2020 as a transition period. The intent is to increase this carbon tax to cover all vehicle categories by 2030.

Different measures have been evaluated for the Energy, AFOLU and Waste sectors and presented in the NC4 (Republic of Namibia, 2020). The abatement potential (Gg CO_2-eq) for the four IPCC sectors and

summed up for the national level, is given in Table ES2. The mitigation potential are 3,804, 10,144 and 20,889 Gg CO_2-eq in 2025, 2030 and 2035 respectively.

Table ES2 - Mitigation potential (Gg CO_2-eq) for the years 2025, 2030 and 2035

Year	Energy	IPPU	AFOLU	Waste	Total
2025	3,665.2	43.8	-28.5	123.1	3803.6
2030	5,612.6	112.8	4,254.3	164.3	10,144.0
2035	7,111.0	169.8	13,395.0	212.8	20,888.6

ES 4. Information on domestic Measurement, Reporting and Verification

The Bali Action Plan introduced "enhanced climate reporting" which sets out global MRV architecture (UNFCCC, 2007). It established a clear process for developing countries to prepare and submit NCs every 4 years and BURs every 2 years followed by consideration through a two-tier international consultation and analysis (ICA) mechanism. Apart from introducing new timelines for reporting, it also encouraged national governments to establish a domestic MRV system. Article 13 of the Paris Agreement (PA) introduced an Enhanced Transparency Framework (ETF) with new additional reporting requirements. In response to the call to establish a domestic MRV system, Namibia launched a Climate Ambitious Reporting Programme (G-CARP) (UNFCCC, 2016b). The G-CARP aims to facilitate the establishment of an integrated climate data management system that is capable of supporting the preparation of national and international reports including on GHG emissions, climate actions implemented, financial and technical support received and tracking of NDC targets and indicators (UNFCCC, 2016a, 2020).

The institutional arrangements for the MRV of GHG emissions are not yet fully operational but still under development. The development of national GHG emission inventories has been made mainly through the Project Management Unit of the CCU with the support of international consultants within the reporting frameworks of NCs and BURs. No law or regulation formalizes the institutional setup for the inventory preparation and there are no formal contracts (or memorandum of understanding) between institutions to ensure data collection and validation of the inventory in a sustainable manner. Furthermore, inventories are only prepared when GEF funds are secured and developed according to the time schedule of the project. Special emphasis is being laid on the rapid development and implementation of a national inventory management system to produce GHG inventories on a sustainable basis. The process has been quite slow due to dearth of funds but will accelerate now with the approval of the CBIT project as the GHG inventory management system cum MRV of emissions will be pivotal to the ETF of the PA.

Reporting on mitigation actions implemented by the country in previous BURs proved very challenging due to a paucity of information on the status and progress of activities implemented. The information provided did not reflect the real status when in fact there are numerous mitigation actions completed or underway in Namibia to implement the Convention as per its obligations. The gender dimensions of mitigation actions were not articulated either. This situation is attributed to the fact that there existed no formal recording system for tracking these mitigation actions within the Namibian institutions and because it was not a reporting requirement. Of prime importance within the reporting context now and to tap needed resources while being transparent and meeting the obligations of the PA, Namibia must develop and implement robust MRV systems to track and report on both Mitigation and Support received before rolling out the activities of its NDC in addition to MRV of emissions. The existing arrangements must be reviewed and upgraded to be fully operational and to deliver to reporting standards. Namibia also counts on basic institutional arrangements for the MRV of NAMAs. NAMA's MRV shall be integrated within the mitigation MRV to ensure the information is used to track the progress of NDCs.

Lack of institutional capacity to manage climate related MRV at MEFT, the focal point ministry for climate change. Specifically, there is no designated office with qualified employees and computer hardware and software to oversee MRV systems and activities across government agencies and industry. This constraint limits the ability of the government to align MRV activities with international requirements and country priorities. Also, electronic systems for MRV in certain sectors cannot be fully implemented due to a lack of trained personnel with a mandate to use them.

Proposals on the revision of the MRV system would need to consider the following items:

- The roles and responsibilities needed by the MRV system, such as entity responsible for the compilation of the inventory, an entity responsible for the coordination of the MRV of support, an entity responsible for QA/QC need to be specified in the MRV system.
- The linkages between MRV components are not addressed, and the integration of the Monitoring and Evaluation existent system with the new components needs to be reinforced.
- The MRV system of support does not count with an entity responsible for coordinating data collection in line with the national finance management system and gathering data.
- The role of the financial entities (data providers for the MRV of support) and their relationship with NSA is not clear.

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

Namibia has made some progress on enhancing of technical capabilities and capacity building of national experts for reporting to the Convention within the framework of NCs and BURs through support received from the GEF. This is insufficient since it covered reporting only while developing of technical capabilities and capacity building for the development and implementation of mitigation projects remain partially developed and should be urgently addressed.

Namibia has been developing and implementing the necessary institutional arrangements for quite some time now and needs to urgently consolidate the existing reporting framework. Human and other resources are still lacking. The country should also develop operational MRV systems to track emissions, mitigation, and support. The approval of the CBIT project will provide the country with much needed resources to develop and implement its MRV systems to track the implementation of the NDC.

Implementation of the Convention as per the country's low-carbon strategy is even a more gigantic task because of the significant amounts of funding required to develop and implement mitigation projects. Funding implementation of mitigation actions as estimated in the NDC is consequential and nearing some 45 billion USD. Namibia, as a developing country is already facing difficult challenges to maintain the welfare of its population due to various constraints and this has worsened following the economic downturn resulting from the COVID-19 pandemic. Under such circumstances, the country will not be able to allocate adequate funding to meet the climate change agenda and relies heavily on support from the international community. Up to now, Namibia has tapped some funds, mainly from the Green Climate Fund, to support its mitigation strategy.

Mitigation of climate change rests on the adoption of the latest technologies and its smooth transfer that demands for appropriate and adequate human and technical capacities in addition to funds. Namibia has not been able to undertake a recent assessment of its technology needs and transfer for mitigating and adapting to climate change due to unavailability of enough resources. However, when preparing NCs, technology needs assessments have been conducted for measures identified when performing mitigation and adaptation assessments to enable for the consideration of the most recent and efficient technologies.

In this regard, Namibia welcomes support to review and update its technology needs assessment. Such an update will be very useful to develop appropriate mitigation and adaptation plans.

Further strengthening of capacity of institutions and national exerts identified follows:

- Training on the use of the 2006 IPCC Guidelines and software, data processing and management strategies.
- Capacity building on GHG data management.
- Improvement in mitigation baseline setting.
- Continuous training of national GHG inventory experts.
- Development of mitigation scenarios for the non-energy sector (AFOLU &Waste), especially marginal abatement curves.
- Improvements in the institutional arrangements and MRV systems.
- Assessment and monitoring of the effects of GHGs on the policy level mitigation actions.

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

The Global Environment Facility (GEF) provided USD 352 000 to the Ministry of Environment, Forestry and Tourism of the Government of Namibia, through the UNDP country office, the implementing agency, to support the country prepare its BUR4 for the fulfilment of its obligations under the UNFCCC.

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

Namibia is preparing for the implementation of the voluntary components of its NDC which is presently being reviewed to raise the ambition as per the PA, to reduce emissions and increase sinks as laid out in the mitigation chapter of this report. Namibia has not yet identified and worked on NAMAs extensively except for one project designed on rural electrification using renewable energy in off-grid systems. Other areas of intervention are road transport, electricity generation, residential, cement production, livestock, wood removals and solid waste sectors while increasing sinks in the forests and soils.

Namibia cannot disregard adaptation to climate change as its consequences can be disastrous to not only the economy but also to its citizens, especially the poorest and most vulnerable segments of the population as well as the environment and ecosystems which hosts unique biodiversity. Adaptation to climate change has been an unconditional part of the national development programme to build resilience. The vulnerability of the economy is clear considering the regressing contribution to national GDP in two vital sectors. Agriculture, which was contributing more than 5% of national GDP in the past, saw its contribution regress to 4.5% in 2019. The Fisheries sector contribution to the GDP which stood at just below 5% in 2007, declined to around 3% in 2019. This in turn affected the manufacturing industries based on Agriculture and Fishing, threatening food security and the subsistence livelihood of the communities.

1 National Circumstances

1.1 Introduction

This section reviews and updates Namibia's national circumstances with respect to the United Nations Framework Convention on Climate Change (UNFCCC), discusses the current institutional arrangement and future improvements needed to address the more demanding reporting requirements of UNFCCC and the Enhanced Transparency Framework (ETF) of the Paris Agreement (PA), emphasising on key sectors, development priorities and issues related to climate change.

1.2 Convention Obligations

The UNFCCC was adopted in 1992 at the UN Conference on Environment and Sustainable Development in Rio de Janeiro, Brazil. The Convention came into force on 21 March 1994. The Republic of Namibia ratified the Convention on 16 May 1995 as a Non-Annex 1 Party and this decision came into effect on 14 August 1995. The country signed and ratified the Paris Agreement on 22 April 2016 and 21 September 2016, respectively. Namibia is currently updating its NDC and implementing the Capacity Building Initiative for Transparency project.

Under Article 4.1 (a) of the Convention, each party must communicate to the Conference of the Parties (COP) information related to implementation, in accordance with Article 12 in its national communication. Further, according to Decisions 1/CP.16, *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* as per the Guidelines provided in accordance with Decision 2/CP.17. Decision 18/CMA.1 requires developing countries to prepare and submit Biennial Transparency Reports (BTRs) every 2 years in lieu of Biennial Update Reports (Bus) to meet the ETF of the PA.

To meet its reporting obligations, Namibia has submitted four national communications (NCs) and three BURs, the Republic of Namibia being the first developing country to submit the latter in 2014. The planned submission date of the BUR4 was December 2020 to comply with the inventory year 2016 being within 4 years of submission as per Decision 2/CP.17 but unfortunately, this could not materialize due to the delay in accessing funds. Moreover, the COVID-19 pandemic seriously disrupted the planned schedule of activities In line with the latest COP decisions, Namibia has presented its last four inventories as stand-alone reports, NIR1 to NIR4, for maximizing transparency as advocated under the PA. Thus, Namibia has to-date submitted seven GHG inventories detailing its emissions and sinks as components of its NCs and BURs. Namibia has now prepared its eighth national inventory in the best possible transparent manner and reporting the findings in the NIR5 and as a chapter in the BUR4 along with other actions taken to implement the Convention. Additionally, Namibia prepared and submitted its Intended Nationally Determined Contributions during COP 21 in Paris. All these reports have been prepared with support from the GEF through UNDP. The reporting guidelines adopted during COP 17 for the preparation of BURs from Parties not included in Annex I to the Convention and contained in annex III of decision 2/CP.17 have been adopted for the preparation of this report.

1.3 Long-term vision for Namibia

Prosperity, interpersonal harmony, peace, and political stability are the over-arching targeted national goals underlying the development agenda spelt out in Namibia Vision 2030, the Policy Framework for Long-term National Development of the country. The operationalization of the broad and unifying vision

of the policy framework is to be achieved through a series of National Development Plans (NDPs) which in turn provide specific, actualised development goals, as well as strategic directions for implementation.

One of the key mandates of the current NDP5 is to expedite the implementation of Namibia's development strategy with respect to identified high-level national priorities, desired outcomes, and strategic initiatives. The four priority areas identified in the NDP5 are, Basic enablers, the Economy, the Environment, and the Community.

The four pillars are:

- Economic progression.
- Social Transformation.
- Environmental Sustainability; and
- Good Governance.

It is worth noting the importance given to climate change in this NDP5 with the latter being clearly identified as an area for priority action under the pillar Environmental Sustainability.

The stated economic priorities of Namibia in the NDP5 are Logistics, Tourism, Manufacturing and Agriculture. Again, it is worth noting that the underlying economic sectors are vulnerable to climate change.

Though not expressed on its own, climate change stands high on the agenda of Namibia. The country is highly committed to implement the Convention to play its role as a signatory Party, by contributing in the international effort to curb down emissions and increase sinks of GHGs while investing in adaptation to climate change impacts. The potential for mitigation is clearly spelled out in the INDC of Namibia while more details on the country's efforts on adaptation can be obtained from the NC4.

1.4 Institutional Arrangements for implementing the Convention

The Cabinet of Namibia is the Government entity entrusted with the overall responsibility for the development of policies, including those on climate change. The National Climate Change Committee (NCCC) oversees the implementation of the climate change policy, including the preparation of the reports for submission to the Convention and plays an advisory role to Government on climate change issues. It comprises representatives of the various ministries and other stakeholders such as the private sector and NGOs amongst others. Ministry of Environment, Forestry and Tourism (MEFT), the official ministry acting as national focal point of the Convention, is responsible for coordinating and implementing climate change activities, including the preparation of both the NCs and BURs to enable the country to meet its reporting obligations. This is done through the Climate Change Unit (CCU) established within the Department of Environmental Affairs (DEA).

The NCCC was established in 1999 by MET to follow up on further obligations to the UNFCCC and establish an action plan which would enable the country to meet the said objectives. As a formalised and multi-sectoral committee, the NCCC provides the support required by the CCU by advising and guiding it for sector-specific and cross-sector implementation and coordination of climate change activities. The NCCC is chaired by MEFT and the deputy chair is the National Meteorological Service of the Ministry of Works and Transport. The NCCC reports to the Executive Officer of MEFT via the head of the DEA. The NCCC has the powers to establish working groups and subcommittees as required for implementing and conducting specific climate change activities. Such working groups have been active and very useful for overseeing and providing guidance on the different thematic areas during the preparation of NCs and BURs. Given that climate change has a bearing on all socio-economic sectors, various Ministries, Organizations and Agencies actively address climate change related issues, either solely or in collaboration with other

stakeholders as required. Usually, the CCU within MEFT directly assists these different bodies with planning, development, implementation, and coordination of the activities at the local, regional and national levels as required. Existing local and regional structures also collaborate and support the implementation of climate change activities.

Preparation of NCs was on an *ad-hoc* basis and did not require a permanent set-up that would have proven too onerous for the country being given the scarcity of resources. Thus, reporting on the different thematic areas was outsourced and the CCU of MEFT coordinated the whole process until the final report had been circulated, reviewed and validated by all stakeholders of the NCCC for submission to the Cabinet for final clearance and submission to the COP. With the enhancement of the reporting requirements that came into force since the last few years and the higher standards of the NCs and detailed information required for the BURs, the initial institutional arrangements became inappropriate. The recent situation demanded for a permanent structure to enable the sustainable production of these reports while guaranteeing their quality. In addition, there is a need to develop and establish permanent systems for Monitoring, Reporting and Verifying (MRV) mitigation actions within the framework of NDCs and other activities related to the Convention for Namibia to honour its commitments relative to the ETF of the PA.

Conscious that the existing institutional arrangements were no longer appropriate and suitable under these new circumstances, MEFT reviewed the initial ad-hoc set-up towards developing and implementing new and more robust sustainable systems for meeting the enhanced and more frequent reporting obligations.

One important decision was to shift from outsourcing the different elements of the Convention reports to having them produced in-house. While the NCCC and the CCU were kept in place, an institutional mapping was done by the latter, which kept the responsibility of coordinating the production of the reports, to identify all stakeholders who would have a role and contribution to bring in the production of better quality NCs, the BURs and development of the MRV systems. A round of one-on-one institutional consultations to engage stakeholders was made and this was followed by formalization through official letters inviting nominations of representatives. Nominees were then called for a brainstorming session to present them the new needs for meeting reporting standards, to discuss implications for the institutions and agree on their role, contribution, and responsibilities, namely for the key GHG inventory component. It became evident during these consultations that there existed a serious lack of capacity. The consensus was to try, with minimal outsourcing. Concurrently, this will serve for capacity building to enable the stakeholders assume their new responsibilities.

Within the present institutional arrangements, there will be a sharing of responsibilities with the coordinating body taking on most of the planning, preparation, quality control, archiving, evaluation and validation and the other stakeholders, within working groups, concentrating on the preparation of the more technical components, including data collection and validation, performing technical tasks like compilation of the GHG inventory, performing mitigation and vulnerability assessments, producing draft reports and documenting these. Special emphasis was laid when creating the working groups to ensure equitable gender representation. In fact, two out of the four working groups are headed by women which exemplifies women empowerment within the system.

During the exercise of strengthening of the existing institutional arrangements, numerous and very daunting challenges cropped up. The most urgent ones were:

- Insufficient capacity of the coordinating body as well as lack of institutional and technical skills on the different thematic areas of the NCs and BURs.
- To maintain a motivated permanent coordinating body and/or personnel.

- Staff scarcity / unavailability in collaborating institutions due to their already overloaded schedules and staff turn-over; and
- Lack of incentives and adequate funds to develop and maintain a permanent system in place.

It was also evident that the development and implementation of robust institutional arrangements will take considerable time to become fully operational and run smoothly. It is anticipated that this will take an additional two to three rounds of BURs and NCs, to take care of the ETF and BTRs of the PA. The present institutional arrangements are depicted in Figure 1.1.

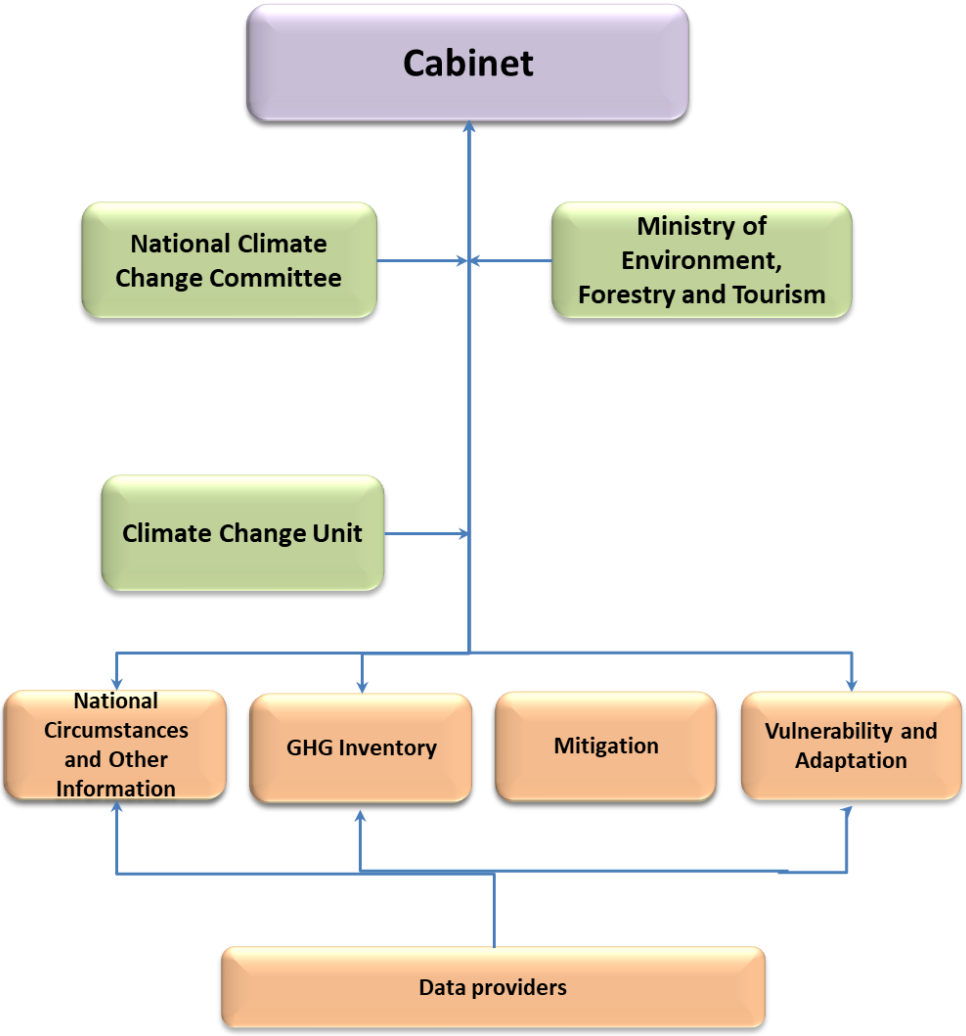

Figure 1.1: Institutional arrangements for implementing the Convention

1.5 Geographical Characteristics

The Republic of Namibia is situated in the south-western region of the African continent and lies between latitude 17° and 29°S and longitude 11° and 26°E. The country covers a land area of 825,418 km^2 and has a coastline 1,500 km long on the South Atlantic Ocean. Namibia shares borders with Angola in the North, Zambia in the north-east, Botswana in the east and South Africa in the south.

Namibia consists of five geographical areas, namely, the central plateau, the Namib Desert, the Great Escarpment, the Bushveld and the Kalahari Desert.

The physical geographic context of Namibia is determined by its position at the border of the continental shelf of the southern African subcontinent in the climatic sphere of influence of the Tropic of Capricorn and the cold Benguela Current. The land surface ascends from the Namib Desert to the mountains of the continental border range with peaks at 2,606 metres above mean sea level (mamsl). To the east and north the country then descends into the Kalahari Basin with a mean altitude of 1000 mamsl.

1.6 Climate

Namibia is one of the biggest and driest countries in sub-Saharan Africa. It is characterized by high climatic variability in the form of persistent droughts, unpredictable and variable rainfall patterns, variability in temperatures and scarcity of water. The climate of Namibia is a consequence of the country's location on the south-western side of the African continent, situated at the interface between different climate systems. The cold Benguela Current along the west coast and Namibia's position, straddling the sub-tropical high-pressure belt, determine the main features of the climate. The Benguela Current brings in cold water to its western shores. The climate of the northern part of the country is influenced by the Inter-Tropical Convergence Zone (ITCZ) and the Mid-Latitude High Pressure Zone, while the southern part of the country lies at the interface between the Mid-Latitude High Pressure Zone and the Temperate Zone. The different seasons experienced in Namibia are driven by the northward and southward movements of these zones, in response to the apparent movement of the sun.

The cold water from the western shores (Benguela Current) is adverted from the south and is partly driven by a high-pressure system over the South Atlantic. The combination of cold water and high pressures leads to subsidence of cold dry air over much of the country which commonly suppresses rainfall. This situation is dominant during most of the year, except in summer when heating of the continent is greatest and the southerly position of the ITCZ draws moisture and rainfall from the tropics over northern and eastern Namibia. Therefore, the ITCZ and the Temperate Zone bring rainfall, while the Mid-Latitude High Pressure Zone brings drier conditions.

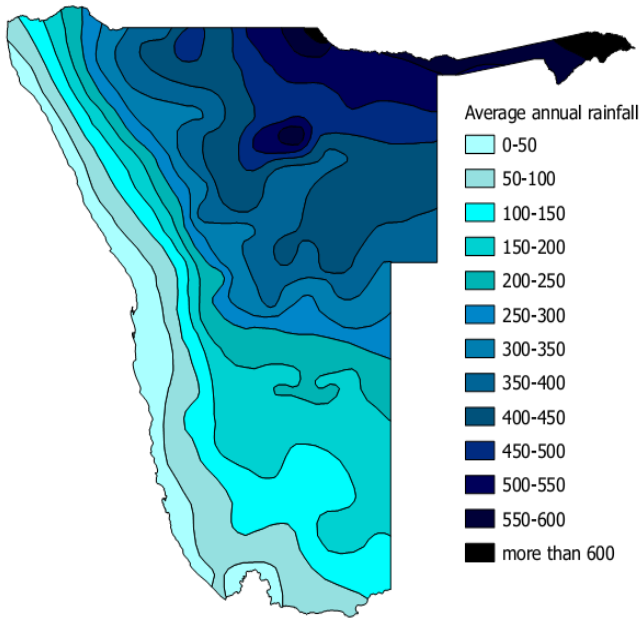

Figure 1.2 - Distribution of average annual total rainfall in Namibia

The movement of the ITCZ towards the south during the Namibian summer results in the rainfall season, normally starting in November and ending in April. In the far south, the Temperate Zone is moving northwards during the winter, resulting in the winter rains that occur in the far south-west of the country. Small variations in the timing of these movements result in the considerable differences in the weather experienced in Namibia from one year to another.

The mean annual rainfall ranges from just above 600 mm in the north-east to less than 25 mm in the south-west and west of the country (Figure 1.2). The rainfall isohyets generally follow a gradient from the north-east to the south-west. There are exceptions from this general pattern, e.g., the maize triangle of Tsumeb, Grootberg and Otavi receives more rainfall than would be expected in that geographic location. The reason for this is the undulating topography, which gives rise to orographic rainfall. On the other hand, the coastal zone receives almost no rainfall at all.

Most rain occurs in the summer months of November to April in the form of localized showers and thunderstorms. In the extreme south-west, winter rain and even snow can be expected between June and August. The inter-annual coefficient of variation of rainfall is very high, ranging from 25% in the north-east to >80% in the south-west. At some places in the southern parts of the country, winter rains account for up to 50% of annual rainfall. In the western part of the Namib Desert, coastal fog is an important source of water for the desert fauna and flora. Fog precipitation is five times greater than that of rain and is far more predictable.

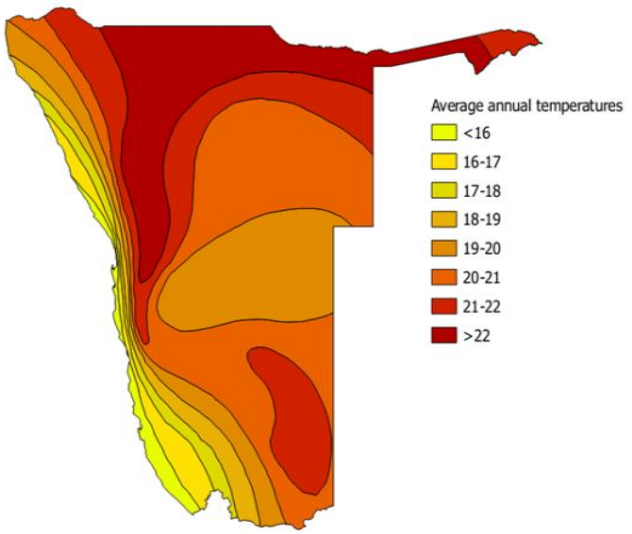

Figure 1.3 - Average annual temperature in Namibia

Namibia is characterized by high temperatures (Figure 1.33). Apart from the coastal zone, there is a marked seasonal temperature regime, with the highest temperatures occurring just before the wet season in the wetter areas or during the wet season in the drier areas.

The lowest temperatures occur during the dry season months of June to August. Mean monthly minimum temperatures do not, on average, fall below 0°C. However, several climate stations in the central and southern parts of Namibia have recorded individual years with negative mean minimum monthly temperatures, and individual days of frost occur widely.

From a hydrological point of view, Namibia is an arid, water deficient country. High solar radiation, low humidity and high temperature lead to very high evaporation rates, which vary between 3,800 mm per annum in the south to 2,600 mm per annum in the north. Over most of the country, potential evaporation is at least five times greater than average rainfall. In those areas where rainfall is at a minimum, evaporation is at a maximum. Surface water sources such as dams are subjected to high evaporation rates.

Wind speeds are generally low in Namibia. Winds exceed a mean speed of 3 m/s only at the coast and exceed a mean speed of 2 m/s only at isolated climate stations inland, e.g., Keetmanshoop. These winds, and the occasional stronger gusts, do not cause any real problem apart from some wind erosion in the drier parts of the country during the driest part of the year. Away from the coast, relative humidity averages between 25% and 70%.

Despite its very dry climate, Namibia holds a remarkable variety of species, habitats and ecosystems ranging from deserts to subtropical wetlands and savannas. Namibia is one of the very few countries in Africa with internationally recognized “biodiversity hotspot”. Namibia’s most significant “biodiversity hotspot” is the Sperrgebiet, which is the restricted diamond mining area in the Succulent Karoo floral kingdom, shared with South Africa. The Succulent Karoo is the world’s only arid hotspot. It constitutes a refuge for an exceptional level of succulent plant diversity, shaped by the winter rainfall and fog of the Southern Namib Desert. A large portion of its plants is endemic (MEFT, 2001) and climate change is a serious threat to this biodiversity.

1.7 Water Resources

Namibia is the driest country in Southern Africa. Water is a scarce resource and one of the major primary limiting factors to economic development in Namibia. The effects of climate change, rapid population growth, and rural exodus pose additional challenges and threaten people’s livelihoods as well as the balance of the ecosystems. Namibia’s rainfall is skewed, with the north-east getting more than the west and south-western parts of the country. Namibia’s international boundaries are marked by the Kunene river in the north-west, the Okavango river in the central north, the Zambezi and Kwando rivers in the north-east and the Orange river in the south. Perennial surface water resources are found only in these rivers which are all shared with neighbouring riparian states with an obligation for them to be managed according to the relevant rules of international water law.

Of the water that Namibia receives as precipitation, it is estimated that only 2% ends up as surface run-off and a mere 1% becomes available to recharge groundwater. The balance of 97% is lost through direct evaporation (83%) and evapotranspiration (14%). Rainfall often evaporates before it reaches the ground. Another source of moisture comes from fog in the cooler coastal regions where it is an extremely valuable source of moisture to desert animals and plants.

The primary sources of water supply are perennial rivers, surface and groundwater (alluvial) storage on ephemeral rivers, and groundwater aquifers in various parent rocks. Additionally, unconventional water sources have been adopted to augment the limited traditional sources. About 45% of Namibia’s water comes from groundwater sources, 33% from the Border Rivers, mainly in the north, and about 22% from impoundments on ephemeral rivers (Christelis and Struckmeier, 2001).

1.8 Agriculture and Forestry

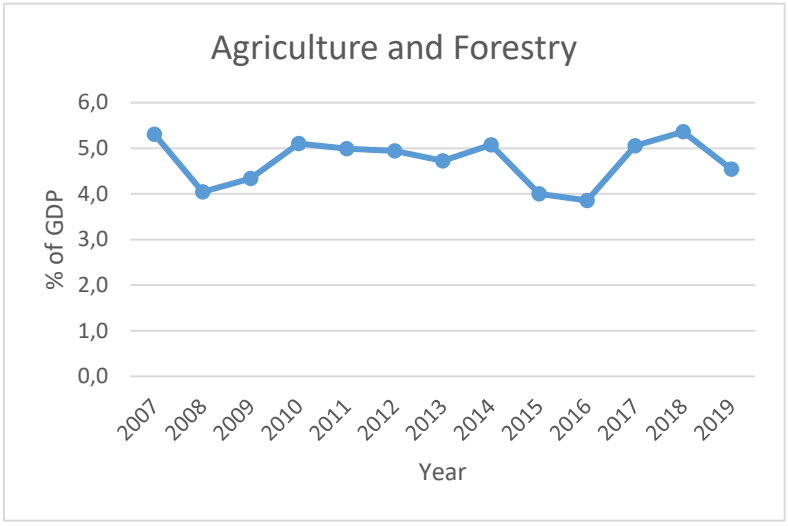

Figure 1.4 - Contribution of agriculture and forestry to national GDP

The share of Agriculture and Forestry in GDP has been relatively flat over the years, and stood at 4.5% in 2019, slightly below the average of 4.5% for the 2007-2019 period (Figure 1.4) (NSA, Annual National Accounts 2014 and 2019). However, despite its modest contribution in the country's GDP, agriculture impacts directly on the livelihood of 70% of the population. The production of white maize, wheat, pearl millet and livestock including cattle, goat and sheep is divided in the intensive commercial production units and the extensive communal production system. The commercial sector though occupying 44% of land involves only 10% of population while the communal sector occupies 41% of the land and involves 60% of the population.

Approximately 48% of Namibia's rural households depend on subsistence agriculture as their main source of income (NDP4). The majority of rural communities, particularly in the higher rainfall areas of the north, depend directly on forest resources for use as fuel wood, building materials, fodder, food and medicine. It is necessary to ensure the systematic management and sustainability of forest resources.

The variability of climate, particularly rainfall, has a profound impact on the availability aspect of food security. The prolonged drought at the start of this decade have highlighted this important feature of the Namibian society. A 2013 survey by the FAO revealed that 330,000 people particularly in the poor north-western areas are food insecure and a further 447,000 moderately food insecure. This situation also puts pressure on forest resources.

1.8.1 Communal-area conservancies

Community conservation in Namibia covers over 159,755 km^2 which is about 52.2% of all communal land with about 172,000 residents. Of this area, communal-area conservancies manage 158,247 km^2 which is about 19.2% of Namibia. From 1991 to 2012, community conservation has contributed about N$ 2.9 billion to Namibia's net national income. During the year 2012 alone, community conservation generated over N$ 58.3 million for local communities. In the same year, community conservation facilitated 6,477 jobs and 55 conservancies had a total of 99 enterprises based on natural resources (NACSO, 2012). Community conservation also helps in building resilience to climate change, empowers and promotes the welfare of women and indigenous people.

1.8.2 Community forests

At the end of 2012, there were 32 registered community forests in Namibia. The use of all indigenous plant resources is regulated by the Directorate of Forestry (DoF) within MEFT. The Forestry Act of 2001 and the Forestry Amendment Act of 2005 enable the registration of community forests through a written agreement between the Directorate and a committee elected by a community with traditional rights over a defined area of land. The agreement is based on an approved management plan that outlines the use of resources. All residents of community forests have equal access to the forest and the use of its produce. Community forests have the right to control the use of all forest produce, as well as grazing, cropping and the building of infrastructure within the classified forest (NACSO, 2012). These enactments and the declaration of community forest contributed significantly in forest management, reducing forest

degradation while optimizing the exploitation of forest resources by the communities, especially women and the indigenous people.

1.9 Fisheries

Namibia has one of the most productive fishing grounds in the world, primarily attributed to the Benguela Current. The up-welling caused by the current brings nutrient-rich waters up from the depths that stimulate the growth of microscopic marine organisms. These in turn support rich populations of fish, which form the basis of the marine fisheries sector. As is the case in other up-welling systems, relatively few species dominate, and their abundance can vary greatly in response to changing environmental conditions. Over 20 commercially important fish species are landed using various fishing methods. The offshore commercial fishery represents the largest component of the fishing industry. Small pelagic (open water) species (pilchard, anchovy and juvenile mackerel) and lobster are fished along the shallower onshore waters on the continental shelf. Large pelagic species including adult mackerel, demersal (bottom dwelling) hake and other deep-sea species, such as monkfish, sole and crab, are fished in the waters further offshore.

Since independence in 1990, the fishing industry has grown to become one of the pillars of the Namibian economy. The commercial fishing and fish processing sectors significantly contribute to the economy in terms of employment, export earnings, and contribution to GDP. The sector is a substantial export earner, with over 85% of Namibia's fish output destined for international markets. It is to be noted, however, that the contribution of the fishery sector to national GDP has been shrinking since 2007, when it stood at 3.2%, to reach the level of 2.7% in 2019, that is, a reduction of 0.5% depicted in Figure 1.5 (NSA, Annual National Accounts 2014 and 2019).

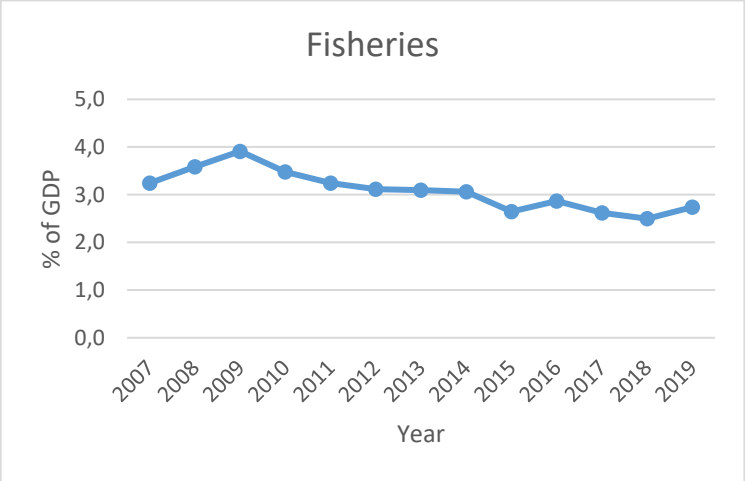

Figure 1.5 - Contribution of fishing and fish processing on board to national GDP

1.10 Mining

Namibia is known world-wide for producing gem quality rough diamonds, uranium oxide, special high-grade zinc and acid-grade fluorspar, as well as a producer of gold bullion, blister copper, lead concentrate, salt and dimension stone. Mining is one of the major contributors of Namibia's national economy with 9.1% of the country's GDP in 2019 following a spike in 2007, 2008, and 2012 (Figure 1.6) (NSA, Annual National Accounts 2014 and 2019).

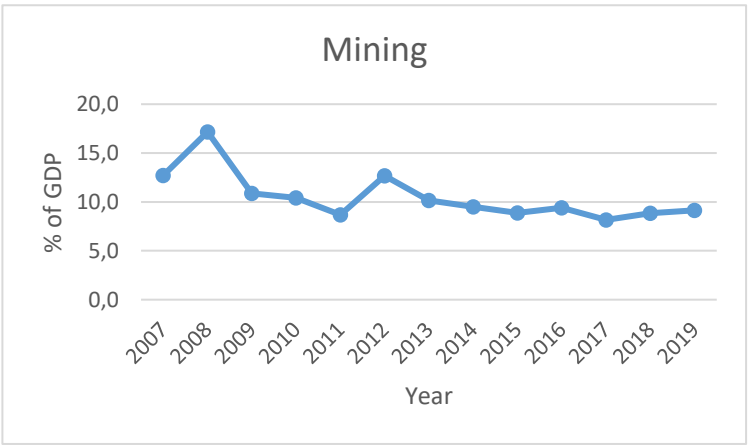

Figure 1.6 - Contribution of mining and quarrying to national GDP

1.11 Manufacturing

Namibia's manufacturing sector is inhibited by a small domestic market, dependence on imported goods, limited availability of local capital, widely dispersed population, small skilled labour force with high relative wage rates, and subsidized competition from South Africa. Manufacturing, a priority sector under the NDP5 contributed 12.2% to national GDP in 2019 (Figure 1.7). This performance was supported mainly by the following six sub-sectors[1] - Beverages, Other food products, Basic non-ferrous metals, Chemical and related products, Grain Mill products, Diamond processing, Meat Processing which together accounted for 77.0% of the manufacturing share of GDP in 2019. It is to be noted, however, that the total share of the manufacturing sector in GDP shrunk by 1.4% over the period 2007 to 2019.

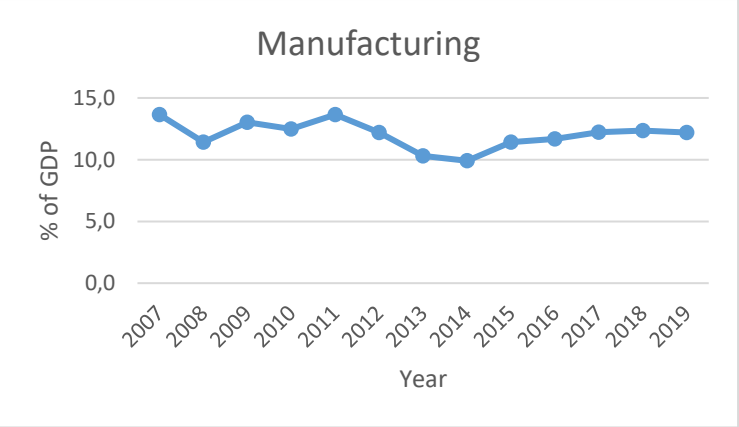

Figure 1.7 - Contribution of manufacturing to national GDP

1.12 Energy

The most dominant energy source in Namibia is liquid fuel, which includes petrol and diesel, accounts for about 63 % of total net energy consumption and is mainly used in the transport sector. Liquid fuels are followed by electricity with 17 % net consumption, coal with 5 % and the remaining 15 % from other sources of energy such as solar, wood and wind energy, among others (Energy Demand and Forecasting in Namibia. National Planning Commission, 2013). Namibia does not produce or export any fossil fuel though it is planned to exploit natural gas from the Kudu gas reserve discovered in the 1970s. Most of the fossil fuels are imported from South Africa.

In 2017, Namibia's electricity demand stood at 677 MW peak power and is expected to reach 755 MW in 2022. On the supply side, Namibia has currently only 3 major power generation stations, with an installed capacity of about 500 MW. The biggest one is the Ruacana Hydro Power station which generates about 347 MW of electricity, Van Eck Coal power station generates about 120 MW and Anixas diesel power station at the coast with 22.3 MW respectively (NamPower Corporate strategy and business plan, 2019-2023).

By 2017, eleven solar and one wind power plants were commissioned for a total capacity of 59.5 MW (NamPower Corporate strategy and business plan, 2019-2023). The solar plants are HopSol (5 MW), Omburu (4.5 MW, Osona (5 MW), Ejuva I and Ejuva II (5 MW and 5 MW respectively), Alcon (5 MW), Aoe (5 MW), Metdecci (5 MW), camelthorn (5 MW), Sertum (5 MW), Momentus energy (5 MW) and the wind plant OmbeDO (5MW). Committed IPPs are constructing 6 plants, One wind of 44 MW and five solar totalling 72 MW.

The local energy supply does not meet the demand. Currently, Namibia imports most of this difference from South Africa and other Southern Africa Development Community (SADC) member states. A special arrangement between the Namibian power utility NamPower and Eskom, the South African Power utility, enables Namibia to buy and utilize electricity from South Africa, with ZESCO in Zambia providing most of

[1] Other sub-sectors include Non-metallic minerals products, Other manufacturing, Meat processing, Rubber and Plastics products, Wood and wood products, Textile and wearing apparel, Publishing and Printing, Leather and related products

the remaining balance. NamPower also imports on a smaller scale from Zambia for supply to the Caprivi region and exports on a small scale to Angola and Botswana (Annual National Accounts, 2012).

Studies have shown that energy consumption is related to and acts as a driver to economic growth and GDP production. This implies that increasing energy production of the country should be one of the high priority objectives on the economic developmental agenda, so that the development plan in place is not constrained by energy shortage. The National Energy Policy (MME, 2017) is thus geared towards increasing the energy supply in Namibia through:

- Sustained and improved energy infrastructure.
- Expanded energy research and development.
- Increased energy efficiency awareness; and
- Increased investment in the energy sector.

The strategy aims at increasing the exploitation of local energy resources for electricity generation to reduce the country's dependence on foreign sources as well as to increase the share of renewables in the future energy mix. Namibia intends to tap solar and wind energy resources in the future while concurrently exploiting efficiently the invasive bush as a biomass energy source since the latter is proving so detrimental to the livestock sector productivity and development.

1.13 Transport

Namibia's road network is regarded as one of the best on the continent with road construction and maintenance being at international standards. Namibia has a total road network of more than 64,189 km, including 5,477 km of tarred roads which link the country to its neighbours Angola, Botswana, South Africa, Zambia, and Zimbabwe. The management and maintenance of the national road network is the responsibility of the Roads Authority under the Roads Authority Act, 1999 (Act 18 of 1999).

The country has two ports which handle imported and exported goods, and service the fishing industry. The only deep-sea harbour is Walvis Bay in the Erongo Region and the other harbour is Luderitz in the Karas Region. The Port of Walvis Bay receives approximately 3,000 vessels each year and handles about 5 million tonnes of cargo.

Passenger transport is carried out mainly by minibuses and sedans and is increasing in intensity. For businesspeople and tourists, air travel has become a more important means of transport to bridge the long distances. As of December 2019, Namibia had a total of 394,027 vehicles, representing an increase of 68,6 as compared with March 2007, when there was only 233,640. Out of the total number of vehicles in 2019, 44.2% of them are light passenger motor vehicles (less than 12 persons), closely followed by light load vehicles (GVM 3,500 kg or less), with 42.1%.

The railway network comprises 2,382 km of narrow-gauge track with the main line running from the border with South Africa via Keetmanshoop to Windhoek, Okahandja, Swakopmund and Walvis Bay. Omaruru, Otjiwarongo, Otavi, Tsumeb and Grootfontein are connected to the northern branch of the railway network.

1.14 Tourism

Over the years, supported by Namibia's unique landscapes and biodiversity, tourism has developed into an important sector, contributing both directly and indirectly to national GDP. In 2019, a total of 1.6 million tourists visited Namibia which represents a 5.9% increase from arrivals recorded in 2018 (Figure 1.8). According to the WTTC (2020), the contribution (direct and indirect) of Travel & Tourism to GDP in 2014 was N$ 28.6 billion (14.7% of GDP). This primarily reflects the economic activity generated by industries such as hotels, travel agents, airlines, and other passenger transportation services (excluding commuter services) and also includes, for example, the activities of the restaurant and leisure industries directly supported by tourists. (WTTC, 2020).

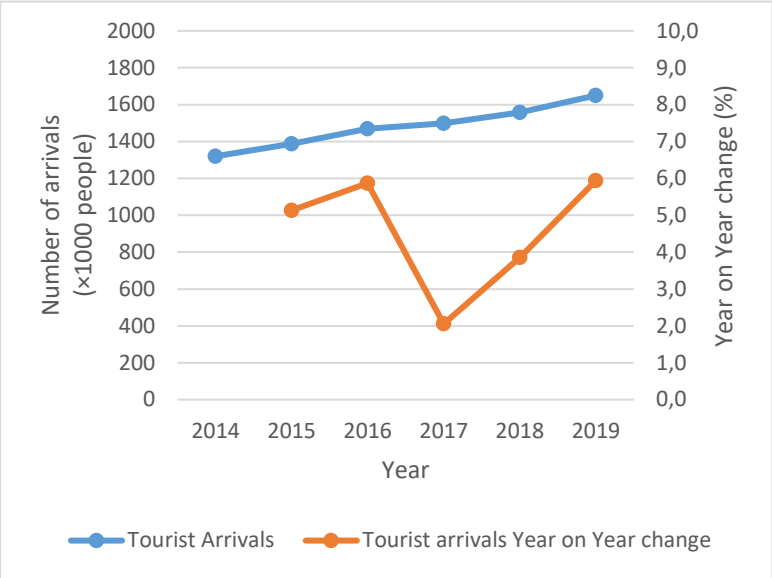

Figure 1.8 - Number of Tourist Arrivals in Namibia

Tourism also generates an important number of jobs, often in rural areas where it is otherwise difficult to obtain employment. The sector also plays an important role in the reduction of poverty in rural areas through employment and income injection, especially in conservancies.

Being reliant on the wildlife and scenery potential of Namibia, the tourism industry is thus vulnerable to the adverse impacts that climate change may have on these resources.

1.15 Waste

Namibia, as a medium income country with a growing wealthy urban middle class and significant urban drift, is feeling the pressure of amounts of waste generated on its facilities throughout the country and more especially in the urban areas. Solid municipal waste is dumped in landfills or open dumps while almost all urban settlements are connected to reticulated wastewater treatment systems. Management of the landfills and dumps are not of the highest standards and very often, the waste is burnt in the open dumps to reduce the volume or eliminate health risks. Additionally, in most areas there is no segregation of waste and no separate landfills or dumps, implying that industrial waste is dumped along with municipal waste.

The evolution of household solid waste disposal for the period 2001 to 2014, until results from the ongoing census becomes available, is illustrated in Figure 1.9 (NSA, 2001 and 2011) and its salient facts are summarised below:

(i) The general trend for regular collection of waste has been for an increase from 30.9% in 2001 to 36.1% in 2014, with a peak of 37.2% in 2011.

(ii) The amount of waste which is collected in an irregular way decreased from 11.5% in 2001 to 4.8% in 2014.

(iii) Burning is the waste disposal practice which experienced the most important change, increasing from 18.0% in 2001 to 34.4% in 2014, peaking at 37.8% in 2011.

(iv) Roadside dumping decreased from 14.7% in 2001 to 9.7% in 2014.

(v) Disposal of waste in rubbish pits decreased from 20.3% in 2001 to 9.7% in 2014.

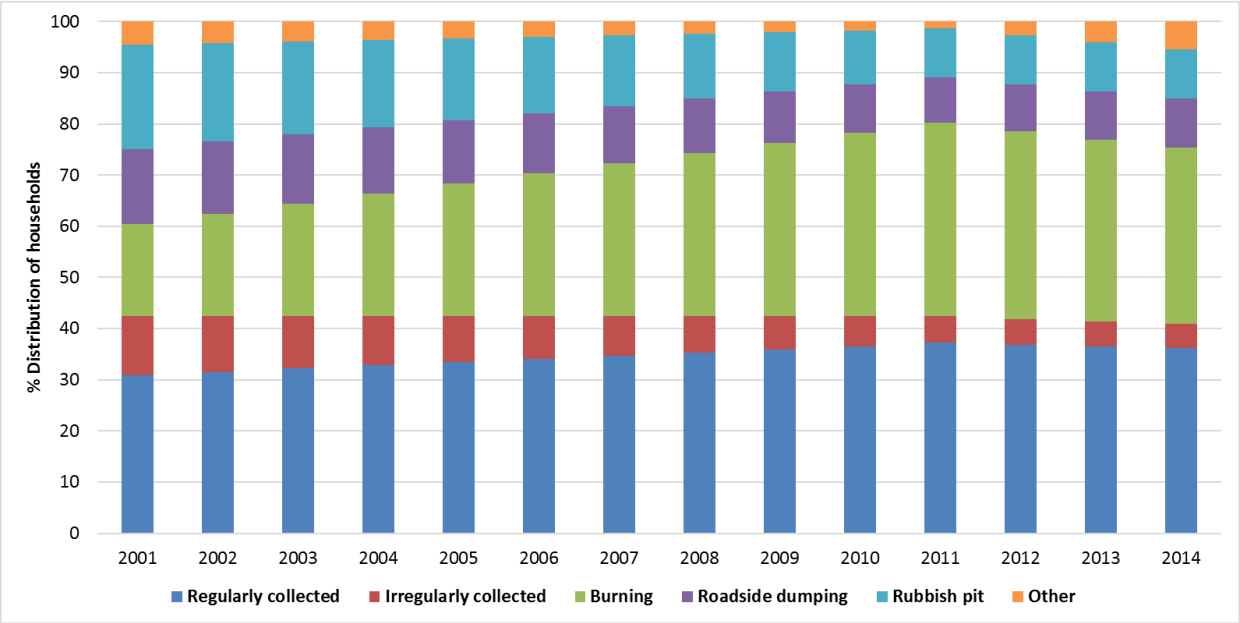

Figure 1.9 - Percentage distribution of households by means of waste disposal (2001 - 2014)

1.16 Economic Indicators

Since 2015, Namibia's GDP growth has flattened, following a sustained growth rate of around 5-6% per year from 2010, resulting in a GDP of N$ 143.740 billion in 2019 (Figure 1.10).

In 2019, Namibia recorded a GDP per capita of N$ 73,704 (US$ 4,984), thus classifying it as a middle-income economy in 2019. However, with a Gini index of around 59.1 (2015 World Bank estimate - https://data.worldbank.org/indicator/SI.POV.GINI?locations=NA [2021-01-19]), Namibia remained among the ten countries with the world's highest inequality in the distribution of family income.

It was estimated that in 2010, around 29% of the population lived below the national poverty line. Furthermore, poverty is even more pronounced in the largely rural northern regions of Kavango, Oshikoto, Zambezi, Kunene and Ohangwena with more than one third of the population in these regions being poor (Republic of Namibia, 2015).

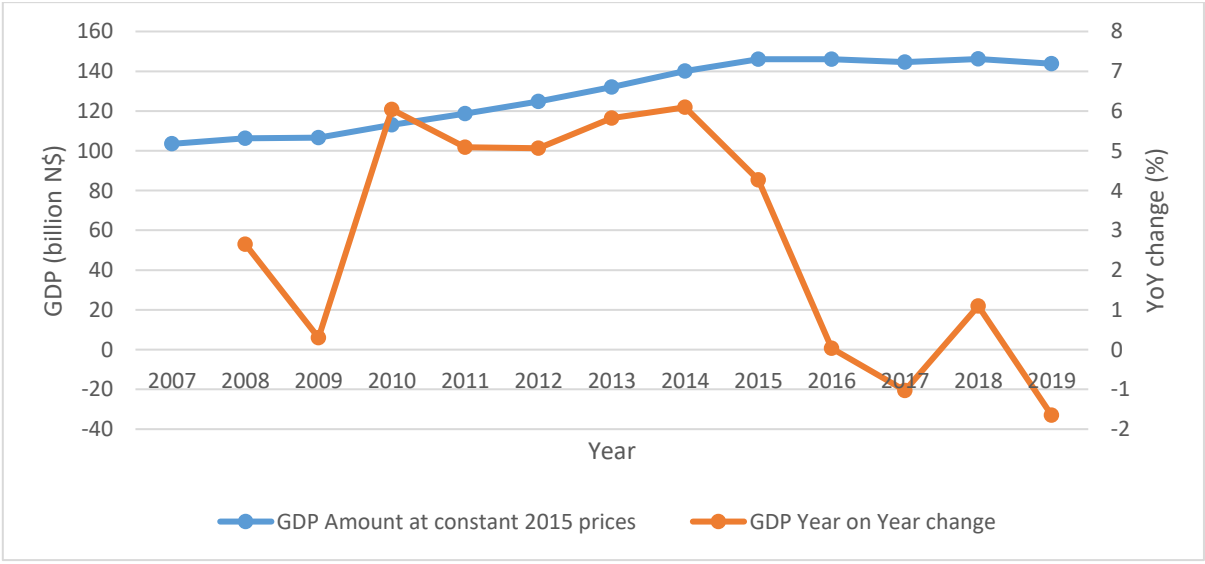

Figure 1.10 - Evolution of GDP and annual GDP growth rates for the period 2007 to 2019

According to The Namibia Labour Force Survey 2018 Report (NSA, 2019), Namibia had an economically active labour force of 983,843 persons, among which 708,895 are employed. Agriculture was the most important source of employment, accounting for 23.0% of employed persons, followed by accommodation and food service activities at 11.4%, and thirdly, wholesale and retail trade at 11.1% of employed persons.

According to the same report, unemployment stood at 33.4% (male:32.5%; female: 34.3%). It is to be noted that youth (15-34 years) unemployment was even higher, with 46.1% unemployed.

The Namibia Labour Force Survey 2018 report also showed that 31.6% of the employed population are in vulnerable employment. Most of the vulnerable workers are subsistence/communal farmers (41.0%) and other own account workers (44.1%), with the remaining being unpaid family labour (14.8%). The persons in vulnerable employment are more at risk than others because these people are unlikely to have formal work arrangements or access to benefits or social protection programmes, and they are more at risk to the effects of economic cycles (NSA, 2019) and climate change.

1.17 Population

According to the Namibia Inter-censual Demographic Survey (NIDS) of 2016, the total population of Namibia was estimated at 2,324,388 people, a 10% increase compared with the National Population and Housing census of 2011 which estimated the total population of Namibia at 2,113,077.

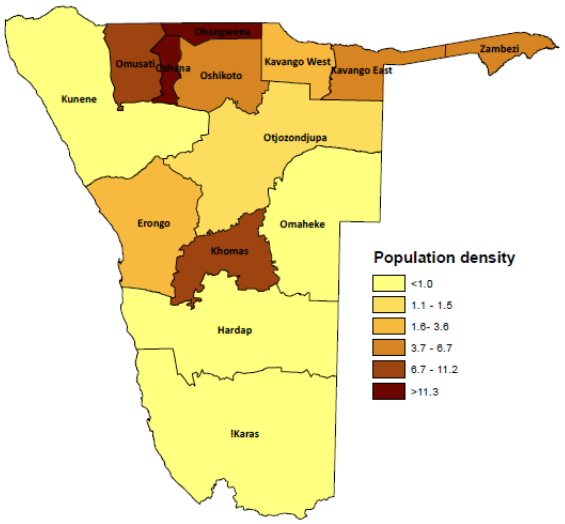

Figure 1.11 - Map showing population density of Namibia

According to the NIDS 2016:

- Woman outnumbered man with 1,194,643, compared to 1,129,754.
- 14% of the population is under 5 years, 23% between the ages of 5 and 14, 57% between the ages of 15 - 59 years, and only 6% is 60 years and above.
- A total of 48% of Namibia's population lived in urban areas, while 52% of the population lived in rural areas. The urban population grew by 11.6% between 2011 and 2016, while the rural population decreased by 8.8% over the same period. This trend illustrates the high rates of rural-urban migration in Namibia.
- The population density is low at 2.8 people per square kilometre at national level. In the Khomas region, where the nation's capital is situated, the population density stood at 11.8 persons per square kilometre and the most highly populated region was Ohangwena with 23.9 persons per square kilometre (Figure 1.11).
- 54% of households are headed by males and 46% by females.

1.18 Health

Namibia's provision of health services is shared between the public and the private sector, the latter focusing on urban areas. The Ministry of Health and Social Services has prioritized the implementation of three health Millennium Development Goals, namely goals 4, 5, and 6: to reduce child mortality, improve maternal health, and combat HIV/AIDS, malaria, and other diseases, respectively.

Statistics on life expectancy for males and females show two distinct phases: a phase of decline (from 1990 to 2004), and a phase of increase (from 2004 to 2013). Between 1990 and 2004 life expectancy for males and females decreased by 9 and 12 years, respectively, mainly due to the HIV/AIDS epidemic, while between 2004 and 2013 the trend was reversed, life expectancy rising by 11 years for females but only by six years for males. Life expectancy for males in 2013 was still below 1990 levels (IHME, 2016) (Figure 1.22).

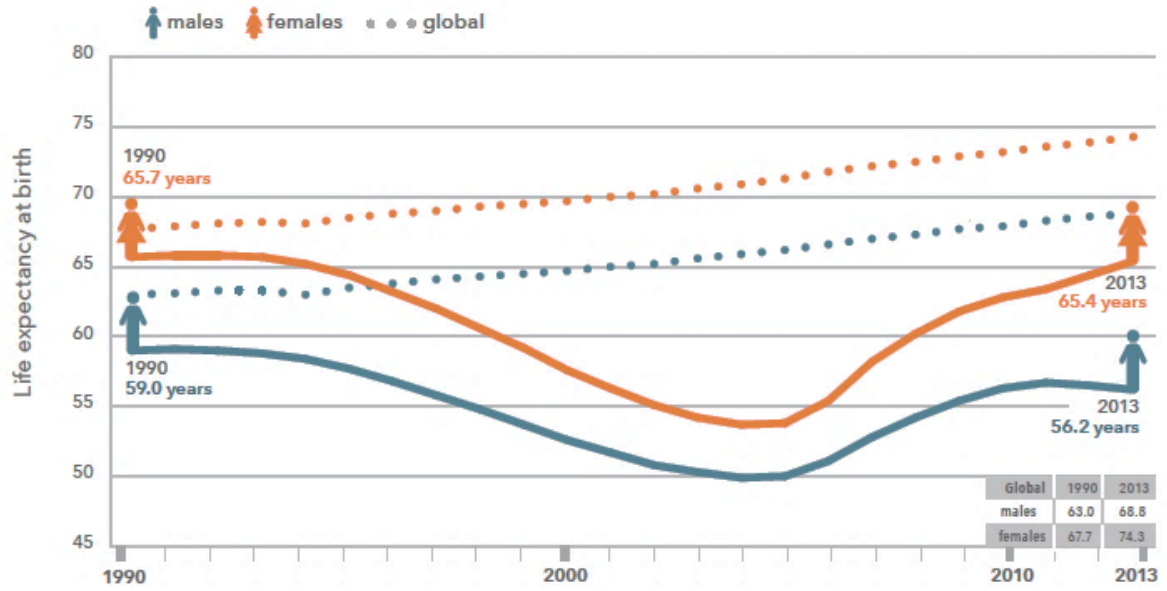

Figure 1.22 - Life expectancy for males and females, Namibia, 1990 - 2013
Source: IHME, 2016

The leading causes of disease burden (disability and premature mortality) in Namibia in 2013 (IHME, 2016) were: (i) HIV/AIDS, (ii) tuberculosis and (iii) lower respiratory infections.

Approximately 12% of the total Namibian population aged 15-49 is living with HIV/AIDS (CDC,2018). However, recent data show dramatic progress in Namibia toward HIV epidemic control. For example, results from the first Namibia Population-based HIV Impact Assessment (NAMPHIA) show that 77% of all HIV-positive adults have achieved viral load suppression, projected to surpass the Joint United Nations Programme on HIV/AIDS (UNAIDS) target of 73% by 2020 (CDC, 2018). Nonetheless, NAMPHIA results also suggest that women aged between 15 and 24 still have a far higher HIV incidence rate (0.99%) than same-aged young men (0.03%) in the country. This highlights the continued need for expanded primary HIV prevention in young women.

TB remains a serious concern in Namibia, which has one of the highest case notification rates in the world. The country now faces the new challenges caused by the emergence of multidrug-resistant TB and the growing problem of extensively drug-resistant TB which negatively affect the capacity for management of identified cases (WHO, 2016). It is to be noted that the very high incidence of tuberculosis in Namibia is fuelled by the HIV/AIDS epidemic, 38% of TB patients with known HIV-status being also HIV-positive in 2016 (CDC, 2018).

Malaria is one of the major health problems. However, year-on-year incidences of malaria are highly variable, and closely correlated with the prevailing temperature, rainfall, and humidity. Malaria is endemic in parts of the north-central and north-eastern regions. In contrast, in north-western and parts of central Namibia, malaria transmission is seasonal and follows the onset of rains; these unstable occurrences increase the risk of malaria epidemics.

Infant and child mortality is comparatively low, but the maternal mortality ratio has increased, even though over 70% of births are delivered in hospitals. General life expectancy has not improved, partly because of the HIV/AIDS epidemic. Malnutrition levels in children under the age of five years are as high as 38% in some regions. The five leading causes of inpatient deaths (all age groups) are HIV/AIDS, diarrhoea, tuberculosis, pneumonia, and malaria.

2020 has added another serious challenge healthwise to the country with the appearance of the COVID-19 pandemic. Namibia resisted well during the year through the application of the recommendations of the World Health Organisation coupled with strict control of its borders relative to arrivals and departures of citizens from severely affected countries. However, the situation has presently degraded with the appearance of new variants of the virus. This is viewed with much concern by the health authorities because of the limits of the health services to cope with an extensive blowout of the pandemic. The serious impact of the pandemic on the economy cannot be neglected also and is a further source of concern for Government.

2 Greenhouse Gas Inventory

2.1 Introduction

Under Article 4.1 (a) of the Convention, each party must develop, periodically update, publish, and make available to the 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.

To meet its reporting obligations regarding national GHG inventories, Namibia has to-date submitted seven GHG inventories detailing its emissions and sinks as components of its NCs (4) and BURs (3). Namibia has now prepared its eighth national inventory in the best possible transparent manner and reporting the findings in the NIR5 and as a chapter in the fourth BUR4 along with other actions taken to implement the Convention. All these reports have been prepared with support from the GEF through the UNDP country office.

Additionally, Namibia has prepared and submitted its Intended Nationally Determined Contributions during COP 21 in Paris. The country signed and ratified the Paris Agreement on 22 April 2016 and 21 September 2016, respectively. Namibia is also currently updating its NDC and implementing the CBIT project.

2.2 The inventory process

2.2.1 Overview of GHG inventories

The preparation of the present inventory started end 2019 after completion of the one contained in the BUR3. One year was allocated to implement and complete the different steps of the inventory cycle as depicted in Figure 2.1.

The INC and SNC of the Republic of Namibia to the UNFCCC included the National Inventory of greenhouse gases 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). These inventories have all been compiled using the sectoral bottom-up approach. The reference approach has also been used for the Energy sector, to enable comparison of the two methods. The gases estimated were carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), Hydrofluorocarbons (HFCs) and the and the precursor gases oxides of nitrogen (NO_x), sulphur dioxide (SO_2), non-methane volatile organic compounds (NMVOCs) and carbon monoxide (CO). A third Inventory has been compiled using a mix of Tiers 1 and 2 for the first Biennial Report and submitted to the UNFCCC in 2014. The latest four inventories have been submitted as stand-alone national inventory reports (NIR). The 2006 IPCC Guidelines, 2006 IPCC GL 2019 Refinement and ICC inventory software were used for compiling these inventories.

This eighth GHG inventory is presented as a summary chapter of the BUR4 and as a stand-alone detailed national inventory report (NIR5) and provides data on GHG emissions by sources and removals by sinks for a full time series for the period 1990 to 2016, the years 1990 and 2016 being additions to the previous one. Improvements over the previous inventory consisted in the inclusion of the sub-category Manufacture of Solid Fuels. Once again, a mix of Tiers 1 and 2 has been adopted.

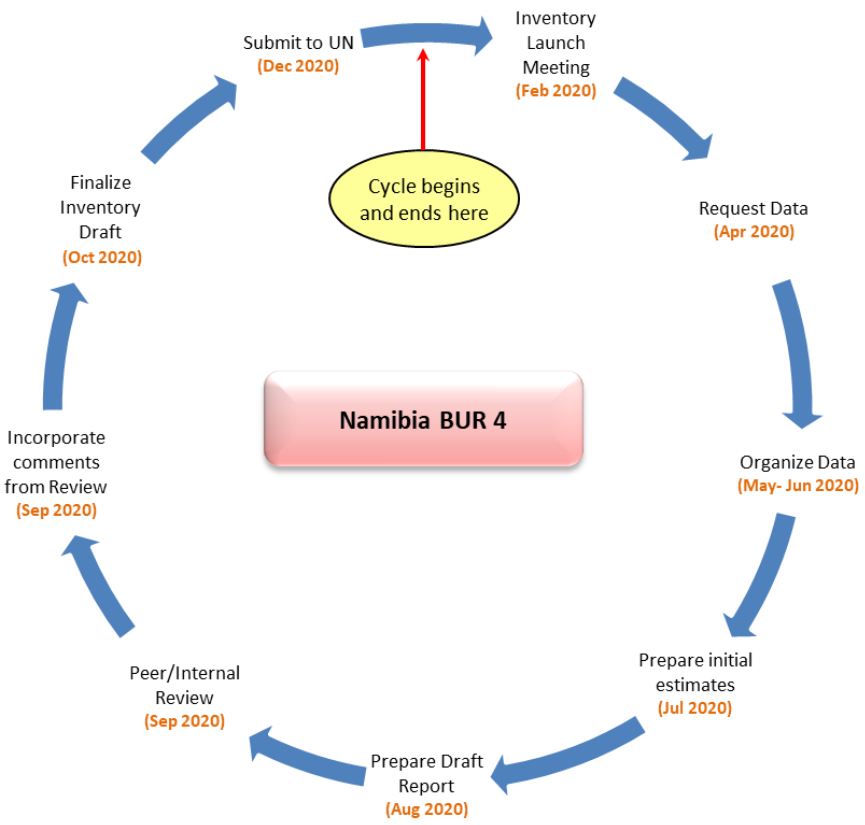

Figure 2.1 - The inventory cycle of Namibia's BUR4

2.2.2 Institutional arrangements and inventory preparation

Namibia consolidated the in-house production of its GHG inventory except for the support from a company's services for computation of emissions and report writing and an independent international consultant for performing the QA and capacity building to meet the enhanced transparency and higher standards of reporting due to lack of financial resources to maintain permanent staff for a full institutionalization of the process. The upfront segment of the process is a laborious exercise also as sufficient financial resources to support adequate human capacity remains a prominent limiting factor. Another factor is the numerous changes in the working groups following staff movements, promotions, and resignations.

The CCU of the MEFT monitors and coordinates the production of reports to the Convention, including the GHG inventories as National Focal Point of the Convention. The same framework adopted for the previous inventory (NIR4) compilation was followed. Collaboration with data providers, institutions, and organizations to support derivation of national emission factors and enable moving to Tier 2 were consolidated. Capacity building of the inventory working group members continued.

The responsibilities within the institutional arrangements did not change with:

- The CCU of MEFT for inventory coordination, compilation, and submission.
- Ministry of Mines and Energy for the Energy sector.
- Ministry of Industrialization, Trade and SME Development for the Industrial Production and Product Use sector.
- Ministry of Agriculture, Water and Land Reform for the Agriculture, Forest, and Other Land Use sector.
- The MEFT for the Waste sector.

- Namibia National Statistics Agency for Archiving, including provision of quality-controlled activity data.
- The CCU of MEFT for coordinating QA/QC.
- External consultant for capacity building and QA.
- The CCU of MEFT for coordinating Uncertainty Analysis; and
- The CCU of MEFT to act as GHG inventory specialist to track capacity building needs, the IPCC process and COP decisions for implementation.

The institutional arrangements for the compilation of the inventory and reporting for the different sectors are shown in Figure 2.2. The different steps adopted for the preparation of the inventory were:

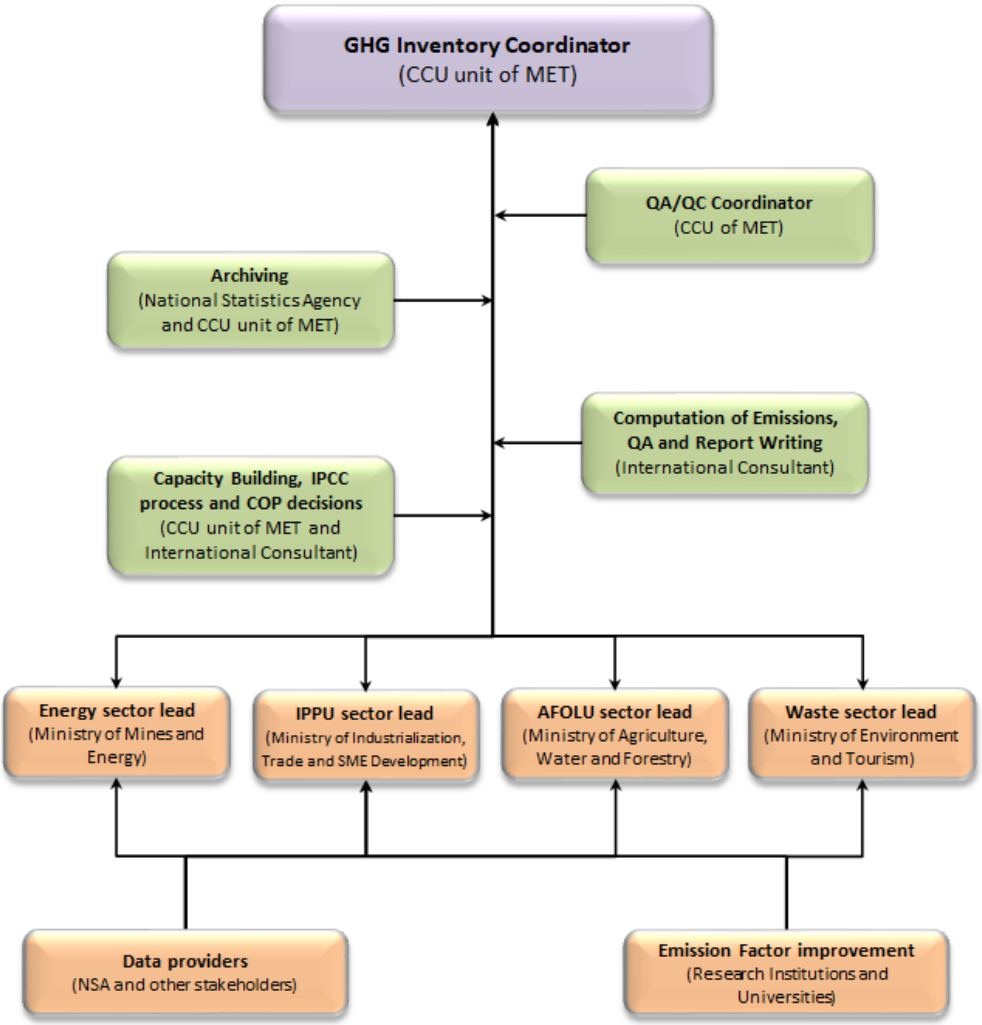

Figure 2.2 - Institutional arrangements for the GHG inventory preparation

- Drawing up of work plan with timeline and deliverables.
- Allocation of tasks to sectoral experts.
- Collection, quality control and validation of activity data.
- Selection of Tier level within 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.
- Uncertainty analysis.
- QA/QC of emissions and outputs.
- Assessment of completeness.
- Recalculations.

- Trend analysis.
- Identification of Gaps, constraints, needs and improvements.
- Report writing.
- Circulation of report to stakeholders for comments.
- Integration of stakeholder's comments.
- Validation of GHG inventory and chapter for inclusion in the BUR4; and
- Submission to UNFCCC as a stand-alone NIR5 and a component of the BUR4

2.2.3 Key Category Analysis

Key Category Analysis (KCA) gives the characteristics of the emission sources and sinks. According to the *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (IPCC, 2000), key categories are those which contribute 95% of the total annual emissions, when ranked from the largest to the smallest emitter. Alternatively, a key source 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 a good practice to identify key categories, as it helps prioritize efforts and improve the overall quality of the national inventory, notwithstanding guiding of 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 2016 are presented in Table 2.1 and for the year 1990 in Table 2.2.

Table 2.1 - Key Category Analysis for the year 2016 - Approach 1 - Level Assessment

A	B	C	D	E	F	G
IPCC Category code	IPCC Category	GHG	"2015 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	-125,635	125,635	0.851	0.851
3.B.3.b	Land Converted to Grassland	CO_2	9,756	9,756	0.066	0.917
3.A.1	Enteric Fermentation	CH_4	4,000	4,000	0.027	0.944
1.A.3.b	Road Transportation	CO_2	2,779	2,779	0.019	0.963

Table 2.2 - Key Category Analysis for the year 1990 - Approach 1 - Level Assessment

A	B	C	D	E	F	G
IPCC Category code	IPCC Category	GHG	"2015 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	-88,401	88,401	0.806	0.806
3.B.3.b	Land Converted to Grassland	CO_2	8,672	8,672	0.079	0.885
3.C.1	Emissions from Biomass Burning	CH_4	3,594	3,594	0.033	0.917
3.A.1	Enteric Fermentation	CH_4	2,878	2,878	0.026	0.944
3.B.1.b	Land converted to Forestland	CO_2	-1,620	1,620	0.015	0.958

There are four key categories in the quantitative level assessment for the year 2016 as opposed to five for the year 1990. All of these for both years were from the AFOLU sector except for Road Transportation in 2016, of which enteric fermentation from Agriculture and the others from FOLU.

The results change quite drastically when considering the trend assessment covering the period 1990 to 2016 (Table 2.3). There are now nine key categories compared to the level assessment of 2016 with four only.

Table 2.3 - Key Category Analysis for the period 1990 - 2016 - Approach 1 - Trend Assessment

A	B	C	D	E	F	G	H
IPCC Category code	IPCC Category	GHG	1991 Year Estimate Ex0 (Gg CO_2-eq)	2015 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	-88,401	-125,635	0.066	0.304	0.304
3.B.3.b	Land Converted to Grassland	CO_2	8,672	9,756	0.050	0.229	0.532
3.A.1	Enteric Fermentation	CH_4	2,878	4,000	0.023	0.108	0.640
1.A.3.b	Road Transportation	CO_2	527	2,779	0.023	0.106	0.746
3.B.1.b	Land Converted to Forest land	CO_2	-1,620	-963	0.013	0.062	0.808
3.C.1	Emissions from biomass burning	CH_4	3,594	479	0.012	0.055	0.863
3.C.4	Direct N_2O Emissions from managed soils	N_2O	1,441	2,015	0.012	0.055	0.917
3.C.1	Emissions from biomass burning	N_2O	1,575	209	0.005	0.024	0.941
1.A.4	Other Sectors - Liquid Fuels	CO_2	347	380	0.002	0.009	0.950

The summary of Key Categories based on the quantitative level to the 95% level assessments for year 2016 and trend, for period 1990 to 2016, is presented in Table 2.4. The number of Key categories increased from four under level assessment to nine with the four main ones recurring in the trend assessment also.

Table 2.4 - Summary of Key Categories for level (2016) and trend (1990 - 2016) assessments

Number	IPCC category code	IPCC category	GHG	Identification criteria	Comment
1	3.B.1.a	Forest land Remaining Forest land	CO_2	L1,T1	Quantitative
2	3.B.3.b	Land Converted to Grassland	CO_2	L1,T1	Quantitative
3	3.A.1	Enteric Fermentation	CH_4	L1,T1	Quantitative
4	1.A.3.b	Road Transportation	CO_2	L1,T1	Quantitative
5	3.B.1.b	Land Converted to Forest land	CO_2	T1	Quantitative
6	3.C.1	Emissions from biomass burning	CH_4	T1	Quantitative
7	3.C.4	Direct N_2O Emissions from managed soils	N_2O	T1	Quantitative
8	3.C.1	Emissions from biomass burning	N_2O	T1	Quantitative
9	1.A.4	Other Sectors - Liquid Fuels	CO_2	T1	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.

2.2.4 Methodological issues

This section gives an overview of the methodological approach adopted for all sectors and sub-sectors covered in this inventory report. These procedures are extensively detailed in the respective section covering the individual IPCC Key Categories.

Generally, the method adopted to compute emissions involved multiplying activity data (AD) by the relevant appropriate emission factor (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. The 2006 IPCC Guidelines and 2019 Refinement were supplemented with the European Monitoring and Evaluation Programme/European Environment Agency (EMEP/EEA) Guidebook 2016 for estimation of emissions of non-CO_2 gases. Equations from the Guidebook were programmed in Excel, estimations made and entered manually in the sectoral tables generated by the IPCC Inventory Software for reporting in the NIR5.

The Tier 2 method has been adopted for estimating emissions in the Road Transportation (1.A.3.b) sector where the vehicle population has been disaggregated in different classes coupled with mileage run annually and consumption per vehicle class. Additionally, national emission factors and stock factors as appropriate have been derived and adopted to compile estimates at the Tier 2 level partially for Enteric Fermentation (3.A.1) for Dairy Cows and Other Cattle in the Livestock and Forestland Remaining Forestland (3.B.1.a) in the AFOLU sector. Thus, the inventory has been compiled using a mix of Tiers 1 and 2. This is good practice and improved the accuracy of the emission estimates of most of the key categories and reduced the uncertainty level.

Global Warming Potentials (GWP) as recommended by the IPCC have been used to convert GHGs other than CO_2 to the latter equivalent. Based on decision 17/CP.8, the values adopted were those from the IPCC Second Assessment Report for all direct GHGs, namely carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O) as well as HFCs used for Refrigeration and Air Conditioning (Table 2.). Additional gases, known as (indirect gases), which affect global warming, namely oxides of nitrogen (NO_x), carbon monoxide (CO), non-methane volatile organic compounds (NMVOCs) and sulphur dioxide (SO_2), have also been computed and reported in the inventory.

Table 2.5 - Global Warming Potential

Gas		Global Warming Potential
Carbon Dioxide	(CO_2)	1
Methane	(CH_4)	21
Nitrous Oxide	(N_2O)	310
HFC - 32	(CH2F2)	650
HFC - 125	(CH2CF3)	2800
HFC - 134a	(CF2FCF3)	1300
HFC - 143a	(CF3CH3)	3800

Default EFs were assessed for their appropriateness prior to their adoption; namely based on the situations under which they have been developed and the extent to which these were representative of national circumstances. Country-specific EFs and stock factors derived using national data and the IPCC equations as appropriate for the Livestock and Land sub-sectors were used instead of the default ones which did not reflect the national context.

Country-specific AD are readily available as a fairly good statistical system exists since 2003 whereby data pertaining to most of the socio-economic sectors are collected, verified and processed to produce official national statistics reports. Additional and/or missing data, and those required to meet the level of disaggregation for higher than the Tier 1 level, were sourced directly from both public and private sector operators by the working groups and coordinator. Data gaps were filled through personal contacts with the stakeholders by the national experts and/or from results of surveys, scientific studies and by statistical modelling in line with the splicing techniques provided in the 2006 IPPC Guidelines. All the data and information collected during the inventory process have been stored in the software database and worksheets.

In some cases, due to the restricted timeframe and lack of a declared national framework for data collection and archiving to meet the requirements for preparing GHG inventories, derived data and estimates were used to fill in the gaps. These were considered reliable and sound since they were based on scientific findings and other observations. Estimates used included fuel use for navigation, domestic aviation, food consumption and forest areas by type. Most AD for the period 1991 to 2002 were generated based on related socio-economic factors or through extrapolations from the available time series AD.

2.2.5 Quality Assurance and Quality Control (QA/QC)

Namibia has its own national system for quality control (QC) of data being collected within the different institutions. All data are quality controlled at different stages of the process until the final quality assurance (QA) is made by the National Statistics Agency before archiving in national databases. The private sector also implements its own QC/QA within its data collection and archiving process. Thus, the initial phases of the control system remained beyond the GHG inventory team and the QA/QC process started as from the time the AD are received.

QC and QA procedures, as defined in the *2006 IPCC Guidelines (IPCC, 2006)* have been implemented during the preparation of the inventory. Whenever there were inconsistencies or possible transcription errors, the responsible institution was queried, the problem discussed and solved as far as possible. However, this process is not exempt of mistakes because outliers were frequently observed from the time series data for various activities. QC was implemented through:

- Routine and consistent checks to ensure data integrity, reliability, and completeness.
- Routine and consistent checks to identify errors and omissions.
- Accuracy checks on data acquisition and calculations and the use of approved standardized procedures for emissions calculations; and
- Technical and scientific reviews of data used, methods adopted, and results obtained.

Furthermore, the AD were compared with those available on international databases such as those of FAO, the UN statistical database and the International Energy Agency. However, Namibia is yet to develop and implement a QC management system and this is one of the improvements contemplated in the future.

QA was undertaken by the independent international consultant who was not involved with the preparation of the inventory, the main objectives being to:

- Confirm data quality and reliability used for computing emissions.
- Compare AD with those available on international websites such as FAO and IEA.
- Review the AD and EFs adopted within each source category as a first step; and
- Review and check the calculation steps in the software to ensure accuracy.

Even if QA/QC procedures have been followed throughout the inventory process by the inventory compilers of the different IPCC sectors and the QA officer, a QA/QC plan has yet to be developed to fit within the domestic MRV system under development. Thus, systematic records as per the *2006 IPCC Guidelines* must be developed under a dedicated QA/QC coordinator. This is due to the lack of permanent personnel on the establishment, insufficient capacity and since the inventory management system is still being developed for implementation in the country.

Namibia requested the UNFCCC and Global Support Programme to undertake a QA exercise on its inventory compilation process adopted for the BUR3. The main conclusions and recommendations have been partially attended to. The remaining activities are listed below with the status of actions taken, are:

- Incineration of medical waste is still being implemented.
- Institutional arrangements to ensure annual provision of AD for preparing the inventory are being strengthened.
- Development and implementation of a QC management system is under way but remains a problem due to lack of permanent staff.
- Improvement AD for the AFOLU sector through production of new maps to generate land use changes, national stock and emission factors, possible use of Collect earth for confirming the assumptions and data used are all in abeyance due to unavailability of financial resources.
- Development of legal arrangements for securing collaboration of other institutions for AD is under study.
- Improved documentation and archiving are being addressed; and
- Capacity building in various areas of inventory compilation is ongoing.

2.2.6 Uncertainty analysis

Uncertainty estimation is an essential element of a complete GHG Inventory to provide information on the categories to be prioritized for maximum resources to be allocated to improve the quality of the inventory. Inventories prepared in accordance with the *2006 IPCC guidelines (IPCC, 2007)* will typically contain a wide range of emission estimates, varying from carefully measured and demonstrably complete data on emissions to order-of-magnitude estimates of highly variable emissions such as 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 allocated for the two parameters and the combined uncertainty calculated. In most cases, the uncertainty values allocated to AD and EFs from within the range recommended by the IPCC Guidelines were applied. 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 is subject to expert knowledge. Regarding the EFs, the average value recommended in the IPCC Guidelines were adopted except for nationally determined EFs when the lower values in the range 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 particular recommended methodology, the uncertainty level was derived according to the procedure proposed in the IPCC Guideline and used in the uncertainty analysis. The uncertainty analysis has been performed using the tool available within the IPCC Inventory Software. Uncertainties in total emissions based on the IPCC tool including emissions and removals from the Land sector is presented in Table 2.6. Uncertainty levels for the individual years of the period 1990 to 2016 varied from 26.8% to 29.4% while the trend assessment, when adding one successive year on the base year 1990 for the years 1991 to 2016, ranged from 37.2% to 51.8%.

Table 2.6 - Overall uncertainty (%)

Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Annual	28.9	28.8	28.5	28.2	28.0	27.8	27.6	27.4	27.3	27.2	27.2	27.3	26.9	27.0
Trend (base year 1990)		37.2	38.0	38.7	39.5	40.2	41.0	41.7	42.5	43.3	44.2	44.3	46.1	46.3

Year	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016

Annual	26.8	27.0	27.6	28.0	27.1	28.7	28.0	29.0	29.4	27.1	27.6	27.5	27.3
Trend (base year 1990)	47.0	46.1	44.6	44.0	47.0	42.1	43.9	43.3	42.9	50.2	49.0	49.9	51.8

2.2.7 Assessment of completeness

An assessment of the completeness of the inventory was made for individual activity areas within each source category and the results are presented within the sections covering the individual sectors. The methodology adopted was according to the *IPCC 2006 Guidelines (IPCC 2007)* with the following notation keys used:

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

The level of completeness depicting the scope of the inventory is provided in the national and sectoral reporting tables for the year 2016 within the respective sections further in this chapter and in Part 2 of the NIR for the remaining years of the time series. In cases where there was no activity for all sub-categories within a category, only the category row is maintained for ease of presentation and understanding.

2.2.8 Recalculations

Recalculations have been performed during the computation of the present inventory whenever new improved datasets were obtained. Only recalculated emissions for the base years 1994, 2000 and 2010 are given in Table 2.7 while for the remaining years of the time series, the recalculations can be captured in the sectoral presentations. Original estimates of 1994, 2000 and 2010 were made according to IPCC 1996 Revised GL using only default EFs, Tier 1 and lower coverage of activity areas compared to the present inventory while recalculated values have been compiled in line with the 2006 IPCC GL, a mix of Tiers 1 and 2, the latter for some key categories, improved datasets, and a more exhaustive coverage.

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

Year	1994		2000		2010	
	INC	BUR4	SNC	BUR4	TNC	BUR4
Removals	-5,716	-97,288	-10,566	-108,809	-28,534	-107,920
Emissions	5,685	18,921	9,118	18,787	27,195	20,589
Net removals	-31	-78,367	-1,442	-90,022	-1,339	-87,331

2.2.9 Time series consistency

This inventory now covers the period 1990 to 2016 and AD within each of the source categories covered were abstracted from the same sources for all years. The same EFs have been used throughout the full 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 trends of the emissions.

2.2.10 Constraints and needs

Namibia still faces serious challenges to report to the required standard to the Convention, including the inventory component. To reduce uncertainties and aim at producing an inventory in line with TACCC

principles, Namibia is currently reviewing its national GHG inventory management system and institutional arrangements with support from the Secretariat. One major challenge for estimating emissions for the period 1990 to 1999 consisted of the numerous gaps in AD. The latter were not readily available since the country was still setting up its national statistics system after gaining independence. Thus, most of the AD for this period were sourced from international databases or extrapolated based on AD available for the period 2000 to 2016.

For this inventory, one more category, namely emissions from Manufacture of Solid Fuels (production of charcoal from wood) has been included. Some information has also been collected on the use of SF_6, and incineration of medical wastes, but unfortunately, they were not sufficient to enable computation of emissions in these categories. Further efforts will be invested to address these categories to make the inventory fully exhaustive in the future. A survey is under way for estimating SF_6 from electrical equipment.

Problems encountered during the preparation of this national inventory of GHG were:

- Information required for the inventory were obtained from various sources as no institution has yet been endorsed with the responsibility for collection of specific AD needed for the estimation of emissions according to IPCC on an annual basis. Agreements are being formalized to have the sectoral lead institutions to collect AD, QC these AD and submit them to NSA for databasing and archiving.
- A substantial amount of the AD, including those from the NSA 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 categories are not readily available and had to be generated based on scientific and consumption parameters.
- Reliable 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 of Census data.
- Appropriate information on some activities such as beverage production and auto-production of heat and electricity were not always available as these were not released as considered confidential by the producers.
- Lack of solid waste characterization data, amount generated, and wastewater generated from the industrial sector were only partly available and had to be derived based on production and demographic data amongst others.
- Lack of EFs to better represent national circumstances and provide for more accurate estimates even if this has started to be addressed for some key categories.
- Emissions for a few categories have not been estimated due to lack of AD; and
- National experts could not take over the full inventory compilation process because of insufficient time available when considering their other responsibilities. This dictated the contracting of an international consultant.

2.2.11 National inventory improvement plan (NIIP)

Based on the constraints 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 will be addressed during the preparation of the next NIR. Lack of resources, namely funds and capacity are the major barriers to implementing the NIIP. It is intended to develop a detailed NIIP inclusive of timeframe, costs and other needs along with a schedule for implementation. This document will be used to capture resources for implementing the NIIP to meet the transparency requirements of the PA. The main activities of the NIIP are listed below.

- Capacity building and strengthening of the existing institutional framework within a GHG inventory management system to provide improved coordinated action for a smooth implementation of the GHG inventory cycle for sustainable production of inventories.
- Develop an appropriate framework for adequate and proper data capture, QC and validation.
- Set up a storage and retrieval mechanism of AD collected to facilitate the compilation of future inventories.
- Development of national EFs more representative of the national context for all key categories.
- Develop and implement a QA/QC plan to improve the existing QA/QC system to reduce uncertainty and improve inventory quality.
- Find the necessary financial resources to establish a GHG inventory unit within DEA to be responsible for sustainable inventory compilation.
- Institutionalize the archiving system.
- Undertake surveys for collecting the required AD for categories not covered in this exercise, namely the use of SF_6, and incineration of medical waste.
- Conduct new forest inventories to confirm the stock and emission factors adopted for the Land sector and generated based on published scientific work.
- Produce new maps for 1990 to 2015 to refine land use change data over 5 years periods to replace the poor-quality maps available now which is proving inadequate.
- Refine data collection for determining country-specific (CS) weights for dairy cows, other cattle, sheep, and goats; and
- Develop the digestible energy (DE) factor for livestock as country-specific data is better than the default IPCC value to address this key category fully at Tier 2.

2.3 Trends of greenhouse gas emissions

2.3.1 Overview

The trends of GHG emissions for the Republic of Namibia cover the period 1990 to 2016. Availability of more disaggregated data enabled the adoption of higher Tier methods, namely a combination of Tiers 1 and 2 for compiling this inventory.

2.3.2 The period 1990 to 2016

Namibia remained a net GHG sink over the period 1990 to 2016 as the Land category removals exceeded emissions from the other categories. The net removal of CO_2 increased by 50% over these 27 years from 70,329 Gg in 1990 to 105,428 Gg in 2016. During the same period, the country recorded an increase of 8% in emissions, from 19,692 Gg CO_2-eq to 21,260 Gg CO_2-eq. The trend for the period 1990 to 2016 indicates that the total removals from the LAND category increased from 90,021 Gg CO_2-eq in 1990 to 126,688 Gg CO_2-eq in 2016 (Table 2.2 and Figure 2.3).

Table 2.2 - GHG emissions (Gg CO_2-eq) characteristics (1990 - 2016)

Year	Total emissions	AFOLU removals	Net removals	Per capita emission (t)	GDP emissions index (Year 1990 = 100)
1990	19,692	-90,021	-70,329	13.7	100.0
1991	19,775	-91,794	-72,019	13.3	92.8
1992	19,495	-93,706	-74,211	12.8	85.4
1993	19,072	-95,488	-76,417	12.3	83.7
1994	18,921	-97,288	-78,367	11.9	77.4
1995	18,791	-99,105	-80,314	11.6	73.8
1996	18,482	-100,940	-82,458	11.2	70.3

Year	Total emissions	AFOLU removals	Net removals	Per capita emission (t)	GDP emissions index (Year 1990 = 100)
1997	18,490	-102,793	-84,303	11.0	67.5
1998	18,547	-104,845	-86,298	10.8	65.6
1999	18,609	-106,748	-88,140	10.6	63.6
2000	18,787	-108,809	-90,022	10.5	62.1
2001	19,222	-109,091	-89,869	10.5	62.8
2002	18,462	-113,365	-94,903	9.9	57.5
2003	18,834	-113,824	-94,990	10.0	56.3
2004	18,618	-115,598	-96,980	9.8	49.6
2005	19,030	-113,368	-94,338	9.8	49.4
2006	20,098	-109,749	-89,651	10.2	48.7
2007	20,596	-106,971	-86,375	10.3	47.4
2008	19,294	-115,558	-96,264	9.6	42.9
2009	21,423	-103,774	-82,351	10.5	48.2
2010	20,589	-107,920	-87,331	9.9	43.6
2011	22,581	-106,002	-83,421	10.7	45.2
2012	23,424	-105,021	-81,598	10.9	44.7
2013	19,750	-122,901	-103,151	9.0	35.7
2014	21,147	-120,007	-98,859	9.4	35.9
2015	21,089	-122,078	-100,989	9.2	34.3
2016	21,260	-126,688	-105,428	9.1	34.6

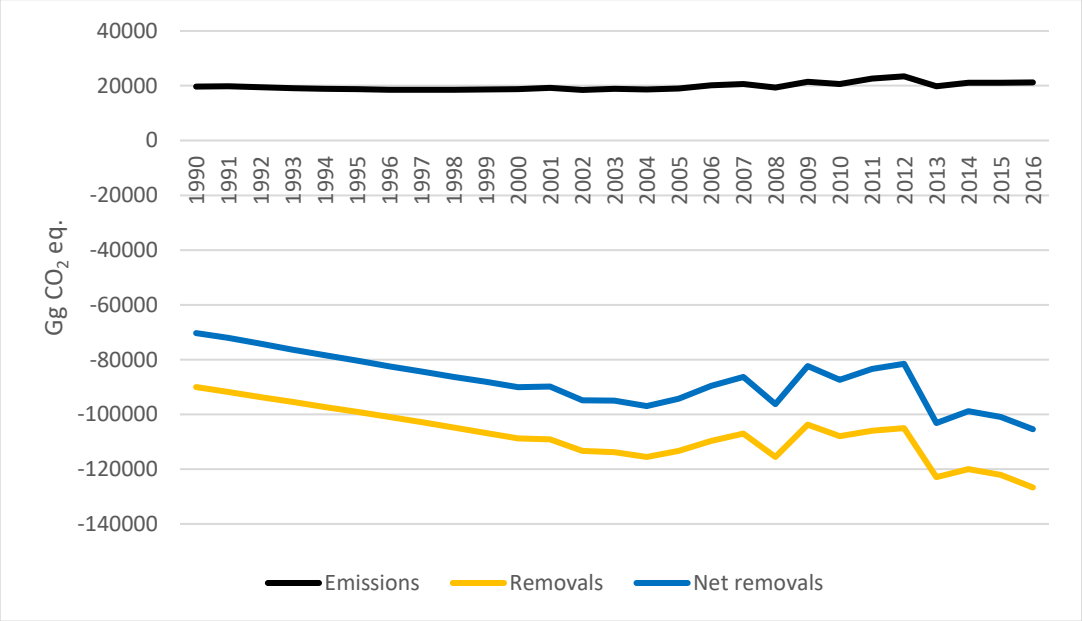

Figure 2.3 - Evolution of national emissions and removals, and the overall (net) situation (Gg CO_2-eq), (1990 - 2016)

Per capita emissions of GHG decreased gradually from 13.7 tonnes CO_2-eq in 1990 to reach 9.1 tonnes in 2016 (Figure 2.4). The GDP emission index decreased almost steadily from 100 in the year 1990 to 35 in 2016 (Figure 2.5).

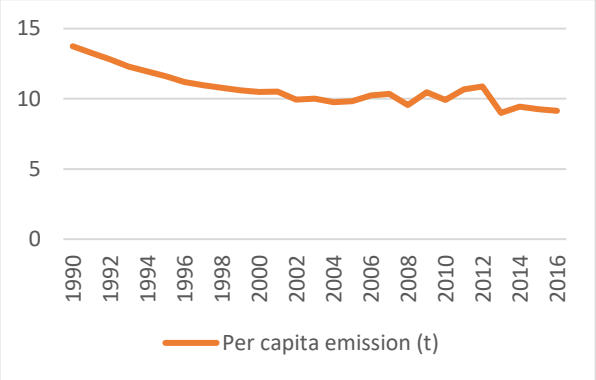

Figure 2.4 - Per capita GHG emissions (1990 - 2016)

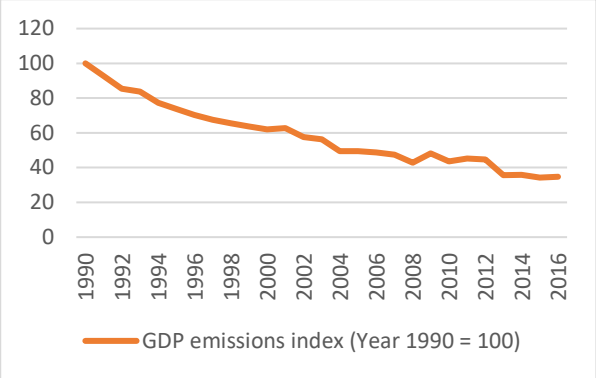

Figure 2.5 - GDP emissions index (1990 - 2016)

2.3.3 Trend of emissions by sector

The AFOLU sector remained the leading emitter throughout this period followed by Energy, for all years under review. Following the setting up of new industries, the IPPU sector took over as the third emitter in lieu of the Waste sector as from the year 2005. Emissions from the AFOLU sector regressed from 18,481 Gg CO_2-eq in 1990 to 16,902 in 2016, representing a decrease of 9% from the 1990 level. The share of GHG emissions from the AFOLU sector out of total national emissions regressed from 94% in 1990 to 80% in 2016.

Energy emissions increased from 1,117 Gg CO_2-eq (6.0%) of national emissions in 1990 to 3,791 Gg CO_2-eq (18%) in 2016 as depicted in Table 2.3. During the period 1990 to 2016, emissions more than tripled.

The contribution of the IPPU sector in total national emissions increased from 21 Gg CO_2-eq in 1990 to 482 Gg CO_2-eq in 2015 (Table 2.3) to regress to 401 Gg CO_2-eq in 2016 since lime production ceased. The very sharp increase in GHG emissions in the IPPU sector in 2011 is due to the commencement of the production of cement.

Waste emissions on the other hand increased steadily but slowly over this period. Emissions from the waste sector increased from the 1990 level of 73 Gg CO_2-eq to 167 Gg CO_2-eq in 2016, representing a 130% increase. In 2016, Energy contributed 18% of emissions, IPPU 2%, AFOLU 79% and Waste 1%.

Table 2.3 - National GHG emissions (Gg, CO_2-eq) by sector (1990 - 2016)

Year	Total emissions	Energy	IPPU	AFOLU	Waste
1990	19,692	1,117	21	18,481	73
1991	19,775	1,200	21	18,478	76
1992	19,495	1,275	22	18,120	79
1993	19,072	1,373	23	17,595	81
1994	18,921	1,488	23	17,328	82
1995	18,791	1,497	30	17,183	81
1996	18,482	1,590	35	16,777	80
1997	18,490	1,641	41	16,726	82
1998	18,547	1,783	46	16,633	85
1999	18,609	1,918	51	16,551	89
2000	18,787	1,960	55	16,678	94
2001	19,222	2,142	58	16,927	95
2002	18,462	2,190	64	16,112	96
2003	18,834	2,482	70	16,176	106
2004	18,618	2,549	81	15,879	108

Year	Total emissions	Energy	IPPU	AFOLU	Waste
2005	19,030	2,699	123	16,095	114
2006	20,098	2,853	124	17,004	116
2007	20,596	2,938	129	17,415	113
2008	19,294	2,788	129	16,256	121
2009	21,423	2,873	132	18,289	129
2010	20,589	2,963	126	17,365	135
2011	22,581	2,832	281	19,326	142
2012	23,424	3,041	356	19,875	152
2013	19,750	2,900	406	16,291	153
2014	21,147	3,276	443	17,271	157
2015	21,089	3,587	482	16,856	165
2016	21,260	3,791	401	16,902	167

2.3.4 Trend in emissions of direct GHGs

The share of emissions by gas did not change during the period 1990 to 2016. The main contributor to the national GHG emissions remained CO_2 followed by CH_4 and N_2O. However, the share of CO_2 increased while those of CH_4 and N_2O regressed over the time series. Halogenated gases crept in as from 1993 with a slight increase over the period under review. In 2016, the share of the GHG emissions was as follows: 64% CO_2, 22% CH_4, 13% N_2O and 1% halogenated gases. The trend of the aggregated emissions and removals by gas is given in Table 2.4 and Figure 2.6.

Table 2.4 - Aggregated emissions and removals (Gg) by gas (1990 - 2016)

Year	Total emissions (CO_2-eq)	Removals (CO_2)	CO_2	CH_4 (CO_2-eq)	N_2O (CO_2-eq)	Halogenated gases (CO_2-eq)
1990	19,692	-90,021	9,801	6,633	3,258	-
1991	19,775	-91,794	9,882	6,625	3,268	-
1992	19,495	-93,706	9,956	6,390	3,150	-
1993	19,072	-95,488	10,053	6,043	2,975	0.2
1994	18,921	-97,288	10,166	5,862	2,893	0.3
1995	18,791	-99,105	10,174	5,752	2,859	6
1996	18,482	-100,940	10,266	5,482	2,723	11
1997	18,490	-102,793	10,316	5,439	2,719	16
1998	18,547	-104,845	10,456	5,376	2,695	20
1999	18,609	-106,748	10,589	5,319	2,677	24
2000	18,787	-108,809	10,629	5,392	2,737	28
2001	19,222	-109,091	11,021	5,417	2,752	32
2002	18,462	-113,365	11,109	4,820	2,497	36
2003	18,834	-113,824	11,356	4,897	2,541	40
2004	18,618	-115,598	11,425	4,689	2,457	47
2005	19,030	-113,368	11,570	4,856	2,515	89
2006	20,098	-109,749	11,720	5,482	2,805	91
2007	20,596	-106,971	11,805	5,741	2,957	93
2008	19,294	-115,558	11,660	4,970	2,578	86
2009	21,423	-103,774	11,741	6,391	3,206	86
2010	20,589	-107,920	11,825	5,760	2,921	85
2011	22,581	-106,002	12,673	6,503	3,315	90
2012	23,424	-105,021	12,952	6,871	3,509	91
2013	19,750	-122,901	12,857	4,421	2,377	95

Year	Total emissions (CO_2-eq)	Removals (CO_2)	CO_2	CH_4 (CO_2-eq)	N_2O (CO_2-eq)	Halogenated gases (CO_2-eq)
2014	21,147	-120,007	13,258	5,105	2,683	101
2015	21,089	-122,078	13,587	4,804	2,585	113
2016	21,260	-126,688	13,700	4,775	2,665	120

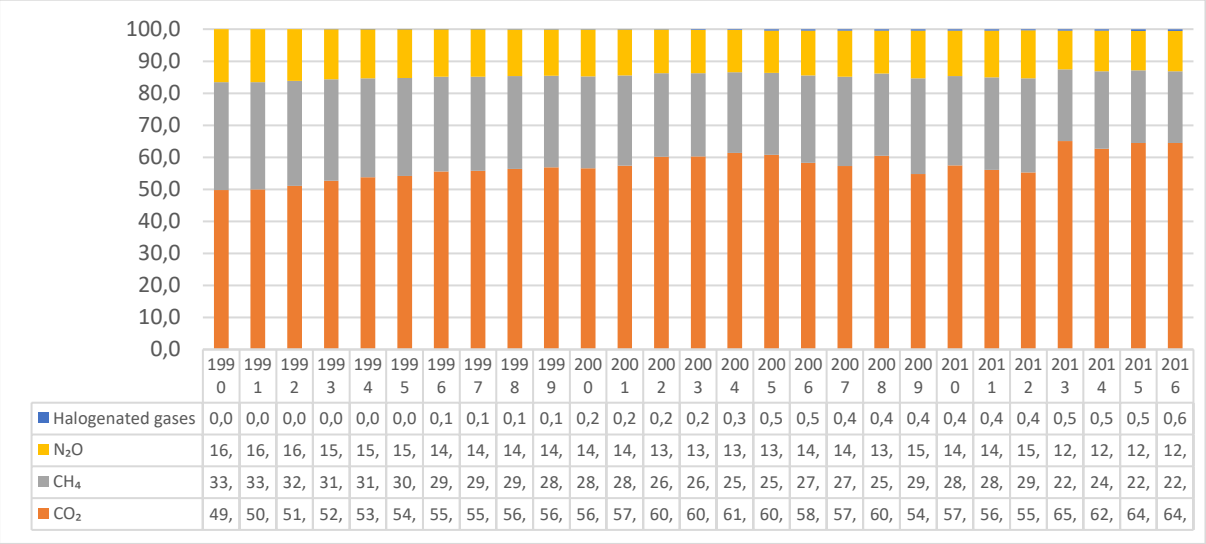

Figure 2.6 - Share of aggregated emissions (Gg CO_2-eq) by gas (1990 - 2016)

2.3.4.1 Carbon dioxide (CO_2)

CO_2 emissions increased by 40% from 9,801 Gg in 1990 to 13,700 Gg in 2016 (Table 2.44). In the same year, the sector that emitted the highest amount of CO_2 was AFOLU with 9,770 Gg followed by Energy with 3,649 Gg (Table 2.5).

Table 2.5 - CO_2 emissions (Gg) by source category (1990 - 2016)

Year	Total emissions	Total net removals	Energy	IPPU	AFOLU - emissions	AFOLU - removals	Waste
1990	9,801	-80,220	1,044	20	8,736	-90,021	0.8
1991	9,882	-81,912	1,125	20	8,736	-91,794	0.9
1992	9,956	-83,750	1,198	21	8,736	-93,706	0.9
1993	10,053	-85,435	1,295	22	8,736	-95,488	0.9
1994	10,166	-87,122	1,407	22	8,736	-97,288	1.0
1995	10,174	-88,931	1,415	23	8,736	-99,105	1.0
1996	10,266	-90,675	1,506	23	8,736	-100,940	1.0
1997	10,316	-92,477	1,555	24	8,736	-102,793	1.1
1998	10,456	-94,389	1,694	24	8,736	-104,845	1.1
1999	10,589	-96,159	1,827	25	8,735	-106,748	1.2
2000	10,629	-98,179	1,868	25	8,736	-108,809	1.2
2001	11,021	-98,070	2,046	25	8,949	-109,091	1.3
2002	11,109	-102,256	2,093	27	8,988	-113,365	1.3
2003	11,356	-102,468	2,379	29	8,947	-113,824	1.4
2004	11,425	-104,174	2,444	32	8,947	-115,598	1.4
2005	11,570	-101,798	2,590	32	8,947	-113,368	1.5
2006	11,720	-98,029	2,740	32	8,947	-109,749	1.6
2007	11,805	-95,166	2,822	35	8,947	-106,971	1.7
2008	11,660	-103,898	2,671	41	8,946	-115,558	1.7

Year	Total emissions	Total net removals	Energy	IPPU	AFOLU - emissions	AFOLU - removals	Waste
2009	11,741	-92,033	2,748	44	8,947	-103,774	1.8
2010	11,825	-96,095	2,837	40	8,947	-107,920	1.9
2011	12,673	-93,329	2,713	189	9,769	-106,002	2.1
2012	12,952	-92,069	2,918	262	9,769	-105,021	2.3
2013	12,857	-110,044	2,776	309	9,769	-122,901	2.3
2014	13,258	-106,748	3,146	340	9,769	-120,007	2.4
2015	13,587	-108,491	3,450	366	9,769	-122,078	2.4
2016	13,700	-112,988	3,649	279	9,770	-126,688	2.4

2.3.4.2 Methane (CH_4)

Methane contributed 4,775 Gg CO_2-eq of the total emissions of 2016. Methane emissions decreased by 1858 Gg CO_2-eq from the 1990 level of 6,633 Gg CO_2-eq to 4,775 in 2016 (Table 2.6). AFOLU contributed between 96% of these emissions in 2016 followed by the Waste sector with 3%.

Table 2.6 - CH_4 emissions (Gg) by source category (1990 - 2016)

Year	Total (Gg CO_2-eq)	Total	Energy	AFOLU - emissions	Waste
1990	6,633	316	2.2	311	2.4
1991	6,625	315	2.3	311	2.5
1992	6,390	304	2.3	299	2.6
1993	6,043	288	2.3	283	2.7
1994	5,862	279	2.4	274	2.8
1995	5,752	274	2.4	269	2.7
1996	5,482	261	2.4	256	2.6
1997	5,439	259	2.4	254	2.7
1998	5,376	256	2.5	251	2.8
1999	5,319	253	2.5	248	3.0
2000	5,392	257	2.5	251	3.2
2001	5,417	258	2.6	252	3.3
2002	4,820	230	2.6	224	3.3
2003	4,897	233	2.7	227	3.8
2004	4,689	223	2.7	217	3.8
2005	4,856	231	2.8	224	4.1
2006	5,482	261	2.8	254	4.2
2007	5,741	273	2.9	267	4.0
2008	4,970	237	2.9	229	4.4
2009	6,391	304	3.0	297	4.7
2010	5,760	274	3.1	266	5.0
2011	6,503	310	3.0	301	5.3
2012	6,871	327	3.0	318	5.8
2013	4,421	211	3.0	202	5.9
2014	5,105	243	3.0	234	6.1
2015	4,804	229	3.1	219	6.4
2016	4,775	227	3.1	218	6.5

2.3.4.3 Nitrous Oxide (N_2O)

Nitrous oxide emissions stood at 2,665 Gg CO_2-eq in 2016. Emissions regressed by 593 Gg CO_2-eq from 3,258 Gg CO_2-eq in the year 1990 to 2,665 Gg CO_2-eq (Table 2.7) in 2016. The AFOLU sector was the highest emitter of N_2O with some 96%.

Table 2.7 - N_2O emissions (Gg) by source category (1990 - 2016)

Year	Total emissions (CO_2-eq)	Total	Energy	IPPU	AFOLU - emissions	Waste
1990	3,258	10.51	0.08	0.002	10.35	0.07
1991	3,268	10.54	0.09	0.003	10.38	0.07
1992	3,150	10.16	0.09	0.003	9.99	0.07
1993	2,975	9.60	0.10	0.003	9.43	0.07
1994	2,893	9.33	0.10	0.003	9.15	0.08
1995	2,859	9.22	0.10	0.003	9.04	0.08
1996	2,723	8.78	0.11	0.004	8.59	0.08
1997	2,719	8.77	0.11	0.004	8.58	0.08
1998	2,695	8.69	0.12	0.004	8.49	0.08
1999	2,677	8.63	0.12	0.004	8.43	0.08
2000	2,737	8.83	0.13	0.004	8.62	0.08
2001	2,752	8.88	0.14	0.005	8.66	0.08
2002	2,497	8.06	0.14	0.005	7.83	0.08
2003	2,541	8.20	0.15	0.005	7.96	0.08
2004	2,457	7.93	0.16	0.005	7.68	0.08
2005	2,515	8.11	0.16	0.005	7.86	0.09
2006	2,805	9.05	0.17	0.006	8.78	0.09
2007	2,957	9.54	0.18	0.006	9.26	0.09
2008	2,578	8.32	0.18	0.006	8.04	0.09
2009	3,206	10.34	0.20	0.006	10.05	0.09
2010	2,921	9.42	0.20	0.007	9.13	0.09
2011	3,315	10.69	0.18	0.007	10.41	0.09
2012	3,509	11.32	0.19	0.007	11.03	0.09
2013	2,377	7.67	0.20	0.007	7.37	0.09
2014	2,683	8.65	0.21	0.008	8.35	0.09
2015	2,585	8.34	0.23	0.008	8.01	0.09
2016	2,665	8.60	0.24	0.008	8.26	0.09

2.3.5 Trends for indirect GHGs and SO_2

Emissions of indirect GHGs (CO, NO_x and NMVOC) and SO_2, have also been estimated and reported in this inventory. Indirect GHGs have not been included in national total emissions. Emissions of these gases for the period 1990 to 2016 are given in Table 2.8.

Emissions of NO_x decreased from 52 Gg in the year 1990 to 35.1 Gg in 2016. Carbon monoxide emissions also regressed, from 2,677 Gg in 1990 to 446 Gg in 2016. Emissions of NMVOCs increased from 17 Gg in 1990 to 28 Gg in 2016 whilst emissions of SO_2 varied between 1.9 Gg and 4.3 Gg during the same period.

Table 2.8 - Emissions (Gg) of indirect GHGs and SO_2 (1990 - 2016)

Year	NO_x	CO	NMVOCs	SO_2
1990	52.0	2,676.9	16.6	1.9
1991	51.1	2,556.7	17.4	2.1
1992	49.9	2,436.1	17.4	2.2
1993	49.3	2,322.6	17.1	2.4
1994	48.9	2,208.2	17.4	2.7
1995	45.6	2,092.8	17.5	2.2
1996	44.3	1,976.6	17.7	2.2

Year	NO_x	CO	NMVOCs	SO_2
1997	42.0	1,859.2	18.3	2.0
1998	41.9	1,741.1	19.1	2.3
1999	41.7	1,622.0	19.9	2.6
2000	39.6	1,475.4	21.3	2.3
2001	41.2	1,488.7	21.2	2.5
2002	37.6	1,143.0	20.9	2.8
2003	39.4	1,151.0	21.7	3.1
2004	37.5	1,035.4	22.1	3.6
2005	41.7	1,278.1	22.0	3.8
2006	46.2	1,629.9	23.0	4.3
2007	49.9	1,915.8	23.1	4.1
2008	37.9	1,212.3	23.1	4.3
2009	56.0	2,275.6	23.6	3.8
2010	52.2	1,958.5	23.7	3.1
2011	53.5	2,089.6	24.8	3.1
2012	57.2	2,178.9	25.9	3.9
2013	31.7	669.8	24.5	2.6
2014	39.2	951.5	26.6	2.9
2015	39.5	799.9	26.5	3.0
2016	35.1	445.9	28.3	3.6

2.3.5.1 NO_x

Emissions of NO_x decreased by 33% over the inventory period from 52.0 Gg in the year 1990 to 35.1 Gg in 2016 (Table 2.9). The two main sources of NO_x emissions were the Energy and AFOLU sectors. The Energy sector witnessed an increase from 10.4 Gg to 29.1 Gg while the AFOLU sector contribution regressed from 41 Gg to 5 Gg from 1990 to 2016. Waste contributed the remainder, less than 1 Gg for all years.

Table 2.9 - NO_x emissions (Gg) by source category (1990 - 2016)

Year	Total emissions	Energy	AFOLU	Waste
1990	52.0	10.4	41.4	0.2
1991	51.1	11.5	39.5	0.2
1992	49.9	12.2	37.5	0.2
1993	49.3	13.4	35.7	0.2
1994	48.9	14.9	33.8	0.2
1995	45.6	13.4	32.0	0.2
1996	44.3	14.0	30.1	0.2
1997	42.0	13.5	28.2	0.2
1998	41.9	15.4	26.3	0.2
1999	41.7	17.0	24.4	0.2
2000	39.6	17.3	22.1	0.2
2001	41.2	18.7	22.2	0.3
2002	37.6	20.5	16.8	0.3
2003	39.4	22.3	16.8	0.3
2004	37.5	22.3	14.9	0.3
2005	41.7	22.7	18.7	0.3
2006	46.2	21.7	24.1	0.3
2007	49.9	21.1	28.5	0.3
2008	37.9	19.9	17.6	0.4

Year	Total emissions	Energy	AFOLU	Waste
2009	56.0	21.6	34.1	0.4
2010	52.2	22.8	29.1	0.4
2011	53.5	21.9	31.2	0.4
2012	57.2	24.2	32.5	0.5
2013	31.7	22.2	9.1	0.5
2014	39.2	25.3	13.3	0.5
2015	39.5	28.0	11.0	0.5
2016	35.1	29.1	5.4	0.5

2.3.5.2 CO

The major contributor of CO was the AFOLU sector with between 78% and 98% of national emissions followed by the Energy sector with between 2% to 4% (Table 2.10). National CO emissions decreased from 2,677 Gg in the year 1990 to 446 Gg in 2016. The AFOLU sector contributed 349 Gg of total CO emissions compared to 88 Gg by the Energy sector and 9 Gg by the Waste sector in 2016.

Table 2.10 - CO emissions (Gg) by source category (1990 - 2016)

Year	Total emissions	Energy	%Energy	AFOLU	%AFOLU	Waste	%Waste
1990	2,676.9	46.6	1.7%	2,627.3	98.1%	3.0	0.1%
1991	2,556.7	48.2	1.9%	2,505.4	98.0%	3.1	0.1%
1992	2,436.1	49.5	2.0%	2,383.3	97.8%	3.2	0.1%
1993	2,322.6	50.9	2.2%	2,268.3	97.7%	3.3	0.1%
1994	2,208.2	52.4	2.4%	2,152.3	97.5%	3.5	0.2%
1995	2,092.8	54.0	2.6%	2,035.2	97.3%	3.6	0.2%
1996	1,976.6	55.7	2.8%	1,917.2	97.0%	3.7	0.2%
1997	1,859.2	57.3	3.1%	1,798.1	96.7%	3.9	0.2%
1998	1,741.1	59.1	3.4%	1,678.0	96.4%	4.0	0.2%
1999	1,622.0	60.9	3.8%	1,556.9	96.0%	4.2	0.3%
2000	1,475.4	62.8	4.3%	1,408.3	95.5%	4.3	0.3%
2001	1,488.7	65.5	4.4%	1,418.8	95.3%	4.5	0.3%
2002	1,143.0	65.7	5.7%	1,072.6	93.8%	4.7	0.4%
2003	1,151.0	70.4	6.1%	1,075.7	93.5%	5.0	0.4%
2004	1,035.4	73.5	7.1%	956.7	92.4%	5.2	0.5%
2005	1,278.1	75.9	5.9%	1,196.7	93.6%	5.4	0.4%
2006	1,629.9	78.5	4.8%	1,545.7	94.8%	5.7	0.4%
2007	1,915.8	80.6	4.2%	1,829.3	95.5%	6.0	0.3%
2008	1,212.3	76.5	6.3%	1,129.5	93.2%	6.3	0.5%
2009	2,275.6	79.3	3.5%	2,189.8	96.2%	6.6	0.3%
2010	1,958.5	83.6	4.3%	1,868.1	95.4%	6.9	0.4%
2011	2,089.6	79.0	3.8%	2,003.0	95.9%	7.5	0.4%
2012	2,178.9	79.4	3.6%	2,091.2	96.0%	8.2	0.4%
2013	669.8	79.1	11.8%	582.4	86.9%	8.4	1.2%
2014	951.5	85.0	8.9%	858.0	90.2%	8.5	0.9%
2015	799.9	86.4	10.8%	704.9	88.1%	8.6	1.1%
2016	445.9	87.9	19.7%	349.3	78.3%	8.7	2.0%

2.3.5.3 NMVOCs

In 2016, NMVOCs emissions stood at 28.3 Gg compared to 17 Gg in the year 1990. The two main emission sources were the Energy and AFOLU sectors (Table 2.11). NMVOCs emissions increased throughout the

inventory period for these two sectors with slight variations between years. Emissions from the Waste sector increased from 0.1 Gg to 0.6 Gg during the inventory period.

Table 2.11 - NMVOCs emissions (Gg) by source category (1990 - 2016)

Year	Total emissions	Energy	IPPU	AFOLU	Waste
1990	16.6	6.5	0.5	9.5	0.1
1991	17.4	6.7	0.5	10.0	0.1
1992	17.4	6.9	0.6	9.8	0.1
1993	17.1	7.1	0.6	9.2	0.1
1994	17.4	7.4	0.7	9.2	0.2
1995	17.5	7.5	0.7	9.1	0.2
1996	17.7	7.7	0.8	9.0	0.2
1997	18.3	7.9	0.9	9.3	0.2
1998	19.1	8.2	1.1	9.7	0.2
1999	19.9	8.4	1.2	10.0	0.2
2000	21.3	8.7	1.3	11.0	0.2
2001	21.2	8.6	1.5	10.9	0.2
2002	20.9	8.7	1.4	10.5	0.2
2003	21.7	9.2	1.6	10.6	0.3
2004	22.1	9.6	1.6	10.6	0.3
2005	22.0	9.9	1.7	10.1	0.3
2006	23.0	10.2	1.7	10.7	0.3
2007	23.1	10.5	1.8	10.5	0.3
2008	23.1	10.0	1.9	10.8	0.4
2009	23.6	10.4	2.1	10.7	0.4
2010	23.7	10.9	2.1	10.3	0.4
2011	24.8	10.5	2.2	11.7	0.5
2012	25.9	10.7	2.3	12.5	0.5
2013	24.5	10.4	2.3	11.3	0.5
2014	26.6	11.1	2.3	12.6	0.5
2015	26.5	11.3	2.4	12.2	0.6
2016	28.3	11.5	2.6	13.5	0.6

2.3.5.4 SO_2

The energy sector remained nearly as the sole emitter of SO_2 (Table 2.12) during the full inventory period. Emissions fluctuated from 1.9 Gg to 4.3 Gg during the inventory period 1990 to 2016. The Waste sector emitted an insignificant amount varying from 0.01 to 0.02 Gg.

Table 2.12 - SO_2 emissions (Gg) by source category (1990 - 2016)

Year	Total emissions	Energy	Waste
1990	1.88	1.88	0.01
1991	2.09	2.09	0.01
1992	2.22	2.21	0.01
1993	2.43	2.43	0.01
1994	2.72	2.71	0.01
1995	2.21	2.20	0.01
1996	2.24	2.23	0.01
1997	1.99	1.98	0.01
1998	2.33	2.32	0.01
1999	2.62	2.61	0.01
2000	2.27	2.26	0.01

Year	Total emissions	Energy	Waste
2001	2.47	2.46	0.01
2002	2.82	2.81	0.01
2003	3.08	3.07	0.01
2004	3.60	3.59	0.01
2005	3.81	3.80	0.01
2006	4.28	4.26	0.01
2007	4.09	4.08	0.01
2008	4.26	4.25	0.01
2009	3.85	3.83	0.01
2010	3.09	3.07	0.01
2011	3.14	3.13	0.01
2012	3.86	3.85	0.02
2013	2.63	2.62	0.02
2014	2.86	2.84	0.02
2015	3.01	2.99	0.02
2016	3.61	3.59	0.02

3.5.5 Halogenated non-ODS emissions (1990 - 2016)

Halogenated non-ODS emissions were compiled as from 1993 only as this was the year these products came into use for the first time. Emissions increased from 0.2 Gg CO_2-eq in 1990 to 119.6 Gg CO_2-eq in 2016.

Table 3.12 - Halogenated non-ODS emissions (Gg CO_2-eq) by source category (1990 - 2016)

Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Emissions (Gg)	-	-	-	0.2	0.3	5.9	11.0	15.8	20.2	24.4	28.4	32.2	35.7	40.3	47.4

Year	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Emissions (Gg)	89.4	91.0	92.6	85.8	85.7	84.6	89.7	91.2	94.7	100.7	113.2	119.6

2.3.6 Summary, Sectoral and Uncertainties tables from IPCC 2006 software for the year 2016

Table 3.13 - Short Summary Table (Inventory Year 2016)

	Emissions (Gg)			Emissions CO_2 Equivalents (Gg)				Emissions (Gg)				
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	-112987.964	227.401	8.596	119.551	NE	NE	NE	NE	35.069	445.903	28.290	3.605
1 - Energy	3649.200	3.146	0.244	NA	NA	NA	NA	NA	29.146	87.920	11.514	3.588
1.A - Fuel Combustion Activities	3649.200	3.146	0.244	NA	NA	NA	NA	NA	29.146	87.920	11.514	3.588
1.B - Fugitive emissions from fuels	NO	NO	NO	NA	NA	NA	NA	NA	NO	NO	NO	NO
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	278.846	NO	0.008	119.551	NE	NE	NE	NE	NO	NO	2.644	NO
2.A - Mineral Industry	262.624	NO	NO	NA	NA	NA	NA	NA	NO	NO	NO	NO
2.B - Chemical Industry	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
2.C - Metal Industry	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
2.D - Non-Energy Products from Fuels and Solvent Use	16.221	NO	NO	NA	NA	NA	NA	NA	NO	NO	1.367	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	119.551	NE	NA	NA	NA	NA	NA	NA	NA
2.G - Other Product Manufacture and Use	NO	NO	0.008	NO	NE	NE	NO	NE	NA	NA	NA	NA
2.H - Other	0.000	0.000	0.000	NA	NA	NA	NA	NA	0.000	0.000	1.278	0.000
3 - Agriculture, Forestry, and Other Land Use	-116918.432	217.723	8.257	NA	NA	NA	NA	NA	5.426	349.270	13.544	NO
3.A - Livestock	NA	194.921	0.511	NA	NA	NA	NA	NA	NA	NA	13.544	NA
3.B - Land	-116829.341	0.000	0.000	NA	NA	NA	NA	NA	NO	NO	NO	NO
3.C - Aggregate sources and non-CO_2 emissions sources on land	1.256	22.801	7.746	NA	NA	NA	NA	NA	5.426	349.270	NA	NA
3.D - Other	-90.347	NO	NO	NA	NA	NA	NA	NA	NO	NO	NO	NO
4 - Waste	2.422	6.533	0.087	NA	NA	NA	NA	NA	0.496	8.714	0.588	0.017
4.A - Solid Waste Disposal	NA	4.239	NO	NA	NA	NA	NA	NA	NO	NO	0.396	NA
4.B - Biological Treatment of Solid Waste	NA	NO	NO	NA	NA	NA	NA	NA	NO	NO	NO	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 equivalent conversion factors (3)	Other halogenated gases without CO_2 equivalent conversion factors (4)	NO_x	CO	NMVOCs	SO_2
4.C - Incineration and Open Burning of Waste	2.422	1.014	0.013	NA	NA	NA	NA	NA	0.496	8.713	0.192	0.017
4.D - Wastewater Treatment and Discharge	NA	1.280	0.074	NA	NA	NA	NA	NA	NO	NO	0.000	NA
4.E - Other (please specify)	NO	NO	NO	NA	NA	NA	NA	NA	NO	NO	NO	NA
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 NH3	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
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Memo Items (5)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
International Bunkers	263.112	0.015	0.007	NA	NA	NA	NA	NA	4.267	0.789	0.274	1.015
1.A.3.a.i - International Aviation (International Bunkers)	108.698	0.001	0.003	NA	NA	NA	NA	NA	0.441	0.038	0.017	0.035
1.A.3.d.i - International water-borne navigation (International bunkers)	154.414	0.014	0.004	NA	NA	NA	NA	NA	3.825	0.752	0.257	0.981
1.A.5.c - Multilateral Operations	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO

Table 3.14 - Long Summary Table (Inventory Year 2016)

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
Total National Emissions and Removals	-112987.964	227.401	8.596	119.551	NE	NE	NE	NE	35.069	445.903	28.290	3.605

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
1 - Energy	3649.200	3.146	0.244	NA	NA	NA	NA	NA	29.146	87.920	11.514	3.588
1.A - Fuel Combustion Activities	3649.200	3.146	0.244	NA	NA	NA	NA	NA	29.146	87.920	11.514	3.588
1.A.1 - Energy Industries	86.867	0.321	0.044	NA	NA	NA	NA	NA	1.055	0.968	0.079	0.866
1.A.2 - Manufacturing Industries and Construction	192.505	0.083	0.005	NA	NA	NA	NA	NA	0.736	1.435	0.359	0.923
1.A.3 - Transport	2852.747	0.633	0.158	NA	NA	NA	NA	NA	18.988	54.242	5.812	0.027
1.A.4 - Other Sectors	379.730	2.101	0.030	NA	NA	NA	NA	NA	6.941	30.839	5.173	1.771
1.A.5 - Non-Specified	137.351	0.008	0.007	NA	NA	NA	NA	NA	1.426	0.435	0.091	0.001
1.B - Fugitive emissions from fuels	NO	NO	NO	NA	NA	NA	NA	NA	NO	NO	NO	NO
1.B.1 - Solid Fuels	NO	NO	NA	NA	NA	NA	NA	NA	NA	NA	NA	NO
1.B.2 - Oil and Natural Gas	NO	NO	NO	NA	NA	NA	NA	NA	NO	NO	NO	NA
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	278.846	NO	0.008	119.551	NE	NE	NE	NE	NO	NO	2.644	NO
2.A - Mineral Industry	262.624	NO	NO	NA	NA	NA	NA	NA	NO	NO	NO	NO
2.A.1 - Cement production	262.624	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	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
2.B.1 - Ammonia Production	NO	NA	NA	NA	NA	NA	NA	NA	NO	NO	NO	NO
2.B.2 - Nitric Acid Production	NA	NA	NO	NA	NA	NA	NA	NA	NO	NO	NO	NO
2.B.3 - Adipic Acid Production	NA	NA	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 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	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
2.C.1 - Iron and Steel Production	NO	NO	NA	NA	NA	NA	NA	NA	NO	NO	NO	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	16.221	NO	NO	NA	NA	NA	NA	NA	NO	NO	2.644	NO
2.D.1 - Lubricant Use	9.064	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2.D.2 - Paraffin Wax Use	7.157	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	1.367	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

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
2.F - Product Uses as Substitutes for Ozone Depleting Substances	NA	NA	NA	119.551	NE	NA	NA	NA	NA	NA	NA	NA
2.F.1 - Refrigeration and Air Conditioning	NA	NA	NA	119.551	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	0.008	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	0.008	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	0.000	0.000	NO	NA	NA	NA	NA	NA	0.000	0.000	1.278	0.000
2.H.1 - Pulp and Paper Industry	NO	NO	NA	NA	NA	NA	NA	NA	NO	NO	NO	NO
2.H.2 - Food and Beverages Industry	0.000	0.000	NA	NA	NA	NA	NA	NA	0.000	0.000	1.278	0.000
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	-116918.432	217.723	8.257	NA	NA	NA	NA	NA	5.426	349.270	13.544	NO
3.A - Livestock	NA	194.921	0.511	NA	NA	NA	NA	NA	NA	NA	13.544	NA
3.A.1 - Enteric Fermentation	NA	190.456	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3.A.2 - Manure Management	NA	4.466	0.511	NA	NA	NA	NA	NA	NA	NA	13.544	NA
3.B - Land	-116829.341	NA	NO	NA	NA	NA	NA	NA	NO	NO	NO	NO
3.B.1 - Forest land	-126598.050	NA	NA	NA	NA	NA	NA	NA	NO	NO	NO	NO
3.B.2 - Cropland	NO	NA	NA	NA	NA	NA	NA	NA	NO	NO	NO	NO
3.B.3 - Grassland	9755.939	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	12.771	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 equivalent conversion factors (3)	Other halogenated gases without CO_2 equivalent conversion factors (4)	NO_x	CO	NMVOCs	SO_2
3.B.6 - Other Land	NO	NA	NA	NA	NA	NA	NA	NA	NO	NO	NO	NO
3.C - Aggregate sources and non-CO_2 emissions sources on land	1.256	22.801	7.746	NA	NA	NA	NA	NA	5.426	349.270	NA	NA
3.C.1 - Emissions from biomass burning	NA	22.801	0.673	NA	NA	NA	NA	NA	5.426	349.270	NA	NA
3.C.2 - Liming	NO	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3.C.3 - Urea application	1.256	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3.C.4 - Direct N_2O Emissions from managed soils	NA	NA	6.499	NA	NA	NA	NA	NA	NA	NA	NA	NA
3.C.5 - Indirect N_2O Emissions from managed soils	NA	NA	0.106	NA	NA	NA	NA	NA	NA	NA	NA	NA
3.C.6 - Indirect N_2O Emissions from manure management	NA	NA	0.468	NA	NA	NA	NA	NA	NA	NA	NA	NA
3.C.7 - Rice cultivation	NA	NO	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	-90.347	NO	NO	NA	NA	NA	NA	NA	NO	NO	NO	NO
3.D.1 - Harvested Wood Products	-90.347	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	2.422	6.533	0.087	NA	NA	NA	NA	NA	0.496	8.714	0.588	0.017
4.A - Solid Waste Disposal	NA	4.239	NO	NA	NA	NA	NA	NA	NO	NO	0.396	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	2.422	1.014	0.013	NA	NA	NA	NA	NA	0.496	8.714	0.192	0.017
4.D - Wastewater Treatment and Discharge	NA	1.280	0.074	NA	NA	NA	NA	NA	NO	NO	0.000	NA
4.E - Other (please specify)	NO	NO	NO	NA	NA	NA	NA	NA	NO	NO	NO	NA
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 NH3	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

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
Memo Items (5)												
International Bunkers	263.112	0.015	0.007	NA	NA	NA	NA	NA	4.267	0.789	0.274	1.015
1.A.3.a.i - International Aviation (International Bunkers)	108.698	0.001	0.003	NA	NA	NA	NA	NA	0.441	0.038	0.017	0.035
1.A.3.d.i - International water-borne navigation (International bunkers)	154.414	0.014	0.004	NA	NA	NA	NA	NA	3.825	0.752	0.257	0.981
1.A.5.c - Multilateral Operations	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO

Table 3.15 - Sectoral Table Energy sector (Inventory Year: 2016)

	Emissions (Gg)						
Categories	**CO_2**	**CH_4**	**N_2O**	**NO_x**	**CO**	**NMVOCs**	**SO_2**
1 - Energy	3649.200	3.146	0.244	29.146	87.920	11.514	3.588
1.A - Fuel Combustion Activities	3649.200	3.146	0.244	29.146	87.920	11.514	3.588
1.A.1 - Energy Industries	86.867	0.321	0.044	1.055	0.968	0.079	0.866
1.A.1.a - Main Activity Electricity and Heat Production	86.867	0.001	0.001	0.192	0.008	0.001	0.751
1.A.1.a.i - Electricity Generation	86.867	0.001	0.001	0.192	0.008	0.001	0.751
1.A.1.a.ii - Combined Heat and Power Generation (CHP)	NO	NO	NO	NO	NO	NO	NO
1.A.1.a.iii - Heat Plants	NO	NO	NO	NO	NO	NO	NO
1.A.1.b - Petroleum Refining	NO	NO	NO	NO	NO	NO	NO
1.A.1.c - Manufacture of Solid Fuels and Other Energy Industries	NO	0.320	0.043	0.864	0.960	0.078	0.115
1.A.1.c.i - Manufacture of Solid Fuels	NO	0.320	0.043	0.864	0.960	0.078	0.115
1.A.1.c.ii - Other Energy Industries	NO			NO	NO	NO	NO
1.A.2 - Manufacturing Industries and Construction	192.505	0.083	0.005	0.736	1.435	0.359	0.923
1.A.2.a - Iron and Steel	NO	NO	NO	NO	NO	NO	NO
1.A.2.b - Non-Ferrous Metals	NO	NO	NO	NO	NO	NO	NO
1.A.2.c - Chemicals	NO	NO	NO	NO	NO	NO	NO
1.A.2.d - Pulp, Paper and Print	NO	NO	NO	NO	NO	NO	NO
1.A.2.e - Food Processing, Beverages and Tobacco	EE	EE	EE	EE	EE	EE	EE
1.A.2.f - Non-Metallic Minerals	EE	EE	EE	EE	EE	EE	EE
1.A.2.g - Transport Equipment	NO	NO	NO	NO	NO	NO	NO
1.A.2.h - Machinery	NO	NO	NO	NO	NO	NO	NO
1.A.2.i - Mining (excluding fuels) and Quarrying	190.067	0.025	0.004	0.681	. 1.197	0.234	0.917
1.A.2.j - Wood and wood products	NO	NO	NO	NO	NO	NO	NO
1.A.2.k - Construction	EE	EE	EE	EE	EE	EE	EE
1.A.2.l - Textile and Leather	EE	EE	EE	EE	EE	EE	EE
1.A.2.m - Non-specified Industry	2.437	0.058	0.002	0.055	0.238	0.125	0.006
1.A.3 - Transport	2852.747	0.633	0.158	18.988	54.242	5.812	0.027
1.A.3.a - Civil Aviation	25.546	0.000	0.001	0.061	4.338	0.069	0.008
1.A.3.a.i - International Aviation (International Bunkers) (1)	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1.A.3.a.ii - Domestic Aviation	25.546	0.000	0.001	0.061	4.338	0.069	0.008
1.A.3.b - Road Transportation	2778.514	0.630	0.139	18.111	49.738	5.669	0.019
1.A.3.b.i - Cars	593.920	0.239	0.028	1.812	13.578	1.621	0.007
1.A.3.b.i.1 - Passenger cars with 3-way catalysts	191.069	0.078	0.009	0.580	4.344	0.519	0.002
1.A.3.b.i.2 - Passenger cars without 3-way catalysts	402.851	0.162	0.019	1.232	9.235	1.103	0.005
1.A.3.b.ii - Light-duty trucks	1090.740	0.332	0.053	4.862	33.205	3.296	0.010
1.A.3.b.ii.1 - Light-duty trucks with 3-way catalysts	818.055	0.249	0.040	3.646	24.904	2.472	0.007
1.A.3.b.ii.2 - Light-duty trucks without 3-way catalysts	272.685	0.083	0.013	1.215	8.301	0.824	0.002
1.A.3.b.iii - Heavy-duty trucks and buses	1091.631	0.057	0.057	11.433	2.597	0.658	0.003
1.A.3.b.iv - Motorcycles	2.224	0.001	0.000	0.005	0.357	0.094	0.000

	Emissions (Gg)						
Categories	CO_2	CH_4	N_2O	NO_x	CO	NMVOCs	SO_2
1.A.3.b.v - Evaporative emissions from vehicles	NO	NO	NO	NO	NO	NO	NO
1.A.3.b.vi - Urea-based catalysts	NO	NO	NO	NO	NO	NO	NO
1.A.3.c - Railways	48.687	0.003	0.018	0.816	0.167	0.073	0.000
1.A.3.d - Water-borne Navigation	EE	EE	EE	EE	EE	EE	EE
1.A.3.d.i - International water-borne navigation (International bunkers) (1)	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1.A.3.d.ii - Domestic Water-borne Navigation	EE	EE	EE	EE	EE	EE	EE
1.A.3.e - Other Transportation	EE	EE	EE	EE	EE	EE	EE
1.A.3.e.i - Pipeline Transport	NO	NO	NO	NO	NO	NO	NO
1.A.3.e.ii - Off-road	EE	EE	EE	EE	EE	EE	EE
1.A.4 - Other Sectors	379.730	2.101	0.030	6.941	30.839	5.173	1.771
1.A.4.a - Commercial/Institutional	EE	EE	EE	EE	EE	EE	EE
1.A.4.b - Residential	110.180	2.064	0.028	0.586	27.760	4.162	0.076
1.A.4.c - Agriculture/Forestry/Fishing/Fish Farms	269.550	0.037	0.002	6.354	3.079	1.011	1.695
1.A.4.c.i - Stationary	EE	EE	EE	EE	EE	EE	EE
1.A.4.c.ii - Off-road Vehicles and Other Machinery	EE	EE	EE	EE	EE	EE	EE
1.A.4.c.iii - Fishing (mobile combustion)	269.550	0.037	0.002	6.354	3.079	1.011	1.695
1.A.5 - Non-Specified	137.351	0.008	0.007	1.426	0.435	0.091	0.001
1.A.5.a - Stationary	EE	EE	EE	EE	EE	EE	EE
1.A.5.b - Mobile	137.351	0.008	0.007	1.426	0.435	0.091	0.001
1.A.5.b.i - Mobile (aviation component)	EE	EE	EE	EE	EE	EE	EE
1.A.5.b.ii - Mobile (water-borne component)	EE	EE	EE	EE	EE	EE	EE
1.A.5.b.iii - Mobile (Other)	137.351	0.008	0.007	1.426	0.435	0.091	0.001
1.A.5.c - Multilateral Operations (1)(2)	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1.B - Fugitive emissions from fuels	NO	NO	NO	NO	NO	NO	NO
1.B.1 - Solid Fuels	NO	NO	NO	NO	NO	NO	NO
1.B.1.a - Coal mining and handling	NO	NO	NA	NO	NO	NO	NO
1.B.1.a.i - Underground mines	NO	NO	NA	NO	NO	NO	NO
1.B.1.a.i.1 - Mining	NO	NO	NA	NO	NO	NO	NO
1.B.1.a.i.2 - Post-mining seam gas emissions	NO	NO	NA	NO	NO	NO	NO
1.B.1.a.i.3 - Abandoned underground mines	NO	NO	NA	NO	NO	NO	NO
1.B.1.a.i.4 - Flaring of drained methane or conversion of methane to CO_2	NO	NO	NA	NO	NO	NO	NO
1.B.1.a.ii - Surface mines	NO	NO	NA	NO	NO	NO	NO
1.B.1.a.ii.1 - Mining	NO	NO	NA	NO	NO	NO	NO
1.B.1.a.ii.2 - Post-mining seam gas emissions	NO	NO	NA	NO	NO	NO	NO
1.B.1.b - Uncontrolled combustion and burning coal dumps	NO	NA	NA	NO	NO	NO	NO
1.B.1.c - Solid fuel transformation	NO	NO	NO	NO	NO	NO	NO
1.B.2 - Oil and Natural Gas	NO	NO	NO	NO	NO	NO	NO
1.B.2.a - Oil	NO	NO	NO	NO	NO	NO	NO
1.B.2.a.i - Venting	NO	NO	NA	NO	NO	NO	NO
1.B.2.a.ii - Flaring	NO	NO	NO	NO	NO	NO	NO
1.B.2.a.iii - All Other	NO	NO	NO	NO	NO	NO	NO
1.B.2.a.iii.1 - Exploration	NO	NO	NO	NO	NO	NO	NO
1.B.2.a.iii.2 - Production and Upgrading	NO	NO	NO	NO	NO	NO	NO
1.B.2.a.iii.3 - Transport	NO	NO	NO	NO	NO	NO	NO
1.B.2.a.iii.4 - Refining	NO	NO	NA	NO	NO	NO	NO

	Emissions (Gg)						
Categories	CO_2	CH_4	N_2O	NO_x	CO	NMVOCs	SO_2
1.B.2.a.iii.5 - Distribution of oil products	NO	NO	NA	NO	NO	NO	NO
1.B.2.a.iii.6 - Other	NO	NO	NO	NO	NO	NO	NO
1.B.2.b - Natural Gas	NO	NO	NO	NO	NO	NO	NO
1.B.2.b.i - Venting	NO	NO	NA	NO	NO	NO	NO
1.B.2.b.ii - Flaring	NO	NO	NO	NO	NO	NO	NO
1.B.2.b.iii - All Other	NO	NO	NO	NO	NO	NO	NO
1.B.2.b.iii.1 - Exploration	NO	NO	NA	NO	NO	NO	NO
1.B.2.b.iii.2 - Production	NO	NO	NA	NO	NO	NO	NO
1.B.2.b.iii.3 - Processing	NO	NO	NA	NO	NO	NO	NO
1.B.2.b.iii.4 - Transmission and Storage	NO	NO	NA	NO	NO	NO	NO
1.B.2.b.iii.5 - Distribution	NO	NO	NA	NO	NO	NO	NO
1.B.2.b.iii.6 - Other	NO	NO	NO	NO	NO	NO	NO
1.B.3 - Other emissions from Energy Production	NO	NO	NO	NO	NO	NO	NO
1.C - Carbon dioxide Transport and Storage	NO	NA	NA	NA	NA	NA	NA
1.C.1 - Transport of CO_2	NO	NA	NA	NA	NA	NA	NA
1.C.1.a - Pipelines	NO	NA	NA	NA	NA	NA	NA
1.C.1.b - Ships	NO	NA	NA	NA	NA	NA	NA
1.C.1.c - Other (please specify)	NO	NA	NA	NA	NA	NA	NA
1.C.2 - Injection and Storage	NO	NA	NA	NA	NA	NA	NA
1.C.2.a - Injection	NO	NA	NA	NA	NA	NA	NA
1.C.2.b - Storage	NO	NA	NA	NA	NA	NA	NA
1.C.3 - Other	NO	NA	NA	NA	NA	NA	NA

	Emissions (Gg)						
Categories	CO_2	CH_4	N_2O	NO_x	CO	NMVOCs	SO_2
Memo Items (3)							
International Bunkers	263.112	0.015	0.007	4.267	0.789	0.274	1.015
1.A.3.a.i - International Aviation (International Bunkers) (1)	108.698	0.001	0.003	0.441	0.038	0.017	0.035
1.A.3.d.i - International water-borne navigation (International bunkers) (1)	154.414	0.014	0.004	3.825	0.752	0.257	0.981
1.A.5.c - Multilateral Operations (1)(2)	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Information Items	0.000	0.000	0.000	0.000	0.000	0.000	0.000
CO_2 from Biomass Combustion for Energy Production	2017.287	0.000	0.000	0.000	0.000	0.000	0.000

Table 3.16 - Sectoral Table IPPU sector (Inventory Year: 2016)

Categories	(Gg)			CO_2 Equivalents(Gg)				(Gg)				
	CO_2	CH_4	N_2O	HFCs	PFCs	SF_6	Other halogenated gases with CO_2 equivalent conversion factors (1)	Other halogenated gases without CO_2 equivalent conversion factors (2)	NO_x	CO	NMVOCs	SO_2
2 - Industrial Processes and Product Use	278.846	0.000	0.008	119.551	0.000	0.000	0.000	0.000	0.000	0.000	2.644	0.000
2.A - Mineral Industry	262.624	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2.A.1 - Cement production	262.624	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	0.000	0.000	0.000	NA	NA	NA	NA	NA	NO	NO	NO	NO
2.A.4.a - Ceramics	NO	NO	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2.A.4.b - Other Uses of Soda Ash	NO	NO	NO	NA	NA	NA	NA	NA	NO	NO	NO	NO
2.A.4.c - Non Metallurgical Magnesia Production	NO	NO	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2.A.4.d - Other (please specify) (3)	NO	NO	NA	NA	NA	NA	NA	NA	NO	NO	NO	NO
2.A.5 - Other (please specify) (3)	NO	NO	NO	NA	NA	NA	NA	NA	NO	NO	NO	NO
2.B - Chemical Industry	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
2.B.1 - Ammonia Production	NO	NA	NA	NA	NA	NA	NA	NA	NO	NO	NO	NO
2.B.2 - Nitric Acid Production	NA	NA	NO	NA	NA	NA	NA	NA	NO	NO	NO	NO
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.8.a - Methanol	NO	NO	NA	NA	NA	NA	NA	NA	NO	NO	NO	NO
2.B.8.b - Ethylene	NO	NO	NA	NA	NA	NA	NA	NA	NO	NO	NO	NO

Categories	(Gg)			CO_2 Equivalents(Gg)				(Gg)				
	CO_2	CH_4	N_2O	HFCs	PFCs	SF_6	Other halogenated gases with CO_2 equivalent conversion factors (1)	Other halogenated gases without CO_2 equivalent conversion factors (2)	NO_x	CO	NMVOCs	SO_2
2.B.8.c - Ethylene Dichloride and Vinyl Chloride Monomer	NO	NO	NA	NA	NA	NA	NA	NA	NO	NO	NO	NO
2.B.8.d - Ethylene Oxide	NO	NO	NA	NA	NA	NA	NA	NA	NO	NO	NO	NO
2.B.8.e - Acrylonitrile	NO	NO	NA	NA	NA	NA	NA	NA	NO	NO	NO	NO
2.B.8.f - Carbon Black	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.9.a - By-product emissions (4)	NA	NA	NA	NO	NA	NA	NA	NA	NO	NO	NO	NO
2.B.9.b - Fugitive Emissions (4)	NA	NA	NA	NA	NA	NA	NA	NA	NO	NO	NO	NO
2.B.10 - Other (Please specify) (3)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
2.C - Metal Industry	0.000	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
2.C.1 - Iron and Steel Production	NO	NO	NA	NA	NA	NA	NA	NA	NO	NO	NO	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	NA	NO	NO	NO	NO
2.C.4 - Magnesium production (5)	NO	NA	NA	NA	NA	NO	NA	NA	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	NA	NA	NA	NA	NA	NA	NA	NA	NO	NO	NO	NO
2.C.7 - Other (please specify) (3)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
2.D - Non-Energy Products from Fuels and Solvent Use (6)	16.221	NO	NO	NA	NA	NA	NA	NA	NO	NO	1.367	NO
2.D.1 - Lubricant Use	9.064	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2.D.2 - Paraffin Wax Use	7.157	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2.D.3 - Solvent Use (7)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.367	NA
2.D.4 - Other (please specify) (3), (8)	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 (9)	NA	NA	NA	NO	NO	NO	NO	NO	NA	NA	NA	NA
2.E.2 - TFT Flat Panel Display (9)	NA	NA	NA	NA	NO	NO	NO	NO	NA	NA	NA	NA

Categories	(Gg)			CO_2 Equivalents(Gg)				(Gg)				
	CO_2	CH_4	N_2O	HFCs	PFCs	SF_6	Other halogenated gases with CO_2 equivalent conversion factors (1)	Other halogenated gases without CO_2 equivalent conversion factors (2)	NO_x	CO	NMVOCs	SO_2
2.E.3 - Photovoltaics (9)	NA	NA	NA	NA	NO	NA	NO	NO	NA	NA	NA	NA
2.E.4 - Heat Transfer Fluid (10)	NA	NA	NA	NA	NO	NA	NO	NO	NA	NA	NA	NA
2.E.5 - Other (please specify) (3)	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	119.551	NE	NA	NA	NA	NA	NA	NA	NA
2.F.1 - Refrigeration and Air Conditioning	NA	NA	NA	119.551	NA	NA	NA	NA	NA	NA	NA	NA
2.F.1.a - Refrigeration and Stationary Air Conditioning	NA	NA	NA	96.204	NA	NA	NA	NA	NA	NA	NA	NA
2.F.1.b - Mobile Air Conditioning	NA	NA	NA	23.346	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) (3)	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	0.000	NA	NE	0.000	0.000	0.000	0.000
2.G.1.a - Manufacture of Electrical Equipment	NA	NA	NA	NA	NO	NO	NA	NO	NA	NA	NA	NA
2.G.1.b - Use of Electrical Equipment	NA	NA	NA	NA	NE	NE	NA	NE	NA	NA	NA	NA
2.G.1.c - Disposal of 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.2.a - Military Applications	NA	NA	NA	NA	NE	NE	NA	NE	NA	NA	NA	NA
2.G.2.b - Accelerators	NA	NA	NA	NA	NE	NE	NA	NE	NA	NA	NA	NA
2.G.2.c - Other (please specify) (3)	NA	NA	NA	NA	NO	NO	NA	NO	NA	NA	NA	NA
2.G.3 - N_2O from Product Uses	NA	NA	0.008	NA	NA	NA	NA	NA	NA	NA	NA	NA

Categories	(Gg)			CO_2 Equivalents(Gg)				(Gg)				
	CO_2	CH_4	N_2O	HFCs	PFCs	SF_6	Other halogenated gases with CO_2 equivalent conversion factors (1)	Other halogenated gases without CO_2 equivalent conversion factors (2)	NO_x	CO	NMVOCs	SO_2
2.G.3.a - Medical Applications	NA	NA	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA
2.G.3.b - Propellant for pressure and aerosol products	NA	NA	NO	NA	NA	NA	NA	NA	NA	NA	NA	NA
2.G.3.c - Other (Please specify) (3)	NA	NA	0.008	NA	NA	NA	NA	NA	NA	NA	NA	NA
2.G.4 - Other (Please specify) (3)	NA	NA	NO	NA	NA	NA	NA	NA	NA	NA	NA	NA
2.H - Other	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.278	0.000
2.H.1 - Pulp and Paper Industry	NO	NO	NA	NA	NA	NA	NA	NA	NO	NO	NO	NO
2.H.2 - Food and Beverages Industry	0.000	0.000	NA	NA	NA	NA	NA	NA	0.000	0.000	1.278	0.000
2.H.3 - Other (please specify) (3)	NO	NO	NO	NA	NA	NA	NA	NA	NO	NO	NO	NO

Table 3.17 - Sectoral Table AFOLU sector (Inventory Year: 2016)

Categories	Net CO_2 emissions / removals	Emissions (Gg)				
		CH_4	N_2O	NO_x	CO	NMVOCs
3 - Agriculture, Forestry, and Other Land Use	-116918.432	217.723	8.257	5.426	349.270	13.544
3.A - Livestock	NA	194.921	0.511	NA	NA	13.544
3.A.1 - Enteric Fermentation	NA	190.456	NA	NA	NA	NA
3.A.1.a - Cattle	NA	169.617	NA	NA	NA	NA
3.A.1.a.i - Dairy Cows	NA	0.183	NA	NA	NA	NA
3.A.1.a.ii - Other Cattle	NA	169.434	NA	NA	NA	NA
3.A.1.b - Buffalo	NA	NO	NA	NA	NA	NA
3.A.1.c - Sheep	NA	8.733	NA	NA	NA	NA
3.A.1.d - Goats	NA	9.843	NA	NA	NA	NA
3.A.1.e - Camels	NA	0.001	NA	NA	NA	NA
3.A.1.f - Horses	NA	0.733	NA	NA	NA	NA
3.A.1.g - Mules and Asses	NA	1.446	NA	NA	NA	NA
3.A.1.h - Swine	NA	0.083	NA	NA	NA	NA
3.A.1.j - Other (please specify)	NA	0.000	NA	NA	NA	NA
3.A.2 - Manure Management (1)	NA	4.466	0.511	NA	NA	13.544
3.A.2.a - Cattle	NA	3.254	0.504	NA	NA	11.448
3.A.2.a.i - Dairy cows	NA	0.002	0.002	NA	NA	0.016
3.A.2.a.ii - Other cattle	NA	3.252	0.502	NA	NA	11.432
3.A.2.b - Buffalo	NA	NO	NA	NA	NA	0.000
3.A.2.c - Sheep	NA	0.349	NA	NA	NA	0.295
3.A.2.d - Goats	NA	0.433	NA	NA	NA	1.067
3.A.2.e - Camels	NA	0.000	NA	NA	NA	0.000
3.A.2.f - Horses	NA	0.089	NA	NA	NA	0.174
3.A.2.g - Mules and Asses	NA	0.174	NA	NA	NA	0.213
3.A.2.h - Swine	NA	0.083	0.004	NA	NA	0.046
3.A.2.i - Poultry	NA	0.084	0.002	NA	NA	0.301
3.A.2.j - Other (please specify)	NA	NA	NA	NA	NA	NA
3.B - Land	-116829.341	NA	NO	NO	NO	NO
3.B.1 - Forest land	-126598.050	NA	NO	NO	NO	NO
3.B.1.a - Forest land Remaining Forest land	-125635.339	NA	NA	NO	NO	NO
3.B.1.b - Land Converted to Forest land	-962.711	NA	NA	NO	NO	NO
3.B.1.b.i - Cropland converted to Forest Land	-62.193	NA	NA	NO	NO	NO
3.B.1.b.ii - Grassland converted to Forest Land	-900.518	NA	NA	NO	NO	NO
3.B.1.b.iii - Wetlands converted to Forest Land	NO	NA	NA	NO	NO	NO
3.B.1.b.iv - Settlements converted to Forest Land	NO	NA	NA	NO	NO	NO
3.B.1.b.v - Other Land converted to Forest Land	NO	NA	NA	NO	NO	NO
3.B.2 - Cropland	NO	NA	NA	NO	NO	NO
3.B.2.a - Cropland Remaining Cropland	NO	NA	NA	NO	NO	NO
3.B.2.b - Land Converted to Cropland	NO	NA	NA	NO	NO	NO
3.B.2.b.i - Forest Land converted to Cropland	NO	NA	NA	NO	NO	NO
3.B.2.b.ii - Grassland converted to Cropland	NO	NA	NA	NO	NO	NO
3.B.2.b.iii - Wetlands converted to Cropland	NO	NA	NA	NO	NO	NO
3.B.2.b.iv - Settlements converted to Cropland	NO	NA	NA	NO	NO	NO

Categories	Net CO_2 emissions / removals	Emissions (Gg)				
		CH_4	N_2O	NO_x	CO	NMVOCs
3.B.2.b.v - Other Land converted to Cropland	NO	NA	NA	NO	NO	NO
3.B.3 - Grassland	9755.939	NA	NA	NO	NO	NO
3.B.3.a - Grassland Remaining Grassland	NO	NA	NA	NO	NO	NO
3.B.3.b - Land Converted to Grassland	9755.939	NA	NA	NO	NO	NO
3.B.3.b.i - Forest Land converted to Grassland	9755.939	NA	NA	NO	NO	NO
3.B.3.b.ii - Cropland converted to Grassland	NO	NA	NA	NO	NO	NO
3.B.3.b.iii - Wetlands converted to Grassland	NO	NA	NA	NO	NO	NO
3.B.3.b.iv - Settlements converted to Grassland	NO	NA	NA	NO	NO	NO
3.B.3.b.v - Other Land converted to Grassland	NO	NA	NA	NO	NO	NO
3.B.4 - Wetlands	NO	NO	NO	NO	NO	NO
3.B.4.a - Wetlands Remaining Wetlands	NO	NO	NO	NO	NO	NO
3.B.4.a.i - Peatlands remaining peatlands	NO	NO	NO	NO	NO	NO
3.B.4.a.ii - Flooded land remaining flooded land	NA	NO	NO	NO	NO	NO
3.B.4.b - Land Converted to Wetlands	0.000	NO	NO	NO	NO	NO
3.B.4.b.i - Land converted for peat extraction	NA	NO	NO	NO	NO	NO
3.B.4.b.ii - Land converted to flooded land	NO	NO	NO	NO	NO	NO
3.B.4.b.iii - Land converted to other wetlands	NA	NO	NO	NO	NO	NO
3.B.5 - Settlements	12.771	NA	NA	NO	NO	NO
3.B.5.a - Settlements Remaining Settlements	NO	NA	NA	NO	NO	NO
3.B.5.b - Land Converted to Settlements	12.771	NA	NA	NO	NO	NO
3.B.5.b.i - Forest Land converted to Settlements	12.771	NA	NA	NO	NO	NO
3.B.5.b.ii - Cropland converted to Settlements	0.000	NA	NA	NO	NO	NO
3.B.5.b.iii - Grassland converted to Settlements	NO	NA	NA	NO	NO	NO
3.B.5.b.iv - Wetlands converted to Settlements	NO	NA	NA	NO	NO	NO
3.B.5.b.v - Other Land converted to Settlements	NO	NA	NA	NO	NO	NO
3.B.6 - Other Land	NO	NO	NO	NO	NO	NO
3.B.6.a - Other land Remaining Other land	NO	NO	NO	NO	NO	NO
3.B.6.b - Land Converted to Other land	NO	NO	NO	NO	NO	NO
3.B.6.b.i - Forest Land converted to Other Land	NO	NO	NO	NO	NO	NO
3.B.6.b.ii - Cropland converted to Other Land	NO	NO	NO	NO	NO	NO
3.B.6.b.iii - Grassland converted to Other Land	NO	NO	NO	NO	NO	NO
3.B.6.b.iv - Wetlands converted to Other Land	NO	NO	NO	NO	NO	NO

Categories	Net CO_2 emissions / removals	Emissions (Gg)				
		CH_4	N_2O	NO_x	CO	NMVOCs
3.B.6.b.v - Settlements converted to Other Land	NO	NO	NO	NO	NO	NO
3.C - Aggregate sources and non-CO_2 emissions sources on land (2)	1.256	22.801	7.746	5.426	349.270	NO
3.C.1 - Emissions from biomass burning	0.000	22.801	0.673	5.426	349.270	NO
3.C.1.a - Biomass burning in forest lands	NA	22.759	0.669	5.355	348.086	NO
3.C.1.b - Biomass burning in croplands	NA	NO	NO	NO	NO	NO
3.C.1.c - Biomass burning in grasslands	NA	0.042	0.004	0.071	1.184	NO
3.C.1.d - Biomass burning in all other land	NA	NO	NO	NO	NO	NO
3.C.2 - Liming	NO	NA	NA	NA	NA	NA
3.C.3 - Urea application	1.256	NA		NA	NA	NA
3.C.4 - Direct N_2O Emissions from managed soils (3)	NA	NA	6.499	NA	NA	NA
3.C.5 - Indirect N_2O Emissions from managed soils	NA	NA	0.106	NA	NA	NA
3.C.6 - Indirect N_2O Emissions from manure management	NA	NA	0.468	NA	NA	NA
3.C.7 - Rice cultivations	NA	NO	NA	NA	NA	NA
3.C.8 - Other (please specify)	NE	NO	NO	NA	NA	NA
3.D - Other	-90.347	NO	NO	NO	NO	NO
3.D.1 - Harvested Wood Products	-90.347	NA	NA	NA	NA	NA
3.D.2 - Other (please specify)	NO	NO	NO	NO	NO	NO

Table 3.18 - Sectoral Table Waste sector (Inventory Year: 2016)

Categories	Gg						
	CO_2	CH_4	N_2O	NO_x	CO	NMVOCs	SO_2
4 - Waste	2.422	6.533	0.087	0.496	8.714	0.588	0.017
4.A - Solid Waste Disposal	0.000	4.239	0.000	0.000	0.000	0.396	0.000
4.A.1 - Managed Waste Disposal Sites	NA	0.000	NA	NO	NO	NO	NA
4.A.2 - Unmanaged Waste Disposal Sites	NA	0.000	NA	NO	NO	0.396	NA
4.A.3 - Uncategorised Waste Disposal Sites	NA	0.000	NA	NO	NO	0.000	NA
4.B - Biological Treatment of Solid Waste	NA	NO	NO	NO	NO	NO	NA
4.C - Incineration and Open Burning of Waste	2.422	1.014	0.013	0.496	8.714	0.192	0.017
4.C.1 - Waste Incineration	NE	NE	NE	NE	NE	NE	NE
4.C.2 - Open Burning of Waste	2.422	1.014	0.013	0.496	8.714	0.192	0.017
4.D - Wastewater Treatment and Discharge	NA	1.280	0.074	NO	NO	0.000	0.000
4.D.1 - Domestic Wastewaster Treatment and Discharge	NA	0.620	0.074	NO	NO	0.000	NA
4.D.2 - Industrial Wastewater Treatment and Discharge	NA	0.659	NA	NO	NO	0.000	NA
4.E - Other (please specify)	NO	NO	NO	NO	NO	NO	NO

Table 3.19 – Uncertainties 1990 to 2016 – Level and Trend assessments – Base year 1990, Year T 2016

(rows with no activity have been deleted for ease of presentation)

Base year for assessment of uncertainty in trend: 1990, Year T: 2016

A	B	C	D	E	F	G	H	I	J	K	L	M
2006 IPCC Categories	Gas	Base Year emissions or removals (Gg CO_2 equivalent)	Year T emissions or removals (Gg CO_2 equivalent)	Activity Data Uncertainty (%)	Emission Factor Uncertainty (%)	Combined Uncertainty (%)	Contribution to Variance by Category in Year T	Type A Sensitivity (%)	Type B Sensitivity (%)	Uncertainty in trend in national emissions introduced by emission factor uncertainty (%)	Uncertainty in trend in national emissions introduced by activity data uncertainty (%)	Uncertainty introduced into the trend in total national emissions (%)
1.A - Fuel Combustion Activities												
1.A.1.a.i - Electricity Generation - Liquid Fuels	CO_2	0.6635502	0.9649458	0.2	7	7.00285656	4.29198E-09	4.1301E-07	1.40057E-05	2.89107E-06	3.96141E-06	2.4051E-11
1.A.1.a.i - Electricity Generation - Liquid Fuels	CH_4	0.000540099	0.000785421	0.2	75	75.00026667	3.26161E-13	3.36165E-10	1.14E-08	2.52124E-08	3.2244E-09	6.4606E-16
1.A.1.a.i - Electricity Generation - Liquid Fuels	N_2O	0.001594578	0.002318862	0.2	297	297.0000673	4.45825E-11	9.92515E-10	3.36571E-08	2.94777E-07	9.51966E-09	8.6984E-14
1.A.1.a.i - Electricity Generation - Solid Fuels	CO_2	20.74578	85.9021922	5	7	8.602325267	5.13265E-05	0.00079603	0.001246825	0.00557221	0.008816387	0.000108778
1.A.1.a.i - Electricity Generation - Solid Fuels	CH_4	0.0046053	0.019069197	5	75	75.16648189	1.93114E-10	1.76708E-07	2.76779E-07	1.32531E-05	1.95713E-06	1.79475E-10
1.A.1.a.i - Electricity Generation - Solid Fuels	N_2O	0.1019745	0.422246505	5	297	297.0420846	1.47866E-06	3.91282E-06	6.12869E-06	0.001162108	4.33364E-05	1.35237E-06
1.A.1.c.i - Manufacture of Solid Fuels - Biomass	CO_2	524.16	1194.115106	5	18.694167	19.35127561	0.05018951	0.005942611	0.017331957	0.111092166	0.122555445	0.027361307
1.A.1.c.i - Manufacture of Solid Fuels - Biomass	CH_4	2.9484	6.71689747	5	245.45455	245.5054661	0.0002556	3.34247E-05	9.74923E-05	0.008204235	0.000689374	6.77847E-05
1.A.1.c.i - Manufacture of Solid Fuels - Biomass	N_2O	5.8032	13.2205601	5	304.54545	304.5864966	0.001524131	6.57882E-05	0.00019189	0.020035511	0.001356864	0.000403263
1.A.2.i - Mining (excluding fuels) and Quarrying - Liquid Fuels	CO_2	26.224857	68.28318706	12.5	7	14.32654878	8.99523E-05	0.00042124	0.000991095	0.002948681	0.017520247	0.000315654
1.A.2.i - Mining (excluding fuels) and Quarrying - Liquid Fuels	CH_4	0.02265291	0.058539361	12.5	75	76.03453163	1.86217E-09	3.57429E-07	8.49668E-07	2.68072E-05	1.50202E-05	9.4423E-10
1.A.2.i - Mining (excluding fuels) and Quarrying - Liquid Fuels	N_2O	0.06688002	0.172830493	12.5	297	297.2629308	2.48098E-07	1.05527E-06	2.50854E-06	0.000313414	4.43452E-05	1.00195E-07
1.A.2.i - Mining (excluding fuels) and Quarrying - Solid Fuels	CO_2	70.5036772	91.30792	6.5	7	9.552486587	7.15074E-05	0.000206734	0.001325287	0.001447135	0.012182551	0.000150509
1.A.2.i - Mining (excluding fuels) and Quarrying - Solid Fuels	CH_4	0.15650922	0.202692	6.5	75	75.28113974	2.1885E-08	4.58917E-07	2.94197E-06	3.44188E-05	2.70437E-05	1.91602E-09
1.A.2.i - Mining (excluding fuels) and Quarrying - Solid Fuels	N_2O	0.34655613	0.448818	6.5	297	297.0711194	1.67095E-06	1.01617E-06	6.51436E-06	0.000301804	5.98825E-05	9.46715E-08

A	B	C	D	E	F	G	H	I	J	K	L	M
2006 IPCC Categories	Gas	Base Year emissions or removals (Gg CO_2 equivalent)	Year T emissions or removals (Gg CO_2 equivalent)	Activity Data Uncertainty (%)	Emission Factor Uncertainty (%)	Combined Uncertainty (%)	Contribution to Variance by Category in Year T	Type A Sensitivity (%)	Type B Sensitivity (%)	Uncertainty in trend in national emissions introduced by emission factor uncertainty (%)	Uncertainty in trend in national emissions introduced by activity data uncertainty (%)	Uncertainty introduced into the trend in total national emissions (%)
1.A.2.i - Mining (excluding fuels) and Quarrying - Other Fossil Fuels	CO_2	1.2587076	30.4760876	6.5	7	9.552486587	7.96623E-06	0.000414993	0.000442344	0.002904953	0.004066202	2.49728E-05
1.A.2.i - Mining (excluding fuels) and Quarrying - Other Fossil Fuels	CH_4	0.01081836	0.26193636	6.5	75	75.28113974	3.65481E-08	3.56679E-06	3.80187E-06	0.000267509	3.49483E-05	7.27826E-08
1.A.2.i - Mining (excluding fuels) and Quarrying - Other Fossil Fuels	N_2O	0.02129328	0.51555728	6.5	297	297.0711194	2.20483E-06	7.02035E-06	7.48304E-06	0.002085044	6.87871E-05	4.35214E-06
1.A.2.m - Non-specified Industry - Liquid Fuels	CO_2	1.10013	2.4374079	12.5	7	14.32654878	1.14615E-07	1.14723E-05	3.53777E-05	8.03061E-05	0.000625395	3.97568E-07
1.A.2.m - Non-specified Industry - Liquid Fuels	CH_4	0.0009639	0.002123037	12.5	75	76.03453163	2.44928E-12	9.86959E-09	3.08148E-08	7.4022E-07	5.44733E-07	8.4466E-13
1.A.2.m - Non-specified Industry - Liquid Fuels	N_2O	0.0028458	0.006268014	12.5	297	297.2629308	3.26319E-10	2.91388E-08	9.0977E-08	8.65422E-06	1.60826E-06	7.7482E-11
1.A.2.m - Non-specified Industry - Biomass	CO_2	0	46.3834672	5	18.694167	19.35127561	7.57263E-05	0.000673232	0.000673232	0.012585508	0.004760468	0.000181057
1.A.2.m - Non-specified Industry - Biomass	CH_4	0	1.218325668	5	245.45455	245.5054661	8.40912E-06	1.76834E-05	1.76834E-05	0.004340461	0.00012504	1.88552E-05
1.A.2.m - Non-specified Industry - Biomass	N_2O	0	0.513531244	5	281.81818	281.8625332	1.96929E-06	7.45364E-06	7.45364E-06	0.002100571	5.27052E-05	4.41518E-06
1.A.3.a.i - International Aviation (International Bunkers) - Liquid Fuels	CO_2	62.904985	108.6983192	4	5	6.403124237	4.55335E-05	0.0002108	0.001577699	0.001053999	0.008924815	8.07632E-05
1.A.3.a.i - International Aviation (International Bunkers) - Liquid Fuels	CH_4	0.009237795	0.01596269	4	79	79.101201	1.49858E-10	3.09563E-08	2.3169E-07	2.44555E-06	1.31064E-06	7.69849E-12
1.A.3.a.i - International Aviation (International Bunkers) - Liquid Fuels	N_2O	0.5454698	0.942558852	4	110	110.0727032	1.01176E-06	1.8279E-06	1.36807E-05	0.000201069	7.739E-05	4.64179E-08
1.A.3.a.ii - Domestic Aviation - Liquid Fuels	CO_2	12.0351	25.54622582	4	5	6.403124237	2.515E-06	0.000109272	0.00037079	0.000546361	0.002097506	4.69804E-06
1.A.3.a.ii - Domestic Aviation - Liquid Fuels	CH_4	0.00179235	0.003786746	4	79	79.101201	8.43335E-12	1.60155E-08	5.49626E-08	1.26523E-06	3.10916E-07	1.69747E-12
1.A.3.a.ii - Domestic Aviation - Liquid Fuels	N_2O	0.105834	0.223598342	4	110	110.0727032	5.69374E-08	9.45681E-07	3.24541E-06	0.000104025	1.83588E-05	1.11582E-08
1.A.3.b.i.1 - Passenger cars with 3-way catalysts - Liquid Fuels	CO_2	53.8531503	191.0691631	5	3.5	6.103277808	0.000127823	0.001603073	0.002773269	0.005610756	0.019609974	0.000416032
1.A.3.b.i.1 - Passenger cars with 3-way catalysts - Liquid Fuels	CH_4	0.500670822	1.630129238	5	9.62	10.84178952	2.93594E-08	1.27811E-05	2.36605E-05	0.000122954	0.000167305	4.31086E-08
1.A.3.b.i.1 - Passenger cars with 3-way catalysts - Liquid Fuels	N_2O	0.779403147	2.781871924	5	12	13	1.22931E-07	2.34413E-05	4.03774E-05	0.000281295	0.000285511	1.60644E-07

A	B	C	D	E	F	G	H	I	J	K	L	M
2006 IPCC Categories	Gas	Base Year emissions or removals (Gg CO_2 equivalent)	Year T emissions or removals (Gg CO_2 equivalent)	Activity Data Uncertainty (%)	Emission Factor Uncertainty (%)	Combined Uncertainty (%)	Contribution to Variance by Category in Year T	Type A Sensitivity (%)	Type B Sensitivity (%)	Uncertainty in trend in national emissions introduced by emission factor uncertainty (%)	Uncertainty in trend in national emissions introduced by activity data uncertainty (%)	Uncertainty introduced into the trend in total national emissions (%)
1.A.3.b.i.2 - Passenger cars without 3-way catalysts - Liquid Fuels	CO_2	114.4372236	402.8508975	5	3.5	6.103277808	0.00056822	0.003360549	0.00584717	0.011761921	0.041345739	0.001847813
1.A.3.b.i.2 - Passenger cars without 3-way catalysts - Liquid Fuels	CH_4	1.063918535	3.398591946	5	9.62	10.84178952	1.27615E-07	2.62102E-05	4.93288E-05	0.000252143	0.000348807	1.85242E-07
1.A.3.b.i.2 - Passenger cars without 3-way catalysts - Liquid Fuels	N_2O	1.656221314	5.908363315	5	12	13	5.54527E-07	4.97678E-05	8.57568E-05	0.000597213	0.000606392	7.24375E-07
1.A.3.b.ii.1 - Light-duty trucks with 3-way catalysts - Liquid Fuels	CO_2	205.2476211	818.0547792	5	3.5	6.103277808	0.002343109	0.007413906	0.011873638	0.025948671	0.0839593	0.007722497
1.A.3.b.ii.1 - Light-duty trucks with 3-way catalysts - Liquid Fuels	CH_4	1.847172493	5.23128884	5	9.62	10.84178952	3.02357E-07	3.57911E-05	7.59294E-05	0.00034431	0.000536902	4.06813E-07
1.A.3.b.ii.1 - Light-duty trucks with 3-way catalysts - Liquid Fuels	N_2O	2.984223339	12.37365583	5	12	13	2.43212E-06	0.000114751	0.000179597	0.001377014	0.001269944	3.50892E-06
1.A.3.b.ii.2 - Light-duty trucks without 3-way catalysts - Liquid Fuels	CO2	68.415849	272.684928	5	3.5	6.103277808	0.000260345	0.002471253	0.003957879	0.008649387	0.027986433	0.000858052
1.A.3.b.ii.2 - Light-duty trucks without 3-way catalysts - Liquid Fuels	CH_4	0.615724137	1.743762743	5	9.62	10.84178952	3.35953E-08	1.19304E-05	2.53098E-05	0.00011477	0.000178967	4.52015E-08
1.A.3.b.ii.2 - Light-duty trucks without 3-way catalysts - Liquid Fuels	N_2O	0.99474071	4.124552015	5	12	13	2.70235E-07	3.82504E-05	5.98657E-05	0.000459005	0.000423315	3.8988E-07
1.A.3.b.iii - Heavy-duty trucks and buses - Liquid Fuels	CO_2	83.9337369	1091.630826	5	3.5	6.103277808	0.004172336	0.014020774	0.015844451	0.049072709	0.112037191	0.014960463
1.A.3.b.iii - Heavy-duty trucks and buses - Liquid Fuels	CH_4	0.092768867	1.206539334	5	9.62	10.84178952	1.60837E-08	1.54965E-05	1.75123E-05	0.000149076	0.000123831	3.75576E-08
1.A.3.b.iii - Heavy-duty trucks and buses - Liquid Fuels	N_2O	1.369445181	17.81081874	5	12	13	5.03913E-06	0.000228757	0.000258515	0.002745087	0.001827975	1.0877E-05
1.A.3.b.iv - Motorcycles - Liquid Fuels	CO_2	0.68912472	2.223897915	5	3.5	6.103277808	1.73164E-08	1.73043E-05	3.22787E-05	6.0565E-05	0.000228245	5.57639E-08
1.A.3.b.iv - Motorcycles - Liquid Fuels	CH_4	0.00681912	0.022006215	5	9.62	10.84178952	5.3505E-12	1.71232E-07	3.19409E-07	1.64725E-06	2.25856E-06	7.81453E-12
1.A.3.b.iv - Motorcycles - Liquid Fuels	N_2O	0.00976128	0.03150096	5	12	13	1.57629E-11	2.45111E-07	4.5722E-07	2.94133E-06	3.23303E-06	1.91039E-11
1.A.3.c - Railways - Liquid Fuels	CO_2	30.21057	48.6867672	5	1.5	5.220153254	6.07141E-06	5.0199E-05	0.000706663	7.52985E-05	0.004996862	2.49743E-05
1.A.3.c - Railways - Liquid Fuels	CH_4	0.035531055	0.05481979	5	250	250.049995	1.76616E-08	2.36043E-08	7.95681E-07	5.90107E-06	5.62631E-06	6.6478E-11
1.A.3.c - Railways - Liquid Fuels	N_2O	3.6146682	5.576962248	5	125	125.09996	4.57521E-05	2.40133E-06	8.09467E-05	0.000300166	0.00057238	4.17718E-07
1.A.3.d.i - International water-borne navigation (International bunkers) - Liquid Fuels	CO_2	144.240579	154.4141743	10	3	10.44030651	0.000244288	0.000893071	0.002241241	0.002679212	0.031695936	0.001011811

A	B	C	D	E	F	G	H	I	J	K	L	M
2006 IPCC Categories	Gas	Base Year emissions or removals (Gg CO_2 equivalent)	Year T emissions or removals (Gg CO_2 equivalent)	Activity Data Uncertainty (%)	Emission Factor Uncertainty (%)	Combined Uncertainty (%)	Contribution to Variance by Category in Year T	Type A Sensitivity (%)	Type B Sensitivity (%)	Uncertainty in trend in national emissions introduced by emission factor uncertainty (%)	Uncertainty in trend in national emissions introduced by activity data uncertainty (%)	Uncertainty introduced into the trend in total national emissions (%)
1.A.3.d.i - International water-borne navigation (International bunkers) - Liquid Fuels	CH_4	0.28253988	0.298833948	10	50	50.99019514	2.1824E-08	1.80207E-06	4.33742E-06	9.01033E-05	6.13404E-05	1.18812E-08
1.A.3.d.i - International water-borne navigation (International bunkers) - Liquid Fuels	N_2O	1.1916648	1.26038808	10	90	90.55385138	1.2244E-06	7.60055E-06	1.82939E-05	0.00068405	0.000258714	5.34857E-07
1.A.4.b - Residential - Liquid Fuels	CO_2	100.49753	110.18034	50	1.5	50.02249494	0.002855225	0.000584572	0.00159921	0.000876857	0.113081231	0.012788134
1.A.4.b - Residential - Liquid Fuels	CH_4	0.2708265	0.2718765	50	50	70.71067812	3.47388E-08	1.93881E-06	3.94615E-06	9.69406E-05	0.000279035	8.72578E-08
1.A.4.b - Residential - Liquid Fuels	N_2O	0.2252119	0.2048511	50	90	102.9563014	4.18104E-08	1.92046E-06	2.97331E-06	0.000172842	0.000210245	7.4077E-08
1.A.4.b - Residential - Biomass	CO_2	691.2976364	776.7888327	20	7	21.1896201	0.025465585	0.003747327	0.011274684	0.026231291	0.31889623	0.102382886
1.A.4.b - Residential - Biomass	CH_4	38.26599205	43.07487184	20	100	101.9803903	0.001813772	0.000206297	0.000625209	0.020629737	0.017683589	0.000738295
1.A.4.b - Residential - Biomass	N_2O	7.379302403	8.325812076	20	500	500.3998401	0.001631507	3.95047E-05	0.000120845	0.019752335	0.003418008	0.000401838
1.A.4.c.iii - Fishing (mobile combustion) - Liquid Fuels	CO_2	246.5811	269.5499175	20	3	20.22374842	0.002793207	0.001445789	0.003912376	0.004337368	0.110658713	0.012264164
1.A.4.c.iii - Fishing (mobile combustion) - Liquid Fuels	CH_4	0.699678	0.76651575	20	50	53.85164807	1.60155E-07	4.07816E-06	1.11256E-05	0.000203908	0.000314679	1.40601E-07
1.A.4.c.iii - Fishing (mobile combustion) - Liquid Fuels	N_2O	0.6197148	0.67891395	20	90	92.19544457	3.68256E-07	3.61209E-06	9.85408E-06	0.000325088	0.000278716	1.83364E-07
1.A.5.b.iii - Mobile (Other) - Liquid Fuels	CO_2	7.761975	137.350884	5	3.5	6.103277808	6.60527E-05	0.001824914	0.001993576	0.006387198	0.014096714	0.000239514
1.A.5.b.iii - Mobile (Other) - Liquid Fuels	CH_4	0.008579025	0.172094769	5	9.62	10.84178952	3.27219E-10	2.31145E-06	2.49787E-06	2.22361E-05	1.76626E-05	8.06412E-10
1.A.5.b.iii - Mobile (Other) - Liquid Fuels	N_2O	0.12664275	2.23642401	5	12	13	7.94505E-08	2.97086E-05	3.24605E-05	0.000356504	0.000229531	1.79779E-07
2.A - Mineral Industry												
2.A.1 - Cement production	CO_2	0	262.62444	35	70	78.26237921	0.039707976	0.003811857	0.003811857	0.266829964	0.188677277	0.106797345
2.A.2 - Lime production	CO_2	2.2350174	0	5	2	5.385164807	0	4.85661E-05	0	9.71322E-05	0	9.43466E-09
2.D - Non-Energy Products from Fuels and Solvent Use												
2.D.1 - Lubricant Use	CO_2	0.503066667	9.064	15	50	52.20153254	2.1043E-05	0.000120628	0.000131559	0.006031389	0.002790793	4.41662E-05
2.D.2 - Paraffin Wax Use	CO_2	17.688	7.157333333	15	100	101.1187421	4.92342E-05	0.000280469	0.000103885	0.02804693	0.002203733	0.000791487
2.F - Product Uses as Substitutes for Ozone Depleting Substances												
2.F.1.a - Refrigeration and Stationary Air Conditioning	CH_2F_2	0	7.946556052	5	5	7.071067812	2.96776E-07	0.00011534	0.00011534	0.000576701	0.000815578	9.97751E-07
2.F.1.a - Refrigeration and Stationary Air Conditioning	CHF_2CF_3	0	53.52898871	5	5	7.071067812	1.34663E-05	0.000776945	0.000776945	0.003884727	0.005493833	4.52733E-05
2.F.1.a - Refrigeration and Stationary Air Conditioning	CH_2FCF_3	0	2.649259074	5	0	5	1.64926E-08	3.84526E-05	3.84526E-05	0	0.000271901	7.39302E-08

A	B	C	D	E	F	G	H	I	J	K	L	M
2006 IPCC Categories	Gas	Base Year emissions or removals (Gg CO_2 equivalent)	Year T emissions or removals (Gg CO_2 equivalent)	Activity Data Uncertainty (%)	Emission Factor Uncertainty (%)	Combined Uncertainty (%)	Contribution to Variance by Category in Year T	Type A Sensitivity (%)	Type B Sensitivity (%)	Uncertainty in trend in national emissions introduced by emission factor uncertainty (%)	Uncertainty in trend in national emissions introduced by activity data uncertainty (%)	Uncertainty introduced into the trend in total national emissions (%)
2.F.1.a - Refrigeration and Stationary Air Conditioning	CF_3CH_3	0	32.07959613	5	5	7.071067812	4.83648E-06	0.000465619	0.000465619	0.002328093	0.003292421	1.62601E-05
2.F.1.b - Mobile Air Conditioning	CH_2FCF_3	0	23.34625996	5	5	7.071067812	2.56157E-06	0.000338859	0.000338859	0.001694294	0.002396093	8.6119E-06
2.G.3.c - Other (Please specify)	N_2O	0.802725206	2.532727055	50	5	50.24937811	1.52244E-06	1.93183E-05	3.67612E-05	9.65915E-05	0.00259941	6.76626E-06
2.H - Other												
3.A - Livestock												
3.A.1.a.i - Dairy Cows	CH_4	2.8873215	3.849762	20	20	28.28427125	1.11445E-06	6.86312E-06	5.58773E-05	0.000137262	0.001580448	2.51666E-06
3.A.1.a.ii - Other Cattle	CH_4	2296.10749	3558.110393	20	20	28.28427125	0.951985201	0.001751153	0.051644115	0.035023059	1.460716147	2.134918276
3.A.1.c - Sheep	CH_4	349.47318	183.39741	20	30	36.05551275	0.004109899	0.004932252	0.002661918	0.147967568	0.075290401	0.027563046
3.A.1.d - Goats	CH_4	195.27354	206.693865	20	30	36.05551275	0.005220353	0.001243202	0.003000054	0.037296051	0.084854328	0.008591252
3.A.1.e - Camels	CH_4	0	0.011592	20	30	36.05551275	1.64196E-11	1.68252E-07	1.68252E-07	5.04755E-06	4.75888E-06	4.81248E-11
3.A.1.f - Horses	CH_4	19.676412	15.387624	20	30	36.05551275	2.89326E-05	0.000204218	0.000223343	0.006126547	0.006317103	7.74404E-05
3.A.1.g - Mules and Asses	CH_4	14.28	30.37587	20	30	36.05551275	0.000112746	0.000130591	0.00044089	0.003917735	0.012470249	0.000170856
3.A.1.h - Swine	CH_4	0.375165	1.747011	20	30	36.05551275	3.72937E-07	1.72048E-05	2.5357E-05	0.000516143	0.000717203	7.80783E-07
3.A.2.a.i - Dairy cows	CH_4	0.0315	0.042	20	30	36.05551275	2.15548E-10	7.4875E-08	6.09608E-07	2.24625E-06	1.72423E-05	3.02343E-10
3.A.2.a.i - Dairy cows	N_2O	0.420069375	0.5600925	20	30	36.05551275	3.83322E-08	9.98498E-07	8.12945E-06	2.99549E-05	0.000229936	5.37677E-08
3.A.2.a.ii - Other cattle	CH_4	43.817571	68.284902	20	30	36.05551275	0.000569763	3.89807E-05	0.00099112	0.001169422	0.028033098	0.000787222
3.A.2.a.ii - Other cattle	N_2O	100.2155839	155.618776	20	30	36.05551275	0.002959162	8.10798E-05	0.002258725	0.002432394	0.063886399	0.004087388
3.A.2.c - Sheep	CH_4	10.4841954	7.3358964	20	30	36.05551275	6.57584E-06	0.000121341	0.000106477	0.003640232	0.003011616	2.23211E-05
3.A.2.d - Goats	CH_4	6.63930036	9.09453006	20	30	36.05551275	1.01066E-05	1.22671E-05	0.000132002	0.000368014	0.00373359	1.40751E-05
3.A.2.e - Camels	CH_4	0	0.00064512	20	30	36.05551275	5.08541E-14	9.36358E-09	9.36358E-09	2.80907E-07	2.64842E-07	1.4905E-13
3.A.2.f - Horses	CH_4	1.79273976	1.87216092	20	30	36.05551275	4.28283E-07	1.17821E-05	2.71734E-05	0.000353464	0.000768581	7.15653E-07
3.A.2.g - Mules and Asses	CH_4	1.2852	3.6451044	20	30	36.05551275	1.62355E-06	2.49799E-05	5.29068E-05	0.000749396	0.00149643	2.8009E-06
3.A.2.h - Swine	CH_4	0.375165	1.747011	20	30	36.05551275	3.72937E-07	1.72048E-05	2.5357E-05	0.000516143	0.000717203	7.80783E-07
3.A.2.i - Poultry	CH_4	0.21346164	1.75529466	20	30	36.05551275	3.76482E-07	2.08387E-05	2.54772E-05	0.000625162	0.000720604	9.10098E-07
3.B - Land												
3.B.1.a - Forest land Remaining Forest land	CO_2	-88401.30178	-125635.3389	20	10	22.36067977	741.8139728	0.096161578	1.82353135	0.961615776	51.57725533	2661.137972
3.B.1.b.i - Cropland converted to Forest Land	CO_2	-250.241064	-62.19340806	20	10	22.36067977	0.000181786	0.004534774	0.000902705	0.045347739	0.025532349	0.002708318
3.B.1.b.ii - Grassland converted to Forest Land	CO_2	-1369.617126	-900.5176963	20	10	22.36067977	0.038111486	0.016687399	0.013070544	0.166873994	0.369690817	0.16451823
3.B.3.b.i - Forest Land converted to Grassland	CO_2	8671.945333	9755.9385	20	10	22.36067977	4.473109048	0.046894757	0.141602354	0.468947568	4.005119381	16.26089308

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2006 IPCC Categories	Gas	Base Year emissions or removals (Gg CO_2 equivalent)	Year T emissions or removals (Gg CO_2 equivalent)	Activity Data Uncertainty (%)	Emission Factor Uncertainty (%)	Combined Uncertainty (%)	Contribution to Variance by Category in Year T	Type A Sensitivity (%)	Type B Sensitivity (%)	Uncertainty in trend in national emissions introduced by emission factor uncertainty (%)	Uncertainty in trend in national emissions introduced by activity data uncertainty (%)	Uncertainty introduced into the trend in total national emissions (%)
3.B.5.b.i - Forest Land converted to Settlements	CO_2	55.4527875	12.770945	20	10	22.36067977	7.66509E-06	0.001019613	0.000185364	0.010196127	0.005242874	0.000131449
3.C - Aggregate sources and non-CO2 emissions sources on land												
3.C.6 - Indirect N_2O Emissions from manure management	N_2O	91.33969966	145.0606959	20	20	28.28427125	0.001582307	0.000120705	0.00210548	0.002414096	0.059551975	0.003552266
3.D - Other												
3.D.1 - Harvested Wood Products	CO_2	0	-90.34748124	0	0	0	0	0.001311347	0.001311347	0	0	0
4.A - Solid Waste Disposal												
4.A - Solid Waste Disposal	CH_4	9.242762349	89.00858079	0	0	0	0	0.001091073	0.001291913	0	0	0
4.B - Biological Treatment of Solid Waste												
4.C - Incineration and Open Burning of Waste												
4.C.2 - Open Burning of Waste	CO_2	0.828253229	2.421649887	40	100	107.7032961	6.39414E-06	1.71514E-05	3.5149E-05	0.001715136	0.001988327	6.89513E-06
4.C.2 - Open Burning of Waste	CH_4	7.28637535	21.30393148	40	100	107.7032961	0.000494856	0.000150885	0.000309215	0.015088543	0.017491867	0.00053363
4.C.2 - Open Burning of Waste	N_2O	1.414837939	4.136708454	40	100	107.7032961	1.86582E-05	2.92983E-05	6.00422E-05	0.002929828	0.003396498	2.01201E-05
4.D - Wastewater Treatment and Discharge												
4.D.1 - Domestic Wastewater Treatment and Discharge	CH_4	4.406965246	13.02792768	20	0	20	6.38134E-06	9.33319E-05	0.000189094	0	0.005348374	2.86051E-05
4.D.1 - Domestic Wastewater Treatment and Discharge	N_2O	20.50611081	22.92795992	20	25	32.01562119	5.06473E-05	0.000112803	0.000332787	0.002820075	0.009412648	9.65508E-05
4.D.2 - Industrial Wastewater Treatment and Discharge	CH_4	28.88629585	13.84427363	0	0	0	0	0.000426748	0.000200942	0	0	0
4.E - Other (please specify)												
5.A - Indirect N_2O emissions from the atmospheric deposition of nitrogen in NO_x and NH3												
5.B - Other (please specify)												
Total												
		Sum(C): -68896.726	Sum(D): -103145.269				Sum(H): 747.427					Sum(M): 2680.039
							Uncertainty in total inventory: 27.339					Trend uncertainty: 51.769

3 Mitigation actions and their effects

3.1 Introduction

3.1.1 Namibia's Reporting

BURs are to be submitted by non-Annex I Parties, containing updates of national GHG inventories, including a national inventory report and information on mitigation actions, needs and support received (UNFCCC, 2012). Namibia's BUR4 provides an update on actions undertaken to implement the Convention, including the status of its GHG emissions and removals by sinks, as well as on the actions to reduce emissions or enhance sinks. Since 2015, Namibia has started charting the course towards low-emissions development and integrating it into national-level planning processes and policies.

In this context, Namibia needs to have suitable tools and approaches at hand to analyse pathways of development and GHG emissions under new or enforced mitigation policies and actions. These pathways are then compared to a projected baseline, a reference pathway without the considered mitigation policies and actions, to assess the impact of mitigation policies and actions.

This chapter assesses emission reductions from national-level mitigation actions in economies that are dominated by energy-related emissions and provides an overview of the main approaches used for developing baseline and mitigation scenarios at the national level (i.e., for the entire economy), considering the main drivers of GHG emissions, technology options, data sources and impacts of mitigation actions.

A bottom-up modelling approach was adopted, which is mostly used for mitigation assessment of individual sectors of the economy. Further, an explanation of the selection of suitable baseline approaches is based on the national circumstances of Namibia. The guidance on maintaining consistency when integrating bottom-up sectoral baselines into a national economy-wide baseline is shown.

3.1.2 Scope

The scope of this chapter is to provide an update of the information most recently submitted in the last national communication and to provide additional information concerning mitigation actions taken or envisaged and their effects as well as support needed and received, covering the areas shown in Figure 3.1.

3.1.3 Namibia's Approach to Reducing Emissions

Energy is a strategic resource for Namibia, and in addition to the use of local resources (i.e., hydro, solar and biomass), we remain reliant on imports of oil and gas for our energy needs. Similarly, for our electricity needs, although Namibia does possess local and renewable generation, a significant portion of our electricity needs are imported. Recognising that energy is a scarce resource, we price fuel and electricity according to supply and demand. We also do not subsidize energy and remain cost reflective. This policy of pricing energy correctly helps to incentivize consumers to use energy wisely, minimising energy wastage and over-consumption, thus helping to control emissions.

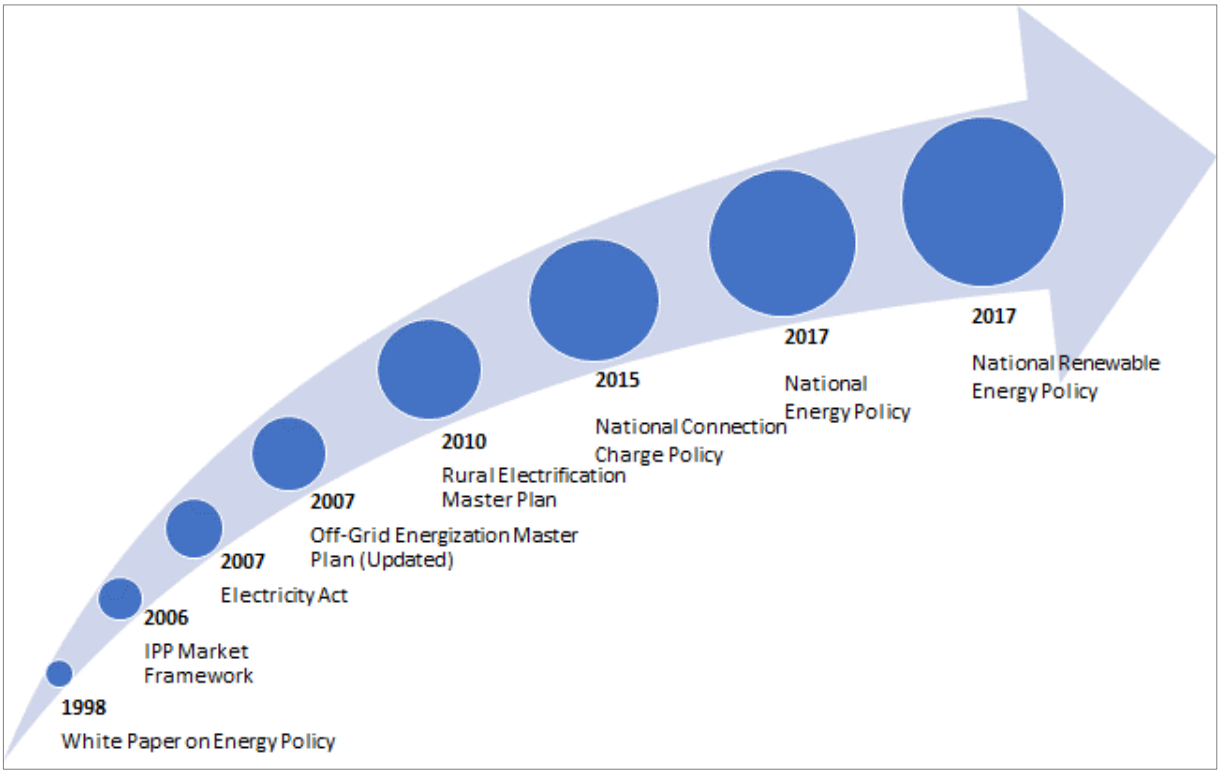

Figure 3.1 - Policy Framework, Laws and Regulations Evolution

3.2 Methodology

3.2.1 Reporting mitigation-related information in the reporting guidelines on BURs

Biennial Update Report Requirements

a) Non-Annex I Parties should provide information, in a tabular format, on actions to mitigate climate change, by addressing anthropogenic emissions by sources and removals by sinks of all GHGs not controlled by the Montreal Protocol (UNFCCC, 2014).

b) For each mitigation action or groups of mitigation actions including, as appropriate, those listed in document FCCC/AWGLCA/ 2011/INF.1, developing country Parties shall provide the following information to the extent possible:

   i. Name and description of the mitigation action, including information on the nature of the action, coverage (i.e., sectors and gases), quantitative goals and progress indicators.

   ii. Information on methodologies and assumptions.

   iii. Objectives of the action and steps taken or envisaged to achieve that action.

   iv. Information on the progress of implementation of the mitigation actions and the underlying steps taken or envisaged, and the results achieved, such as estimated outcomes (metrics depending on the type of action) and estimated emission reductions, to the extent possible.

   v. Information on international market mechanisms.

c) Parties should provide information on the description of domestic measurement, reporting and verification arrangements.

As discussed above, mitigation actions by non-Annex I Parties may take different forms. In some cases, mitigation actions are formulated as economy-wide goals, expressed in various ways, (e.g., absolute, or relative reduction in GHG emissions below 'business-as-usual' (BAU) level) or as specific policies and programmes in particular sectors to project-level activities. As a part of the BUR, Parties do not need to

report on every mitigation action or project they may have undertaken or planned to undertake. BURs should paint a broad picture of a country's mitigation actions according to the level of detail at which the country implements the measure (UNFCCC).

BUR should focus on the overall mitigation objective, the key assumptions, and the subordinate actions (including policies and programmes). It is not necessary to provide information on each mitigation project that underpins NAMAs/mitigation policies and programmes.

However, the establishment of an overall mitigation goal is not mandatory for non-Annex I Parties and not all countries have established national or sectoral policies or NAMAs. Countries without broad mitigation goals in place may report on packages of projects in their BURs.

In the BUR, information on mitigation actions and their effects should be provided in a tabular format and include, to the extent possible. The columns from left to right provide a logical and transparent way of arriving at the evaluation of the outcomes/effects of the mitigation actions. Also, non-Annex I Parties have the flexibility to use the format which best reflects their national circumstances.

Activities under mitigation actions are assigned their metrics, depending on the nature of the action, including GHG emission reductions or other sustainable development benefits. Choice of the metrics, both qualitative and quantitative, is a very important step in the process, as it essentially determines what is measured, and later reported and verified. The information should include a qualitative description of sectors covered by the action, GHGs addressed and objectives to be achieved.

It is necessary to determine and describe qualitative and quantitative indicators that will be used to evaluate the progress in achieving the objective (i.e., the number of households trained). Progress indicators should be clear, specific, reasonably expected to be affected by the mitigation actions in question and quantifiable (Table 3.2 to Table 3.6). In choosing progress indicators, it is important to consider whether reliable data can be collected regularly at a reasonable cost and to ensure that indicators are reported using rigorous and consistent definitions, data sets, collection procedures and methods.

The BUR should further include a qualitative description of the methods and key statistics on the macroeconomic indicators, assumptions on behavioural changes, and other data used in developing the scenarios for the baseline, evaluating current and future missions. It should also contain information on the steps taken to achieve the objectives at the time of reporting and information on the qualitative and quantitative outcomes (e.g., GHG emission reductions and sustainable development benefits). This could include quantitative information based on the chosen progress metrics and a link to the Party's objectives regarding the implementation of the Convention.

Emission reductions from the steps already implemented and the overall reductions expected once the measure is fully implemented can be reported in absolute terms or as a percentage reduction below a baseline. It is best to use the same metrics throughout the report.

3.3 Mitigation actions and their effects

3.3.1 Mitigation Measures to Reduce Emissions

Shifting to Cleaner Energy Sources

Namibia's electricity supply is dominated by imports and in 2010, the country imported 67% of its electricity and generated the remaining 33%. By 2015 the share of imported electricity was 65% (Figure

3.2), Figures cited are calculated from domestic data sources). Based on the developed Energy policy targets and the Electricity generation action plan, the grid emission factor of the power system has improved in tandem. Today, Namibia ranks among the countries with a promising high percentage use of renewables for electricity generation (Republic of Namibia, 2020).

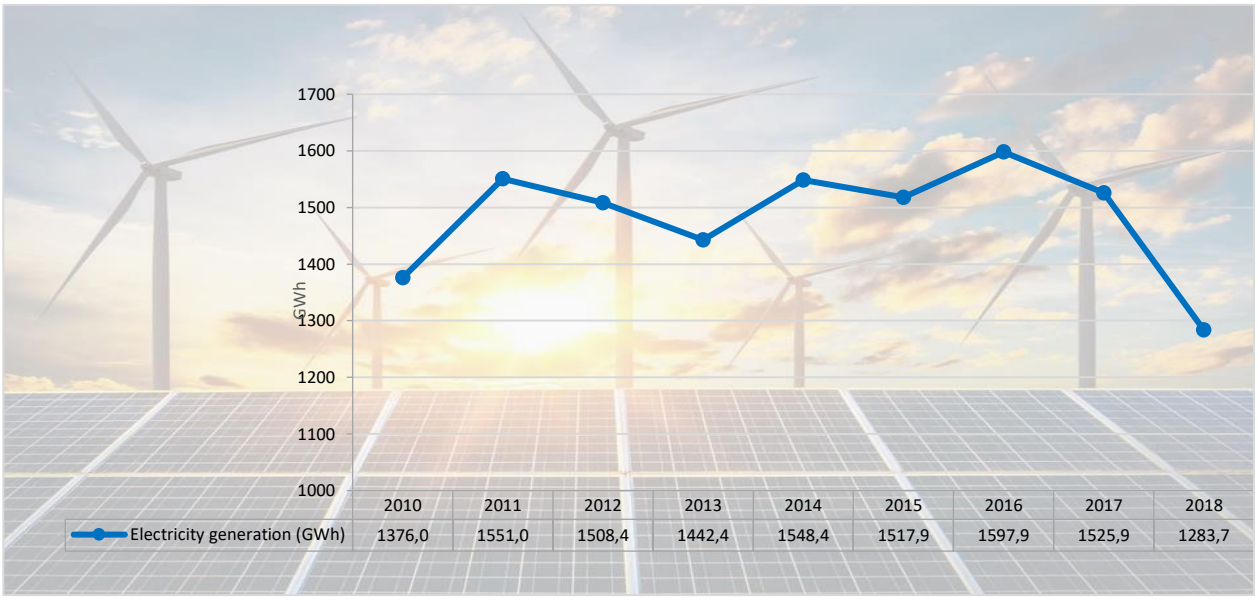

Figure 3.2. - Namibia's total renewable energy - Electricity generation (GWh)

Also, Namibia has commenced a feasibility study to implement a battery energy storage project which will assist with grid stability and most likely offset the use of the countries only coal-fired power station.

Traditionally, Namibia has relied heavily on energy imports from the region. Having access to solar, wind and biomass energy has helped to diversify and secure our energy sources and further increase the share of clean energy in our mix (Table 3.1).

Table 3.1 - Namibia's energy sources and projects

Solar	Wind Energy	Bioenergy
• Power Purchase Agreement (PPA) for Medium Scale Solar PV Power Projects • Solar Revolving Fund: A Financing Strategy for Solar Energy Technologies in Namibia • Assessing the Economic Viability of Business Ideas for Productive Use	• Power Purchase Agreement (PPA) for Medium Scale Wind Power Projects • Wind Energy - Environmental Impact Assessment (EIA) • Wind Energy - Resource Analysis • Economic Feasibility of Wind Energy Projects	• Solid Biomass Energy in Namibia • Bush-to-Electricity in Namibia

Grid / Mini-grid	Energy Access	Financing & Funding
• Bush-to-Electricity in Namibia • Namibia Case Study - Gap Analysis and National Action Plan - Supportive Framework Conditions for Mini-grids Employing Renewable and Hybrid Generation in the SADC Region	• Solar Revolving Fund: A Financing Strategy for Solar Energy Technologies in Namibia	• Namibia Case Study - Gap Analysis and National Action Plan - Supportive Framework Conditions for Mini-grids Employing Renewable and Hybrid Generation in the SADC Region • Solar Revolving Fund: A Financing Strategy for Solar Energy Technologies in Namibia • Wind Energy - Resource Analysis • Economic Feasibility of Wind Energy Projects

The transport sector consumes more energy than any other productive sector of the Namibian economy. Liquid petroleum products for transport constituted over 70% of Namibia's total energy demand. The new generation diesel or CNG propelled buses having EURO 3 or 4 emission standards with the objective of reducing the demand for light passenger vehicles by at least 30% (Figure 3.3).

Figure 3.3. - City of Windhoek Euro 4 emission buses

The mitigation potential in the energy sector is expected to rise from 9 to 69% in 2025, 27 to 84% in 2030 and 37 to 87% in 2035. These ranges corresponded with renewables contributing respectively between 39 to 58% in 2025, 51 to 71% in 2030 and 58 to 76% in 2035 (Republic of Namibia).

Improving Energy Efficiency

Mitigation actions in the energy sector focus on improved energy efficiency through various Demand Side Management (DSM) measures. Actions in the energy sector include: Driving energy efficiency through providing audits (implementation of identified savings has not been measured), distributing free LED lightbulbs, and capacity building.

We have considerable energy efficiency opportunities within the domestic sector. These can cost-effectively reduce the consumption of electrical energy on a household level, thereby contributing to mitigate the increases in domestic energy expenditure and use. The promotion of the use of energy-efficient appliances and greener technologies have been of importance, and hold considerable domestic electricity savings potentials, while cost-effectively enhancing the services from energy-efficient

appliances. Potential domestic electricity savings often lie between 20% and 60% of the total consumption, without the loss of amenities (Konrad Adenauer Stitung, 2018).

Through the current existing National Energy policy Efforts to improve the sector's efficiency in general and, the uptake of energy-efficient technologies and practices have remained disjointed and largely limited in both scale and scope. There are many opportunities to make improvements that would contribute to savings for both individual consumers and the industry at large, resulting in ultimate positive implications on the Namibian economy.

Reducing Emissions from Cement Production

In the cement industry, the possibility of replacing 10 and 20 % of the clinker entering in the production has been considered. The mitigation potential for 10 and 20% replacement of clinker and the percentage reductions are significant. Emissions reductions are projected to vary from 17.62 Gg CO_2 eq (2%) to 59.65 Gg CO_2 eq (5%) for the low scenario and from 35.24 Gg CO_2 eq (4%) to 119.31 Gg CO_2 eq (10%) for the high scenario (Republic of Namibia, 2020).

Reducing Emissions from Waste and Wastewater Treatment

The Namibian Government is also looking to reduce emissions from the waste sector. Apart from flaring and composting, which reduces methane emissions from landfills and sludges, we also intend to increase our recycling rate to 70% by 2030. Our overall recycling rate was 61% in 2017. Other measures to reduce emissions are through better energy management such as maximizing energy efficiency in operations and increasing energy production and recovery.

The country has recognized the urgent need to improve solid waste management leading to the development of the National Solid Waste Management Strategy (SWM) (Figure 3.4). This strategy is important to ensure that the future directions, regulations, funding, and action plans to improve solid waste management are properly coordinated and consistent with national policy, and to facilitate co-operation between stakeholders. Developing key performance indicators and targets have brought significant results in solid waste management.

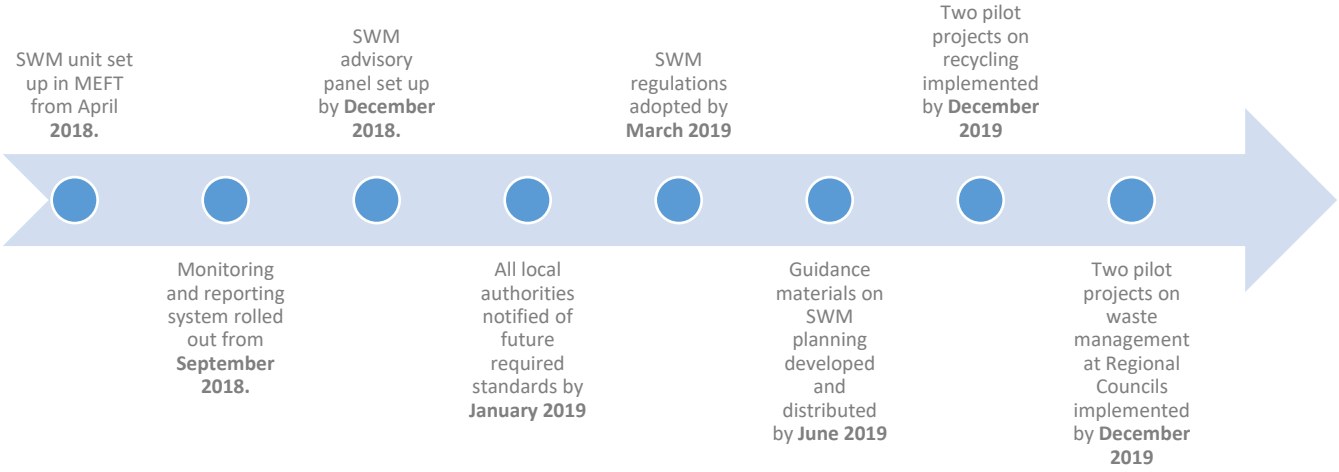

Figure 3.4. - Short-term milestones in the Waste sector

Sustainable harvest of invader/encroacher bush for various purposes

From 2020, Namibia will expand considerably its sustainable removal of invader bush to rehabilitate rangelands. The country has considered de-bushing as a promising mitigation option which also provides for adaptation and preservation of biodiversity. The projected reduction in emissions is 7,440.6 Gg CO_2-eq in 2035 representing 42% (Republic of Namibia, 2020). The country also plans to generate power using biomass in 2025 and this will offset measures the import of energy mainly generated from fossil fuels (Republic of Namibia, 2020).

3.3.2 List of Mitigation Measures

Table 3.2 - Changing to Cleaner Energy

Mitigation Action	Objectives	Description	Progress of Implementation / Steps taken or envisaged to achieve action	Nature of Action	Status	Methodologies / Assumptions	Gases	Progress Indicators	Results achieved
Climate Change Strategy and Action Plan (CCSAP)	Mainstream Climate change adaptation and mitigation in the medium to long-term national development plan	The CCSAP was developed to implement the National Policy on Climate Change (NPCC) and covers the period 2013 to 2020. The CCSAP paves the way to the strategic options to be adopted for mitigating and adapting to climate change to implement the Convention	Several policies and strategies developed such as Renewable Energy Policy (REP); Independent Power Producer (IPP) Policy; Updated Energy Policy; IPP Market and Investment Framework, and Electricity National Integrated Resource Plan (NIRP)	Legislation	Ongoing	Monitoring and Evaluation of the implementation of policies and strategies provided enough resources are available	All greenhouse gas not controlled by the Montreal protocol	Number of institutions to have mainstreamed climate change into their strategies	Policies and strategies being implemented,
Solar Thermal Technology Roadmap for Namibia	Increase the share of solar in the energy mix	Promote widespread adoption of flat plate solar thermal collector capacity in Namibia by 2030.	Preparation is undertaken	Infrastructure Development	Ongoing	Awareness campaigns provided enough resources are available	CO_2, CH_4, N_2O	Flat plate solar thermal collector capacity installed	To be assessed

Table 3.3 - Improving Energy Efficiency

Mitigation Action	Objectives	Description	Progress of Implementation / Steps taken or envisaged to achieve action	Nature of Action	Status	Methodologies / Assumptions	Gases	Progress Indicators	Results achieved
LED Campaign	Replace 1M incandescent bulbs with compact	Nampower is providing one Million LED bulbs free of charge to save energy from lighting as LED bulbs are more	Awareness campaigns, free distribution to launch the lamps and encourage adoption	Legislation, incentive and technology	Ongoing: awareness campaign and provisioning	IPCC 2006 GL and baseline from GHG inventory of Namibia. Lamps used over 12 hours daily on	CO_2, CH_4, N_2O	No. of bulbs distributed	Over 250 000 bulbs distributed so far, increased public awareness and acceptance.

Mitigation Action	Objectives	Description	Progress of Implementation / Steps taken or envisaged to achieve action	Nature of Action	Status	Methodologies / Assumptions	Gases	Progress Indicators	Results achieved
	fluorescent bulbs.	energy efficient. This project will contribute to awareness regarding energy efficiency.			of LED bulbs has commenced	average, lamps are replaced by equivalent ones			30 Megawatts expected to be saved by the end of the campaign
Sustainable urban transport system for Windhoek	Improve transport system and lower urban pollution	Improve transportation system of Windhoek through the adoption of mass transport, cars and freight pooling purchasing of buses for Windhoek local transportation.	Masterplan produced and implementation started	Incentive/Technology	Ongoing	Provided resources are available	CO_2, CH_4, N_2O	Transport systems implemented; modal shifts; % people carpooling	510,000 t CO_2eq/yr by 2030 (planned; conditional)
Namibia Energy Efficiency Programme (NEEP) in buildings	Improve the energy efficiency of buildings through the identification of savings potentials	To develop a rating system for buildings and building codes to improve energy efficiency in buildings. Included 60 energy efficiency audits in commercial and industrial sectors. GEF funded Programme	Renewable Energy & Energy Efficiency Institute (REEEI). In 2014 this institution was transformed into the Namibia Energy Institute (NEI) to include the other energy sectors.	Legislation/ Incentive/Technology	Ongoing	Perform energy audits in buildings Provided enough resources are available and more technicians trained	CO_2, CH_4, N_2O	No. of audits undertaken Savings opportunities identified Reduced energy consumption per m2 in buildings Cost savings	Fifteen audits done, three facilities implemented energy efficiency measures. Project supported the establishment of the Green Building Council of Namibia 17,000 t CO_2eq / yr. savings expected
Assessment of investment and financial flows to mitigate climate change in the energy sector	Quantify the required investment and financial flows required to mitigate in the energy sector	Evaluate investments needed and the flow of funds to implement projects for mitigation in the energy sector	Subsidy to be provided on the LPG kits for cars.	Promotion and incentives	Implementation ongoing	The modelling approach used and estimates of emissions reduction based on GHG inventory of INC; Fuel switching to LPG will be adopted by car owners provided	CO_2, CH_4, N_2O	Funds attracted and invested	Assessment recommendations compiled and about USD600mil spent to date on projects/ interventions commissioned.

Mitigation Action	Objectives	Description	Progress of Implementation / Steps taken or envisaged to achieve action	Nature of Action	Status	Methodologies / Assumptions	Gases	Progress Indicators	Results achieved
						enough resources are available			1,200,000 t CO_2eq/yr. by 2030 expected.
Energy audits in commercial and industrial sectors	Increase energy efficiency through 60 audits	Perform energy audits of commercial and industrial facilities to identify solutions to improve energy savings	Sensitization, Incentive possibly to start with free audits	Legislation and incentives	Implementation ongoing	IPCC 2006 GL and baseline from GHG inventory of Namibia More technicians are available for audits	CO_2, CH_4, N_2O	No of audits performed	17000 t CO_2 abated when fully implemented

Table 3.4 - Reducing Emissions from Cement Production

Mitigation Action	Objectives	Description	Progress of Implementation / Steps taken or envisaged to achieve action	Nature of Action	Status	Methodologies / Assumptions	Gases	Progress Indicators	Results achieved
Reduce clinker used in cement production	Reduce IPPU emissions resulting from the production of clinker	Certain Supplementary Cementitious Materials (SCMs) have hydraulic properties (i.e. they function similarly to clinker). These occur naturally (pozzolans, mainly metakaolin) or are the result of human activities (mainly industrial waste activities).	Sourcing for clinker alternates	Infrastructure Development and technology	Planned	IPCC 2006 GL and baseline from GHG inventory of Namibia. provided alternative material available to replace clinker	CO_2	Amount of clinker replaced per tonne of cementitious product	None

Table 3.5 - Reducing Emissions from Waste and Wastewater Treatment.

Mitigation Action	Objectives	Description	Progress of Implementation / Steps taken or envisaged to achieve action	Nature of Action	Status	Methodologies / Assumptions	Gases	Progress Indicators	Results achieved
Biogas Fish river small CDM (UNFCCC 2012) from landfill and water treatment plants	Convert waste to energy	Biogas Fish river small CDM (UNFCCC 2012) from landfill and water treatment plants.	Proposal prepared and submitted to CDM board	Infrastructure Development	Planned Proposal stage	CDM approved methodologies provided resources are available	CH_4	CDM proposal submitted for approval	CDM proposal prepared
City of Windhoek CDM from Gammams water-treatment plant (245 kW)	Convert waste to energy	Windhoek CDM from Gammams water treatment plant (245 kW)	CDM proposal submitted for approval	Infrastructure Development	Planned proposal stage	CDM approved methodologies provided resources are available	CH_4	CDM proposal submitted for approval	CDM proposal prepared
Kupferberg CDM from landfill gas UNFCCC 2012	Convert waste to energy	Kupferberg CDM from landfill gas UNFCCC 2012	CDM proposal submitted for approval	Infrastructure Development	Planned Proposal stage	CDM approved methodologies provided resources are available	CH_4	CDM proposal submitted for approval	CDM proposal prepared

Table 3.6 - Sustainable harvest of invader bush for various purposes.

Mitigation Action	Objectives	Description	Progress of Implementation / Steps taken or envisaged to achieve action	Nature of Action	Status	Methodologies / Assumptions	Gases	Progress	Mitigation Action
Restore 15 M ha of grassland (INDC Measure)	Restore grassland to improve soil carbon storage	The rangeland management policy was developed. The de-bushing project is underway.	Identified affected area. Mobilising funds	Incentive/Technology	Ongoing	IPCC 2006 GL and baseline from GHG inventory of Namibia Rangeland Policy & Forest Act. Provided resources are available	CO_2, CH_4, N_2O	The number of hectares debushed.	1,359,000 t CO_2eq/year in 2030 (planned; conditional)

4 Information on domestic Measurement Reporting and Verification

4.1 Introduction

A Measurement, Reporting and Verification (MRV) system serves as an important practice to illustrate all measures taken by a country to collect data on GHG emissions as well as mitigation actions and increasingly also on sustainable development impacts of climate actions and financial support received. MRV incorporates three independent but interconnected processes of measurement, reporting, and verification. MRV is a key element for ensuring more transparency, accuracy and comparability of information concerning climate change. It promotes the learning process and allows international benchmarking.

The Bali Action Plan introduced "enhanced climate reporting" which sets out global MRV architecture (UNFCCC, 2007). It established a clear process for developing countries to prepare and submit NCs every 4 years and BURs every 2 years followed by consideration through two-tier international consultation and analysis (ICA). Apart from introducing new timelines for reporting, it also encouraged national governments to establish a domestic MRV system. The PA introduced the ETF with new additional reporting requirements. In response to the call to establish a domestic monitoring reporting, Namibia launched a Climate Ambitious Reporting Programme (G-CARP) (UNFCCC, 2016b). The G-CARP aimed to facilitate the establishment of an integrated climate data management system that is capable of supporting the preparation of national and international reports including on GHG emissions, climate actions implemented, financial and technical support received and tracking of NDC targets and indicators (UNFCCC, 2016a, 2020).

Owing to its importance, MRV has moved to the centre stage of the PA, thus enhancing the requirements that existed already under the UNFCCC. The "National MRV system Assessment report of Namibia" is to provide an assessment of how Namibia's national MRV system operates, its gaps and efforts being made to address them. This chapter is the outcome of the review of existing reports, policy documents and consultations with stakeholders.

4.1.1 Climate change governance in Namibia

The Cabinet of Namibia is the Government entity entrusted with the overall responsibility for policy development, including those on Climate Change. The National Climate Change Committee (NCCC) oversees the implementation of the climate change policy, including the preparation of the reports for submission to the Convention and plays an advisory role to Government on climate change issues (MET, 2015). It comprises representatives of the various ministries and other stakeholders such as the private sector and NGOs amongst others. MEFT, the official government agency acting as the national focal point of the Convention, is responsible for coordinating and implementing climate change activities, including the preparation of both NCs and BURs, thus enabling the country to meet its reporting obligations. This is completed through the Climate Change Unit (CCU), established within the Department of Environmental Affairs (DEA) of MEFT. The CCU is supported directly by the NCCC for the implementation and coordination of sector-specific and cross-sectoral activities while also providing advice and guidance on climate change issues. Since climate change affects directly or indirectly all socio-economic development sectors and is embedded in almost all the Sustainable Development Goals (SDGs), all Ministries through their various departments, Institutions and Agencies actively collaborate and contribute in the implementation of climate change activities at local, regional and national levels. The existing local and regional structures

are also integrated for implementation of climate change activities at different levels within their areas of jurisdiction (MET, 2015).

A Project Management Unit (PMU) responsible for the administration of the NCs and BURs is established under the CCU. The main task of the PMU is the day-to-day management of the NCs and BURs processes but not for the mainstreaming or institutionalization of the issues in the national institutions. The PMU consists of a Project Coordinator, a Project Assistant, an administrative Officer and an Intern. Unlike the INC and SNC, which were purely 100% outsourced to consultants, efforts have been made starting with TNC and BUR1 to institutionalize the NCs and BURs process by supporting the establishment of the three different working groups, respectively on the Inventory of GHGs, Mitigation and Adaptation. These working groups have been working with an international consultant in data collection while at the same time being capacitated in conducting GHG inventories and mitigation analysis. However, due to time constraints (between one BUR to the next), limited financial and technical capacity within key institutions and the coordinating ministry itself, and staff turn-over (MET, 2015) in-house reporting is still not yet fully operational. Since these arrangements have not yielded the desired results, continuous efforts are still being made in the on-going reporting.

Under the GHG Working Group, lead agencies have been identified as per the four IPCC sectors, these are Energy Sector led by Ministry of Mines and Energy; Waste sector (previously led by the City Council of Windhoek, but now to be led by MEFT; AFOLU sector led by Ministry of Agriculture and Water Affairs; and IPPU sector led by Ministry of Industrialization, Trade and SME Development. With the support of an external consultant, these working groups together with MEFT have been involved in the updating of the national GHG inventory, in terms of activity data collection in their respective sectors(MET, 2015).

The NCCC meets at least quarterly per year at a place and time determined by the chairperson acting in consultation with the members and co-chair. The NCCC gives overall technical guidance and feedback on all actions under key strategic documents related to climate change. The National Climate Change Strategic Action Plan (NCCSAP) serves as the guiding document for reporting progress with additional matters added as and when necessary, such as Namibia's participation in the NDC partnership. Attendance is always more than the quorum and it is made up of several key stakeholders. The representation is now codified at an institutional level. Despite this, gaps remain in the technical know-how to enable the members to provide advisory services on key matters related to adaptation and mitigation. Thus, the NCCC members still require support to strengthen their technical expertise and offer verified information to decision-makers and senior policymakers concerning Namibia's progress and challenges on climate change actions and their links to other national strategies and sustainable development goals. Furthermore, the need for integrated planning, reporting, and monitoring is becoming more visible. The establishment of a comprehensive transparency framework for MRV of climate actions under the PA, which should be reliable, regular, and continuous, will contribute towards filling this gap.

4.2 The MRV System in Namibia

Namibia has in place a Monitoring and Evaluation (M&E) system to support its development agenda as laid out in the National Development Plan (NDP). The government implemented a continuous M&E process under the guidance of the National Planning Commission (NPC) for all socio-economic development engines, intending to track progress on the various goals and strategies earmarked in the NDP, including those of MEFT, which has the leading role on climate change. This M&E system has been very useful to track progress achieved in the implementation of the NDPs and also to inform government on its revision, updating as well as the development of new plans and strategies.

Government departments, parastatals and private sector organizations regularly measure, collect, and verify data on their activities to track progress, productivity, quality assurance and to conform to legislation, amongst others. These data are then analysed and reported to the NPC and administrative entities to inform them of the progress and achievements for sustainable decision-making and for guiding implementation and reviewing of Policies and Strategies within the NDP. Most of these data are then stored in private databases and/or centralized within the NSA for further analysis and eventual archiving. The NSA has been established to set up a robust national statistical system to provide quality data for supporting primarily the M&E as well as for other purposes such as providing data for reporting to the Convention to which the country is a Party, research and planning at various levels. The NSA also regularly undertakes surveys and censuses to supplement routine data collection, especially for elements not covered under annual organizational activities.

However, even if this system appears to function well to some extent and has delivered for ensuring sustainable development of the country, this has been achieved according to the capabilities of government and the institutions, taking into consideration the financial, technical, and technological capacities, including the availability of funds, level of knowledge required, availability of appropriate staff and the necessary tools. Unfortunately, data required specifically for compiling GHG inventories, following mitigation and adaptation actions, assessing needs, and reporting on support received have not been integrated within the system during its development up to now. These data are mostly dispersed with individual public and private sector institutions and organizations, demanding for collection on an ad-hoc basis when the BURs are being produced. And in instances where the data is available, it is not captured in the format that will be useful for BURs and NCs report purposes.

Gender equality considerations have not yet been strongly integrated into the existing MRV framework and there is need for gender equality, intergenerational equity and the empowerment of women and youth to be promoted as part of the strengthened framework for MRV.

4.2.1 MRV of emissions

Following the national institutional framework for climate change management, the CCU in MEFT is responsible for coordinating the GHG inventory. The Project Management Unit coordinates the day-to-day issues related to the development of reports. A national GHG working group was established through nominations made by various Executive Directors of key emitting sectors to participate in this working group. The mapping of the stakeholders' exercise is continuously being undertaken and updated. Sector leads have been identified for each of the IPCC sectors, see graph below. The working group members are currently responsible for collecting and providing activity data from their sectors, while they are capacitated to fully take over the role of conducting the GHG inventory. An international consultant has been working with the working group since BUR1 and NC4 training them and capacitating them on the IPCC 2006 software and guidelines used for compiling GHG Inventories.

The NSA has played a key role in terms of providing key national statistics, especially on imports and exports of commodities and therefore further strengthening the relationship of which such a key institute is a priority for Namibia. Currently, data archiving is done by the MEFT, however, discussions have started to have this completed by NSA. Current existing institutional arrangements are depicted in Figure 4.1.

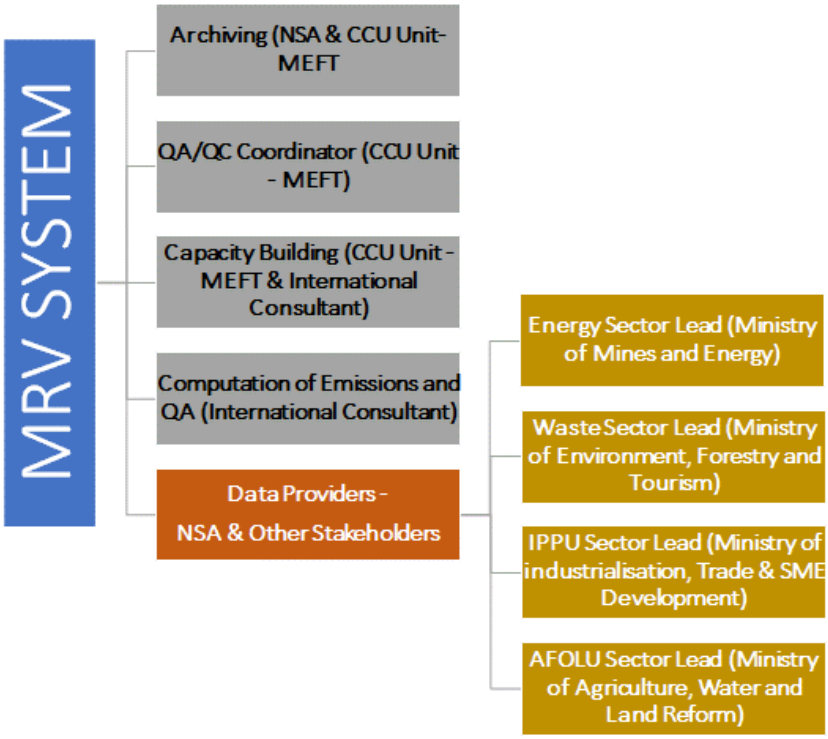

Figure 4.1 - Institutional arrangements for the MRV of emissions

The institutional arrangements for the MRV of GHG emissions are not yet fully operational but still under development. The development of national GHG emission inventories has been made mainly through the Project Management Unit and the support of international consultants within the reporting frameworks of NCs and BURs. No law or regulation formalizes the institutional setup for the inventory preparation and there are no formal contracts (or memorandum of understanding) between institutions are yet in place to ensure data collection and validation of the inventory. Therefore, the institutional arrangements in place are considered not sustainable in the long term. Furthermore, inventories are only prepared when GEF funds are secured and developed according to the time schedule for the GEF-funded project. The inventory will need an inventory preparation schedule agreed by all stakeholders to ensure the preparation of the inventory. Additionally, there is no protocol established for data submission from stakeholders.

Special emphasis is being laid on the rapid development and implementation of a national inventory management system to produce GHG inventories on a sustainable basis. The process has been quite slow due to dearth of funds but will accelerate now with the approval of the CBIT project as the GHG inventory management system cum MRV of emissions will be pivotal to the ETF of the Paris Agreement.

4.2.2 MRV of mitigation and NAMAs

Namibia is committed to contributing to efforts of the international community for combating climate change. In this context, the country has strengthened the existing institutional arrangements, has engaged in the development of an appropriate Measurement, Reporting and Verification systems (MRVs) to better implement and track mitigation of climate change in view of stabilizing greenhouse gases as earmarked in Article 2 (UNFCCC, 2014).

Reporting on mitigation actions implemented by the country in the BUR1, BUR2 and BUR3 (Republic of Namibia, 2016) proved very challenging due to a paucity of information on the status and progress of activities implemented for quite some years now. Thus, the information provided to the COP was not of the best quality and sometimes incomplete. The information provided did not reflect the real situation in the country when in fact there are numerous actions completed or underway in Namibia to implement

the Convention as per its obligations. The gender dimensions of mitigation actions were not articulated either. This situation is attributed to the fact that there existed no formal recording system for tracking these mitigation actions within the Namibian institutions and because it was not a reporting requirement. Of prime importance within the reporting context now and to tap needed resources while being transparent and meeting the obligations of the PA, Namibia must develop and implement robust MRV systems to track and report on both Mitigation and Support received before rolling out the activities of its NDC in addition to MRV of Emissions. Namibia continued to build and improve its system for measuring, reporting and verifying mitigation actions and their effects while tracking support received in implementing these. The institutional arrangements follow closely those described above for the GHG inventory, involving many of the same institutions collaborating for the MRV of emissions but with somewhat different responsibilities for the MRV mitigation and support systems. The Mitigation Working Groups (MWG) established during the production of the BUR2, with representatives responsible for collecting and reporting data related to mitigation actions according to the IPCC sectors AFOLU, Energy, IPPU and Waste, functioned sparingly on account of limited capacity and the absence of well-developed procedures. The existing arrangements must be reviewed and upgraded to be fully operational and to deliver for meeting reporting standards.

Namibia also counts with basic institutional arrangements for the MRV of NAMAs. The MEFT is already acting as NAMA Approver/Focal Point to the UNFCCC and as the National Designated Authority (NDA) to the Green Climate Fund (GCF). The main responsibilities for NAMA´s MRV require in the NAMA implementing entity, while the NCA is responsible for creating reporting templates. The reporting template is provided by the NCA to the NIE. The templates are completed and submitted annually to the NCA by the NIE. The MRV of NAMAS is not currently consistent with the mitigation MRV and its templates. NAMA's MRV shall be integrated within the mitigation MRV to ensure the information is used to track the progress of NDCs. When reporting on their domestic MRV in the BURs, non-Annex I Parties are encouraged to provide information on three key elements, including:

(a) A description of the overall institutional arrangements, whether based on existing or new processes and systems (similar to the information presented in Figure 4.2).

- This includes information on the key domestic MRV processes, systems, and arrangements, including institutional structures, legal and administrative framework, relevant information, methodologies, and experts to be engaged. Where necessary, developing country Parties may choose to voluntarily set up new arrangements and processes for domestic MRV.

(b) A description of the approach used to measure domestically supported mitigation actions. This includes information on the systems for collection and management of relevant data and on how methodologies are being documented (UNFCCC).

- Similar to the information on mitigation programmes being submitted as part of the national communication, this section should describe the institutional arrangements in place to collect information and manage quality assurance (QA) and quality control (QC) through documentation of the methodologies and data sources used.

(c) Finally, MRV should describe the approach used to conduct domestic verification of the information, including a description of experts engaged in the verification and the mechanisms of verification (Figure 4.2).

- This may include information on how the experts involved in the independent evaluation of information/ verification are being selected and appointed (e.g., is there an accreditation process involved, and if so, what does it entail).

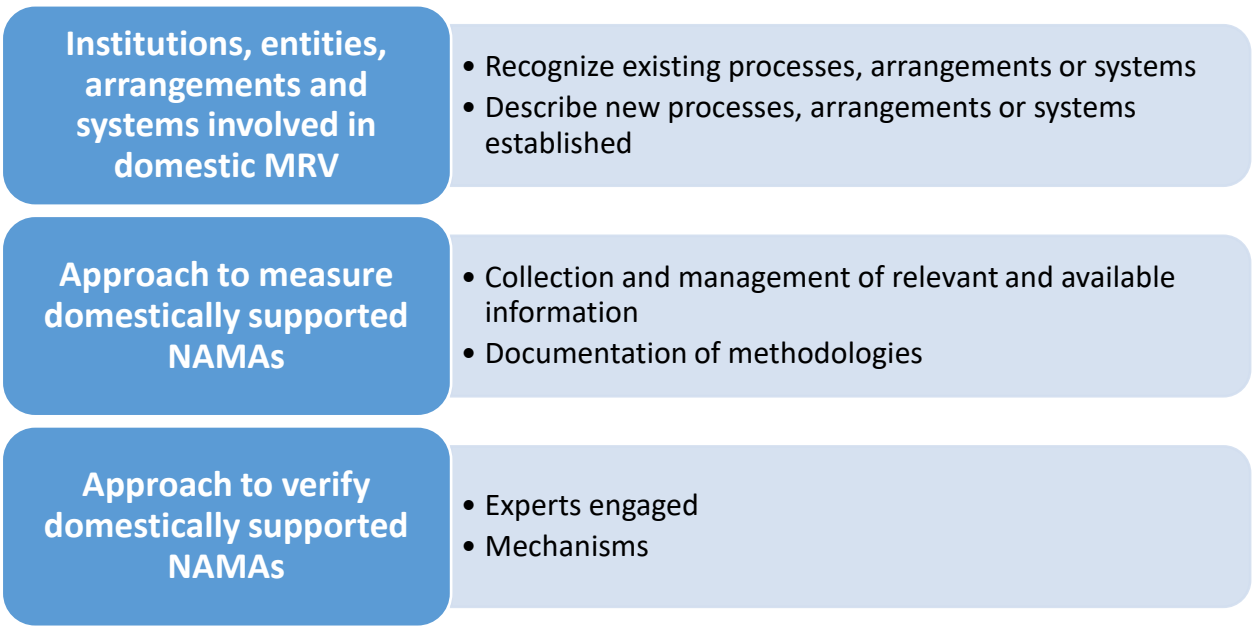

Figure 4.2 -MRV system of NAMAs

4.2.3 MRV data and information tracking

The country will centralise its data collection from sectoral focal points. From a central point, data will be used to monitor emissions and made available for analysis and reporting. Information collected by the government lead departments/agencies will be consolidated annually. The Climate Change Working Group will then assess the effect of the various mitigation measures and track Namibia's progress in meeting our mitigation pledge and objectives.

There is a need to develop and establish permanent systems for monitoring, reporting, and verifying mitigation actions (MRV) and other activities related to the Convention. During the exercise of strengthening of the existing institutional arrangements, numerous and very daunting challenges cropped up. The most urgent ones were Insufficient capacity of the coordinating body as well as lack of institutional and technical skills within the different thematic areas of the NC, maintain a motivated permanent coordinating body and/or personnel, Staff scarcity/unavailability in collaborating institutions due to their already overloaded schedules and staff turn-over and Lack of incentives and adequate funds to develop and maintain the system in place (UNFCCC).

Most of the government institutions have established a data platform from which some of the mitigation data are collected. The rest of the data are generated by filling the common MRV template. In each sector (be it Energy, Transport, Forestry and Waste) there are contact persons who have been tasked to collect, process and document information on specific mitigation actions assigned to them. They collect the information using common MRV template for mitigation actions.

It is thus proposed to work out a system comprising only the stakeholders concerned with mitigation activities to track these under the responsibility of the reinforced CCU. This MRV system can be regularly revisited when preparing the UNFCCC reports to ensure it continues to meet its objectives. For making the apparent linkages on funding, the Ministry of Finance and National Planning Commission should be fully-fledged members of the MRV mitigation and support systems. Ministries, Institutions and Agencies implementing mitigation actions automatically joins the mitigation working group to provide data collected on the action.

User-friendly templates have been designed during the preparation of the BUR2 (Republic of Namibia, 2016) for the collection of data and other information on mitigation actions, to the extent possible. However, these templates have not been used during the preparation of the BUR3 (Republic of Namibia, 2018) due to time constraints as the funding came late to allow for this exercise and the lack of the MRV mitigation system. The design of these templates needs to be tested and incorporated into the MRV of mitigation to ensure the consistency of the data.

Details of the range of information covered in the templates are provided below:

- Mitigation action description: Name of action, main objective, description, coverage (sector and gases) and type (policy, programme or project).
- Implementation information: Status (planned, ongoing, implemented), implementing agency and progress indicators.
- Methodology: Methodology for estimating emissions reductions including assumptions.
- Effects: Outcomes achieved, co-benefits (non-GHG impacts) and estimated emissions reductions.
- Costs and support: Cost of implementing and running action and support received; and
- Other: Barriers and opportunities for replication of mitigation action.

4.3 Efforts to improve the MRV system

Namibia has carried out reforms in the national system for the emission inventory. The MRV system has seen major reforms over the years with the view to improve on its functionality. The changes are aimed at improving coordination among institutions within the governmental set-up. The reforms include establishing institutional roles, strengthening data handling system, specialised training of experts as reviewers, creation of country-specific guidelines in GHG inventory and information on institutional. The institutional arrangement has been transformed significantly by redefining the roles of each lead in different sectors and streamline their activities to reduce overlaps. For instance, each sector has a 'lead' with a mandate specific to their given area (Figure 4.1).

However, data collection templates urgently need to be implemented and be used with a climate change data hub to improve data archiving and public access. The hub should be dedicated to hosting information on GHG emissions, climate change projects, policies, and measures, and the NDC since 2015. Namibia must realise some major gains in GHG data management within the MRV framework. More needs to be done especially looking at the new additions of the MRV tasks following the Paris Agreement.

The improvement efforts seek to further strengthen (a) data availability/acquisition; (b) documentation and archiving; (c) data quality and (d) linkages between inventory compilation processes and national data providers.

Close collaboration between agencies involved in inventory compilation and statistical agencies has been identified as an enabler of inventory improvement. Political and financial support for making inventory improvements are likely to be stronger where stakeholders are aware of how proposed MRV improvements contribute to policy goals in climate or other sectors. Where suitable platforms do not exist, agencies responsible for inventory compilation (whether researchers or officials) may need to consider other ways to engage relevant stakeholders in defining policy goals, identifying, and justifying improvements and related investments. Involving the private sector in discussions on inventory improvement and strengthening research-policy linkages may be of relevance in some contexts. The

domestic MRV system has however been able to successfully support the production of four NCs, three BURs and currently updating its first NDC.

4.4 MRV Capacity Needs

A major gap identified is about the inability of the system to effectively aggregate the cumulative effects of individual mitigations as well as evaluating policy measures. It is important to figure out how the MRV system must be designed with defined roles and responsibilities, how it will be integrated into the existing sectors and above all how the entire domestic MRV must be made to work. The following capacity building needs were from a questionnaire survey:

- training on the use of the 2006 IPCC Guidelines and software, data processing and management strategies.
- capacity-building on GHG data management.
- Improvement of the GHG inventory report.
- Improvement in mitigation baseline setting.
- Continuous training of national GHG inventory experts.
- Development of mitigation scenarios for the non-energy sector (AFOLU and Waste), especially marginal abatement curves.
- Improvements in the institutional arrangements; and
- Assessment and monitoring of the effects of GHGs on the policy level mitigation actions.

4.5 Barriers to the expanded transparency framework

While past interventions and baseline interventions led to the establishment of various working groups under the NCCC, these did not effectively work as envisaged, owing to strategic barriers at systemic, institutional, and individual levels, working in combination with, among others:

- inadequate awareness of the issues amongst stakeholders.
- high staff turnover within key institutions.
- limited institutional commitment (exhibited via lack of institutional commitment and participation of stakeholders). This may be attributed to the limited appreciation of the importance of the reporting, as external consultants led some key components of the work, thus leading to it being viewed (for instance GHG inventory activities) as something outside their institutional mandates; and
- lack of updated technical skills and capacity of nominated experts. Largely, the key technical barrier was created by heavy reliance and use of external consultants (to fill the gap) without any targeted and deliberate ‘graduation’ efforts pursued. Thus, while most of the national experts and institutions were broadly exposed to these processes, challenges facing them not being fully engaged nor enabled (capacity built) to effectively lead the preparation of the national GHG inventory process sustainably still pose the single most significant barrier to creating an effective MRV system.

Table 4.1. - Types of barriers and challenges identified in BURs.

Type of barriers	Barriers and how to achieve long term vision
Systemic	Namibia's systemic barriers emanate from having (a) an unequal society that faces persistent development challenges, leaving some groups behind due to imbalanced power relations, lack of social and economic opportunities including unequal access to climate information. Such negatively impacts (b) rural and urban' men and women's economic empowerment, participation and decision-making, and access to climate information to make informed decisions to transform their societal needs. Specific capacity aiming at improving the performance and stability of critical national institutions - catalyzing transparency and accountability in the MRV systems.
Institutional	Lack of interest from key stakeholders to participate in the BUR processes, resulting from exclusion in their mandates. Creation of Institutional Arrangements with focal points within the mandated national institutions is needed. Formalize the engagement with stakeholders through MoUs.
Individual technical	Inadequate technical capacity of WG members necessitates the building of essential skills for GHG inventory exercise. Enhancement of Namibia's ability to quantify emissions of indirect GHG emissions by a better understanding of air pollutant emission inventories.
Financial	Inadequate framework for provision and management of financial resources, and constraints from central government to carry out the assessments at regional and local levels. Utilization of the Development Finance Assessment (DFA) results.

Organizations and individuals in the private sectors and institutions lack the necessary training and tools to conduct MRV activities. BURs identified a need to provide training to individuals for collecting climate data, particularly the Division of Multilateral Environmental Agreement and in other sectoral ministries.

There is also a need to develop and provide criteria for classifying and reporting updated and disaggregated data on support received. Furthermore, reporting in all areas should have clear timetables, formats and procedures.

Lack of a holistic, continuous system for data collection, formatting, analysis, and reporting: The current project-based cycle for reporting, rather than a continuous process, makes it difficult to respond to emerging MRV requirements. Research under the previous BURs identified several partially developed or tested databases in different sectors. However, there is a lack of coordination among the databases. Certain databases lack formatting or level of scale necessary to contribute meaningfully to climate change activities. In the area of adaptation, there is also a lack of clear processes for collecting information and updating climate risk and vulnerability information, and adaptation and mitigation information are not integrated.

The proposal of the MRV system would need to be revised, as for the following items:

- The roles and responsibilities needed by the MRV system (such as entity responsible for the compilation of the inventory, an entity responsible for the coordination of the MRV of support, an entity responsible for QA/QC, etc) need to be specified in the MRV system.
- The linkages between MRV components are not addressed, and the integration of the M&E existent system with the new components needs to be reinforced.
- The MRV system of support does not count with an entity responsible for coordinating data collection in line with the national finance management system and gathering data.
- The role of the financial entities (data providers for the MRV of support) and their relationship with NSA is not clear.

Lack of institutional capacity to manage climate related MRV at MEFT, the focal point ministry for climate change. Specifically, there is no designated office with qualified employees and computer hardware and software to oversee MRV systems and activities across government agencies and industry. This constraint limits the ability of the government to align MRV activities with international requirements and country priorities. Also, electronic systems for MRV in certain sectors cannot be fully implemented due to a lack of trained personnel with a mandate to use them.

Namibia has made tangible progress in raising its reporting standards to the UNFCCC, shifting from total reliance on consultants to a mix of collaboration between consultants and national experts. The objective of the country is to become fully independent for reporting at the required standards to the Convention in the near to medium term.

This demands far more serious management and for a sustainable system to be put in place. Human and other resources are already lacking, and it is a fact that countries need to have a fully-fledged team dedicated to data collection, QA/QC, and report preparation. Countries should also prepare themselves for verification, amongst others, to meet the standards, namely the transparency component as it stands today.

During the Quality Assessment exercise held by UNFCCC and the UNDP-UNEP Global Support Program, during the implementation of Namibia's BUR3, some of the areas which were identified for urgent improvement were:

(a) Institutionalize the archiving system with NSA.

(b) Improve the institutional arrangements to ensure the annual provision of activity data for preparing the inventory.

(c) Develop and implement a quality control management system.

(d) Develop legal arrangements for securing the collaboration of other institutions for activity data.

(e) Improve on documentation and archiving.

(f) Capacity building in various areas of inventory compilation including the importance of including national consultants.

(g) Conduct new forest inventories to confirm the new approach adopted for the Land sector.

(h) Produce new maps for 1990 to 2015 to refine land-use change data over 5-year periods to replace the low-quality maps available now which is proving inadequate.

(i) Refine data collection for determining country-specific (CS) weights for dairy cows, other cattle, sheep and goats.

(j) Develop the digestible energy (DE) factor for livestock as country-specific data is better than the default IPCC value to address this key category fully at Tier 2; and

(k) Improve activity data for the AFOLU sector through the production of new maps to generate land-use changes, National Stock and Emission factors, possible use of Collect earth for confirming the assumptions and data used.

Namibia needs to tackle all the improvement areas identified above to the extent possible to further improve the level of reporting with particular attention to including gender equality considerations. Mitigation is embedded in the national development plans as detailed in the National Climate Change policy. Various policies falling under the latter have been reviewed, and updated ones produced in 2017, to cater to the latest COP decisions and the PA. However, implementation of mitigation actions faces multiple barriers and difficulties in various areas and the country needs to remove these challenges to move forward. Weaknesses exist at the institutional, organizational, and individual levels, notwithstanding financial and technology transfer needs, especially at a time when the country has endured a drought over the past four years. There is an urgent need to improve the enabling environment for tackling climate change activities, with special emphasis on mitigation in the country.

The flow of technical and capacity building support has been below plans made as per the BUR1. Substantial funding is required to enable Namibia to meet its reporting obligations and implement the Convention. Appropriate and timely funding is essential for meeting reporting requirements at the right standard. On the other hand, funding implementation of mitigation actions as provided for within the country's development strategy and agenda has been practically non-existent. Namibia, as a developing country, faces numerous difficult challenges to maintain the welfare of its population. As such, the country will not be able to allocate adequate funding to meet the climate change agenda, even if this is of prime importance to it. Efforts, including incentives to attract private investors, have been deployed to bring in the funds needed.

Some of the challenges identified during the previous BURs include:

(a) Information required for the inventory was obtained from various sources as no institution has yet been endorsed with the responsibility for the collection of specific activity data needed for the estimation of emissions according to IPCC on an annual basis.

(b) Almost all activity data, including those from the Namibia Statistics Agency, are still not yet in the required format for feeding in the Inter-governmental Panel on Climate Change (IPCC) 2006 the software to make the emission estimates.

(c) National experts are not yet ready to take over the full inventory compilation process, which dictated the collaboration of an international consultant.

(d) Lack of country-specific emission factors.

(e) Some sub-categories were not covered due to lack of activity data; and

(f) Though national experts were provided with some capacity building, this still needs to be pursued in the future until they are fully knowledgeable with the whole process.

4.6 Stakeholders

The MRV system will serve as the main platform for stakeholder coordination in the future climate changes activities in the country. Until the MRV platform is developed, the exchange of information with stakeholders will be performed using a dedicated electronic platform (such as an electronic data hub).

Tracking participation in the working groups (V&A, mitigation and GHG emissions working groups), and participation in project events on an ongoing basis is crucial to monitor stakeholder participation.

Table 4.2. describes stakeholders, their current responsibilities, and their roles in climate change management:

Table 4.2 - Stakeholders, responsibilities, and their roles in climate change management

Type of stakeholder	Name of Stakeholder	Current role in climate change management
National Government Ministries and Agencies	Ministry of Environment, Forestry and Tourism (MEFT)	- Responsible for coordinating, managing climate change issues in the country and implementation of the UNFCCC. The MEFT is also responsible for the coordination of the transposition and implementation of environmental laws in the field of environmental and climate change. -The MEFT is the coordinator of the GHG emissions Inventory and is the lead for the estimates of the Waste Sector.
National Government Ministries and Agencies	National Climate Change Committee (NCCC)	-The multi-sectoral National Climate Change Committee (NCCC) consisting of representatives from relevant ministries and other stakeholders including the private sector, NGOs, academia and implementing partners, oversees the implementation of the climate change policy, including the preparation of National Communications (NC) and Biennial Update Reports (BUR)
National Government Ministries and Agencies	Ministry of Mines and Energy (MME)	-The ministry is in charge of monitoring and reporting in the key sectors relevant to climate change mitigation including energy management, energy efficiency and renewable energy. -GHG inventory lead for the Energy sector, including mitigation -Involved in data collection and transmission activities
National Government Ministries and Agencies	Ministry of Water, Agriculture and Land Reform (MAWLR)	-It oversees monitoring and reporting in key sectors of climate change mitigation (AFOLU) and adaptation in agriculture, and water management. -GHG inventory lead for AFOLU Sector, including mitigation. -Already involved in data collection and transmission activities.
National Government Ministries and Agencies	Ministry of Industrialisation Trade and SME Development (MITSMED)	-It oversees monitoring and reporting on IPPU adaptation and mitigation. -GHG inventory lead for IPPU Sector. -Already involved in data collection and transmission activities.
National Government Ministries and Agencies	Office of the Prime Minister	-Member in NCCC and technical working groups.
National Government Ministries and Agencies	Environmental Investment Fund (EIF)	-Fund supporting protection of the environment, its biological diversity and ecological life-support functions; and the promotion of sustainable natural resources use for economic development by supporting green and environmental enterprises. Expertise in gender. Its gender policy is aimed at contributing to better health for both women and men, through health research, policies and programmes which give due attention to gender considerations and promote equity and equality between women and men. -Member in NCCC. Responsible for resource mobilization for NCCC.

Type of stakeholder	Name of Stakeholder	Current role in climate change management
National Government Ministries and Agencies	National Planning Commission (NPC)	-Responsible for all national planning activities.
National Government Ministries and Agencies	Namibia Statistics Agency (NSA)	-Has the national legal mandate to collect and archive all national data; hence they will be a crucial stakeholder for sex-disaggregated data collection in the project. -Key data provider of the GHG emissions inventory, archiving and socio-economics scenarios. -Already involved in data collection and transmission activities.
National Government Ministries and Agencies	Namibia Agronomic Board (NAB)	-AD and info on agriculture, fertilizer, and practices. -Already involved in data collection and transmission activities.
National Government Ministries and Agencies	Civil aviation office	-Data provider of the GHG inventory on LTOs and bunkering -Already involved in data collection and transmission activities.
National Government Ministries and Agencies	Namibia Roads Authority (NRA)	-Data provider of the GHG inventory on vehicles and road transport. -Already involved in data collection and transmission activities.
National Government Ministries and Agencies	Namibia Airports Authority (NAA)	-Data provider of the GHG inventory on civil aviation. -Already involved in data collection and transmission activities.
National Government Ministries and Agencies	Agribank of Namibia	-Loan provider
National Government Ministries and Agencies	Meat Cooperation of Namibia (Meatco) (Parastatal)	-Data provider of the GHG inventory on livestock sector. -Already involved in data collection and transmission activities.
National Government Ministries and Agencies	National Commission on Research Science and Technology	-Research clearance
National Government Ministries and Agencies	Namibia Meteorological Services	-Data provider on adaptation. Promotes the application of meteorology to aviation, maritime operations, water resources, agriculture, health, energy, tourism, environment, and other sectors of the national economy. To acquire and preserve Namibia's national climate data for use by the present and future generations and for posterity.

Type of stakeholder	Name of Stakeholder	Current role in climate change management
Local Government	City Council of Windhoek	-Data provider of the GHG inventory and mitigation on the waste sector. -Already involved in data collection and transmission activities.
Local Government	Swakopmund and Walvis Bay councils	-Potential data provider of the GHG inventory on waste -Not involved in data collection and transmission activities.
Private sector	Agra	-Potential data provider of the GHG inventory on agriculture, fertilizer, and practices. -Not involved in data collection and transmission activities.
Private sector	FeedMaster	-Potential data provider of the GHG inventory on livestock feeds. -Not involved in data collection and transmission activities.
Parastatal	TransNamib	-Data provider of the GHG inventory on rail transport. -Not involved in data collection and transmission activities.
Parastatal	Nampower	-Data provider of the GHG inventory on electricity generation. -Already involved in data collection and transmission activities.
Parastatal	Namibian Dairies	-Data provider of the GHG inventory on information on cattle feeds. -Already involved in data collection and transmission activities.
Private sector	Ohorongo	-Information on carbon emissions related to Portland clinker production. -Already involved in data collection and transmission activities.
Private sector	Baobab Capital	-Alternative investment manager that invests in early-stage businesses in Southern Africa, growing them into medium and large-scale enterprises, through its three funds. -Could support with funding and information on support.
Parastatal	Development Bank of Namibia	-Provides finance for larger enterprises in key economic sectors that are expected to deliver development impact, economic activity, and employment. The Bank finances previously disadvantaged Namibians and women entrepreneurs. The DBN has been instrumental in availing climate mitigation funding to non-state actors.
Academia	University of Namibia	-Develop national emission factors. -Already involved in data collection and transmission activities.
Academia	Namibia University of Science & Technology	-Develop national emission factors. -Already involved in data collection and transmission activities.
Academia	Namibia Energy Institute	-Serves as a national information resource base for sustainable energy use and management.

Type of stakeholder	Name of Stakeholder	Current role in climate change management
		-Already involved in data collection and transmission activities.
Academia	International University of Management IUM	-Already involved in data collection and transmission activities.
Academia	Southern African Science Service Centre for Climate Change and Adaptive Land Management (SASSCAL)	-Not involved in data collection and transmission activities.
NGOs and civil society organizations	Desert Research Foundation	-Studies and surveys for GHG inventory and EFs
NGOs and civil society organization	Namibia Medical Society	-Works towards cost-effective and efficient health service provision to the people of Namibia through the existing medical capacity and capability.
NGOs and civil society organization	Red Cross Society	-Support gender-responsive disaster management and humanitarian action related to climate change.
NGOs and civil society organizations	The Namibian Association of Community Based Natural Resource Management (CBNRM) Support Organisations (NACSO)	-As an association comprising 8 Non-Government Organisations (NGOs) and the University of Namibia, NACSO provides services to rural communities seeking to manage and utilise their natural resources in a sustainable manner. Could provide support on the linkages between gender and climate change.
NGOs and civil society organizations	Integrated Rural Development and Nature Conservation	-Works towards improve the lives of rural people by diversifying the socio-economy in Namibia's communal areas to include wildlife and other valuable natural resources. Provides capacity building trainings with a focus on building women's leadership skills.
NGOs and civil society organizations	Namibian Development Trust	-Seeks to ensure improved livelihoods and empower rural communities
Media	Media Institute of Southern Africa (NAMIBIA)	-MISA is a media institute, providing media and literacy trainings and access to information.
Media	NBC	-As the public broadcaster of Namibia, NBC is uniquely positioned to increase the awareness of the general public on climate change mitigation, adaptation and reporting.

Type of stakeholder	Name of Stakeholder	Current role in climate change management
Implementing Partner	FAO	-Supports strengthened capacity for disaster risk reduction, resilience building and climate change adaptation and mitigation in Namibia
Implementing Partner	IOM	-IOM is the leading inter-governmental organization in the field of migration, and also works on climate change induced migration.
Implementing Partner	UNIDO	-Specialized agency of the United Nations promoting industrial development for poverty reduction, inclusive globalization, and environmental sustainability.
Implementing Partner	GiZ	-Specialized agency of the German cooperation for supporting climate action in developing countries.
Implementing Partner	Friedrich-Ebert Stiftung	-Promotes democracy, development, social justice and peace through capacity-building, policy research, public dialogue, and international exchange. -Commissioned research on youth and climate change in Namibia.

4.6.1 Private Sector Engagement

The private sector is part of the NCCC, which is the steering committee for the project board of Namibia´s CBIT. Additionally, numerous entities from the private sector are included in the stakeholder engagement plan of the project, and they are expected to attend to the capacity building activities of the project. The private sector will be involved in the national MRV of Namibia as one key data provider for the national GHG emissions inventory as well as mitigation and adaptation policies and measures.

4.7 Conclusion and Recommendations

Namibia has been undertaking a range of excellent work as they establish a robust MRV system. Still, in its infancy Namibia's MRV system needs to be further developed with different scales and scopes, utilising a range of different guidance, and incorporating to a greater or less degree fundamental technical elements. Although the country is making good progress, the survey results suggest that there are several fundamental areas of system design that could be better incorporated into the domestic MRV systems.

One broad area where such support would be valuable is guidance on the practical use of the range of tools that the IPCC provides for estimating GHG emissions and removals. This includes how the use of the IPCC Guidelines, various guidance and IPCC emissions calculations templates could be applied in the design of a domestic MRV system.

Namibia is generally in need of technical assistance on QA/QC and verification, including practical tools. Incorporating QA/QC and verification into MRV systems is a good example of where Namibia should be encouraged to think strategically for the longer-term, but to implement incrementally. Such an approach helps ensure that simple opportunities to incorporate QA/QC and/or verification approaches into MRV systems are not missed, but also recognises specific national circumstances and capabilities.

The IPCC training suggested above could target QA/QC and verification in addition to other technical areas that the country identifies. To supplement formal training opportunities, Namibia could consider facilitating informal networks of technical experts related to MRV. These national experts could share amongst themselves how they are approaching aspects of systems design such as QA/QC and verification.

A gender-responsive transparency framework for MRV is vital to ensure that the different needs, challenges and priorities of women and men are addressed. It is key that the MRV framework actively promotes the leadership of women in decision-making processes in order to achieve and sustain the full, equal and meaningful participation of women in climate action. Gender balance needs to be actively promoted in the institutional arrangements like the NCCC and the technical working groups. Similarly, it is critical to increase the understanding and expertise of national institutions on the systematic integration of gender considerations into their work. Therefore, it would be advisable to have a gender specialist leading in the drive to establish a comprehensive Transparency Framework for MRV of climate actions and reporting on implementation under the Paris Agreement project.

In addition, it is recommended that the MEFT facilitate formal opportunities for MRV system information sharing such as mutual peer reviews with neighbouring countries. Such a review would provide Namibia as a country with a different technical perspective. A similar initiative has been underway in Asia for the past decade, where technical experts come together annually for workshops on GHG inventories. The initiative includes the opportunity for countries to undertake a mutual 'review' of a sector of their inventory. Reviews of this type assist not just the country being reviewed, but also afford the experts undertaking the review an opportunity to learn more about how other countries undertake MRV.

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

5.1 Reporting

The approach adopted for reporting to the Convention was maintained for the BUR4, namely consolidating inhouse reporting. Notable progress has been achieved since this process started but the country is still not fully prepared to totally assume reporting. Constraints still exist at the institutional and technical levels to report to the required standard for meeting the ETF of the PA. The major constraint is the weakness of the institutional framework resulting from unavailability of sufficient funds within Government budget to consolidate the human capacity of institutions through the employment of additional staff on a permanent basis, and the fact that the members of the working groups have not yet mastered the reporting process. Thus, capacity building remains of utmost importance and urgent relative to the ETF requirement of the PA for preparing BTRs as from 2024. Namibia welcomes the recent approval of its CBIT project by the GEF which will provide vital resources needed to develop the appropriate institutional framework, including the MRV systems for reporting transparently to the COP while enhancing the capacity of national experts. Further enhancement of the capacity of a wide range of national experts will be done during the preparation of the BUR5 and NC5 on thematic areas not covered in the CBIT project but in synergy with the latter. The request for funding of the BUR5 and NC5 from the GEF is under development.

5.2 Implementation

Namibia has fully embarked on implementing measures to mitigate, and adapt to, climate change since the country ratified the Convention. Mitigation and adaptation are embedded in the national climate change policy with actions laid out in the five years development plans, especially in the ongoing NDP5 where climate change is given due importance under Environmental Sustainability which is one of the four pillars of this plan. Namibia is geared to move towards low-carbon and climate-resilient development. This transition will be addressed through the sectors energy, transport, industrial production, agriculture, water resources, and waste management. Various sectoral policies have been reviewed and updated to cater for the latest COP decisions and the PA when implementing the NDP5.

Namibia has witnessed notable progress in implementing its low-carbon and climate resilient development strategies. The transition from generation of electricity from fossil fuels to renewable sources is factual now while on the adaptation front, various projects are implementing sustainable use of natural resources which is vital for the country as the economy is highly natural resource based.

However, implementation of both mitigation and adaptation actions still faces multiple challenges and barriers in various areas and the country stands to remove these to reach its objectives. Weaknesses exist at the institutional, organizational, and individual levels, notwithstanding financial and technology transfer needs, especially at a time after the country experienced a prolonged drought and is facing the COVID-19 pandemic since last year. Namibia has improved its enabling environment for tackling climate change activities but still more needs to be done to attain the much needed well-functioning and operational institutional framework. Many barriers have been removed in the recent years to speed up the smooth implementation of mitigation and adaptation projects. Namibia's expectations on the PA have materialised to a certain extent by tapping funds from the Green Climate Fund (GCF), among others. One major achievement has been the creation of the Environment Investment Fund of Namibia (EIF) which is playing a pivotal role in the mobilization of funds from the GCF mainly.

5.3 Technical and capacity building needs

The flow of technical and capacity building support has been on the low side to fully enable Namibia to implement the identified strategies for mitigating and adapting to climate change. Namibia has recorded some progress on enhancing of technical capabilities and capacity building of national experts for reporting to the Convention within the framework of NCs and BURs through support received from the GEF. This has proven to be insufficient since it covered reporting only while developing of technical capabilities and capacity building for the development and implementation of mitigation projects stay only partially developed and should be urgently addressed. A list of current technical and capacity building needs is provided in Table 5.1.

Table 5.1 - Technical and capacity building needs including support received and additional requirements

Activity	Status	Support needed	Support received	Additional support needed
Preparation of BURs and NCs	Ongoing	Additional technical assistance to strengthen existing institutional arrangements, enhance coordination and capacitate national experts	GEF funds under Enabling Activities for preparing NCs and BURs	Specific technical assistance to analyse weaknesses and propose solutions for enhancing the existing institutional arrangements
Compilation of GHG inventories	Ongoing	Further capacity building for estimating emissions, generating national EFs, running the LAND module of the IPCC 2006 software and applying the EMEP EEA methods	Capacity building of a restricted number of experts through contracting of an international consultant with funds provided by the GEF	Further technical assistance to speed up capacity building
Preparation of land cover maps for tracking land use changes and improve estimates of associated emissions	Planned	Technical Assistance for correcting satellite images, producing reliable land cover land use maps and generating land use changes over time	None	Funds in lieu of or technical assistance to contract consultants who can provide the support needed and the appropriate satellite imageries
Develop and implement MRV systems	Ongoing	Technical assistance/funds	1.1 M USD from the GEF for the CBIT project	
Improve knowledge on market mechanisms linked to mitigation	Ongoing	Assistance to enhance capacities to understand and take advantage of existing market mechanisms for developing mitigation and adaptation projects	USD 300,000 from GCF for Strengthening National Designated Authorities, Strategic framework for engagement with the Fund and Support of accreditation of local institutions	Additional support to mobilize funds under existing market mechanisms for mitigation purposes
Solar home systems	Ongoing	Capacity building for installation and maintenance of solar home systems and assessment of impacts	None. Capacity building of several national experts done with government support	Further support to increase number of available technicians and capacity building on assessing GHG emissions reduction

Activity	Status	Support needed	Support received	Additional support needed
Solar water heaters	Ongoing	Capacity building for installation and maintenance of solar water heaters and assessment of impact	None. Capacity building of several national experts done with government support	Further support to increase number of available technicians and capacity building on assessing GHG emissions reduction
Photovoltaic pumps	Ongoing	Capacity building for installation and maintenance of photovoltaic pumps and assessment of impact	None. Capacity building of several national experts done with government support	Further support to increase number of available technicians and capacity building on assessing GHG emissions reduction
Solar cookers	Ongoing	Technical assistance for promoting penetration, adoption and assessment of impact	None. Some awareness raising programmes delivered but not extensive enough	Further support to enhance capabilities of more NGO members for sensitization of the public
Improve energy efficiency in buildings	Ongoing	Capacity building of architects and engineers to integrate energy efficiency concepts in new buildings	None	Support to enhance capabilities of a higher number of professionals for performing energy audits in buildings
Reduce distribution losses in the electricity network	Planned	Capacity building of engineers to assess and implement measures to reduce losses	None	Additional support to improve the capacity of engineers and other concerned staff
Energy audits in industries	Ongoing	Assistance to train engineers and technicians in performing energy audits to enhance the programme	None	Support to enhance capabilities of a higher number of professionals for performing energy audits in buildings
Reduce deforestation – NILALEG project	Ongoing	Technical assistance to assess degradation level	Some support received from German Development Bank (KfW) through GIZ. USD 10.8 M from GEF	
Promote community forest management-CBNRM	Ongoing	Technical assistance for awareness raising	EUR 6.8 from GIZ and USD 10M from GCF	
Use alternatives to poles for construction	Ongoing	Assistance to evaluate impact and rate of adoption of alternative materials and market evaluation	None	Support to design and implement studies on adoption of alternative construction materials
Improve pastures (feed quality) to reduce enteric fermentation	Ongoing	Assistance to evaluate impact of feed quality on enteric fermentation, research to improve the quality of pastures	None	Support to design and implement studies for improving pastures to reduce enteric fermentation

Activity	Status	Support needed	Support received	Additional support needed
Switch from Fuelwood/charcoal to solar/LPG	Ongoing	Assistance to promote technology and evaluate impact	None	Further support to assess emissions reduction
Convert waste to energy	Planned	Technical assistance to prepare projects for funding	None	Support for assessing feasibility of waste conversion to energy
Composting of abattoir sludge	Ongoing	Assistance to evaluate impact and prepare project for funding	None	
Switch to improved wastewater treatment technologies	Ongoing	Assistance to evaluate impact and other benefits	None	Additional support to develop sound project proposals

5.4 Financial Needs

Substantial funding is required by Namibia to enable the country to meet its reporting obligations and implement the Convention. Funding is vital for preparing the necessary reports for the country to be compliant with the COP decisions. While funding by the GEF has been most welcome, it should be highlighted that this is most of time not adequate and timely enough to ensure compliance.

Reporting is more stringent and frequent now to meet specially the ETF of the PA. This requires for robust institutional arrangements and operational sustainable systems. Namibia has been developing and implementing these requirements for quite some time now and needs to urgently consolidate the existing reporting framework to meet its obligations. Human and other resources are still lacking. Countries should also be endowed with operational MRV systems to track emissions, mitigation, and support. The approval of the CBIT project will provide the country with much needed resources to develop and implement its MRV systems to track the implementation of the NDC. Funding by the GEF for the preparation of BURs and the future BTRs within a 2-years cycle is problematic. Development and approval of BUR projects is lengthy such that when the funds are released, only about a year remains to conclude the report. This prevents the country from meeting its reporting schedules. This time constraint very often affects the quality of the national reports. Since the contents of the BURs do not change, it is highly recommendable that financing be done in a more expeditive manner, based on progress achieved in the preparation of the report already funded.

Implementation of the Convention as per the country's low-carbon strategy is even a more gigantic task because of the significant amounts of funding required to develop and implement mitigation projects. Funding implementation of mitigation actions as estimated in the NDC is consequential and nearing some 45 billion USD. Namibia, as a developing country is already facing difficult challenges to maintain the welfare of its population due to various constraints and this has worsened following the economic downturn resulting from the COVID-19 pandemic. Under such circumstances, the country will not be able to allocate adequate funding to meet the climate change agenda and relies heavily on support from the international community. Up to now, Namibia has not tapped much funding to support its mitigation strategy. It is desirable that Annex I Parties fulfil their pledges to avail funds required for implementing the NDC. Table 5.2 provides a description of support needed and received in addition to those provided in the BUR3.

Table 5.2 - Updated financial needs including support received and additional requirements since BUR3

Activity	Status	Support needed	Support received	Additional support needed
Preparation and submission of BUR5 and NC5	Funding request under preparation	USD 852,000 from GEF		USD 500,000 for preparation of appropriate land use and land cover maps for the period 1990 to 2015
Community-based Adaptation (CBA) Programme	Ongoing		USD 4,525,140 from GEF for Global project, USD 4,125,140 from government	To be reassessed once project is completed
Wind power electricity generation plan	Ongoing	Financial needs being worked out	None	Will be provided in BUR5
Adoption of solar technologies for generating on– and off-grid electricity	Ongoing	Financial needs under evaluation	None	To be reassessed once project is completed
Solar (Energy) shops	Ongoing	USD 2.0 million	Government funds USD 200,000 to date	USD 120,000 annually over the next 15 years
REFIT Solar farms projects	Ongoing	USD 200 million	Foreign partners and Local banks – DBN and Standard Bank of Namibia	To be reviewed after completion of this project
Fuel switching to reduce fuelwood consumption	Ongoing	USD 1.2 Billion	USD 0.6 billion already invested by government	Additional 0.6 billion USD to complete the programme
Replace 1M incandescent lamps with compact fluorescent lamps	Ongoing – 250,000 bulbs distributed	USD 1,200,000	NamPower and Government funds USD 300,000 as at end 2016	Updated cost at USD 140,000 annually over next 6 years to complete the programme
Expand the installation of solar systems	Planned	USD 40,000,000 to upscale the project	None	To be reassessed once project is completed
Photovoltaic water pumps	Ongoing	USD 200,000 for next 2 years to continue programme	Government funds USD 50,000 in the past years	USD 150,000 for years 3 and 4
Biogas Fish river small project from landfill and water treatment plants	Planned	Financial needs under preparation	None	To be reassessed once project is completed
Windhoek from Gammams water treatment plant	Planned	Financial needs under preparation	None	To be reassessed once project is completed
Kupferberg project electricity from landfill gas	Planned	Financial needs under preparation	None	To be reassessed once project is completed

Activity	Status	Support needed	Support received	Additional support needed
Erongo wind farm (220 kW)	Planned short term	Financial needs being worked out	None	To be reassessed once project is completed
Several 1 kW mini hydro for water pumping	Planned short term	Financial needs being worked out	None	To be reassessed once project is completed
44 MW windfarm in Luderitz	Planned short term	75.2 m USD	None	To be reassessed once project is completed
Revision of NDC under Paris agreement	Ongoing	Financial and technical support to revise INDC	USD 200,000 through UNDP and EUR 280,000 from German Ministry of Environment	To be reassessed once project is completed
Projects for (i) Improving rangeland and eco-system management practices of smallholder farmers (ii) Building resilience of communities living in landscape threatened under climate change through an Ecosystems-based Adaptation approach in Namibia (EBA Project)	Ongoing	Financial support for implementation of these adaptation projects	USD 10 M through EIF from GCF	To be reassessed once project is completed
The National Framework for Leapfrogging to Energy Efficient Appliance and Equipment in Namibia (Refrigerators and Distribution Transformers)	Ongoing	Financial support needed for setting up the regulatory framework of Minimum Energy Performance Standard (MEPS)	USD 328,755 from GCF	To be reassessed once project is completed

5.5 Technology Needs Assessment and Technology Transfer Needs

Mitigation of climate change rests on the adoption of the latest technologies and its smooth transfer that demands for appropriate and adequate human and technical capacities in addition to funds. Namibia has not been able to undertake a recent assessment of its technology needs and transfer for mitigating and adapting to climate change due to unavailability of resources. However, when preparing NCs, technology needs assessments have been conducted for measures identified when performing mitigation and adaptation assessments to consider the most recent and efficient technologies. It is recommendable that Namibia embarks on the mobilization of necessary resources to review and update its technology needs assessment. Such an update will be very useful to develop appropriate mitigation and adaptation plans. A list of the most urgent needs related to technology, soft and hard, assessment and transfer is given in Table 5.3.

Table 5.3 - Technology Needs Assessment and Technology Transfer needs

Activity	Status	Support needed	Support received	Additional support needed
In-depth Technology Needs Assessments for mitigation and adaptation	Planned	USD 500,000 over next 2 years	Small amounts of funds from GEF allocation for NC4	USD 500,000 for years 3 and 4
Barrier removal for RE technology transfer	Planned	USD 100,000 annually over next 5 years	None	Presently not available
Photovoltaic pumps	Ongoing	Funds to extend adoption over whole territory	None	Presently not available
Adoption of efficient cooking stoves to reduce fuelwood consumption	Ongoing	Funds to estimate potential and supply technology	None	Presently not available
Biomass conversion to electricity	Planned	Funds and technical capacity	None	Presently not available
Waste to energy	Planned	Funds and technical capacity	None	Presently not available
Wastewater treatment	Planned	Funds and technical capacity	None	Presently not available
Biogas production and conversion to electricity	Planned	Funds and technical capacity	None	Presently not available
Introduction of clean public and private transport technologies	Ongoing	Funds and technical knowhow	None	Presently not available
Traffic monitoring	Planned	Funds and technical knowhow	None	Presently not available

5.6 Progress and priorities for action

The major achievements from the BUR3 to the BUR4 are Consolidation of the GHGIMS to better track emissions and mitigation actions; Improved AD collection framework with HFCs and PFCs addressed and Enhanced capacity of Institutions and national experts for implementing the Convention.

Priority areas for improvement are: Further capacity building of national experts for meeting the ETF of the PA; Conduct surveys on use of SF6 and incineration of medical wastes to attain 100% completeness of the inventory; Access funds for generating land use land cover maps to refine land use changes and quality of the inventory; Develop and implement a QA/QC plan as per IPCC guidelines; Finalize archiving procedures; Develop NAMAs and include on the UNFCCC register; Update the technology needs assessment in line with the revised NDC; Shift from present reporting standards to the CRF format in line with Decision 18/CMA.1.

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), through the UNDP country office, the implementing agency, provided funds to the tune of USD 352,000 to support Namibia prepare its BUR4 for the fulfilment of its obligations under the UNFCCC. The government of the Republic of Namibia through its MEFT, Department of Environmental Affairs, Division of Multilateral Environmental Agreement (MEA) contributed USD 50,000 in kind to complement the funding required to complete the BUR4 project.

6.2 Technical

Capacity building has been a recurrent feature of the previous three BUR projects and during the preparation of the BUR4, this exercise continued under the EA funded by the GEF through training meetings and workshops delivered by international consultants on the subject. This partially filled up the capacity building needs to produce BURs. Another ongoing initiative is:

6.2.1 Development of a sustainable GHG inventory management system

Namibia benefited from support provided by the UNFCCC through an international consultant to improve the existing inventory management system towards increasing its operationalisation and sustainability. This project is still ongoing.

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

Climate Change is the most dangerous threat to humanity which is already heavily bearing its consequences. Namibia is preparing for the implementation of the voluntary components of its NDC which is presently being reviewed to raise the ambition as per the PA, to reduce emissions and increase sinks as laid out in the mitigation chapter of this report.

Namibia has not yet identified and worked on NAMAs extensively except for one project designed on rural electrification in the rural regions using renewable energy in off-grid systems. The project which is on the UNFCCC NAMA registry is looking for a sponsor to support implementation. Mini grids and Energy zones are the two areas of intervention identified for action in this NAMA.

Based on the results of the mitigation assessment presented in the NC4, Namibia aims at developing a mitigation plan in accordance with the updated national development strategies and plans, namely the National Development Plan (NDP5). The most promising and feasible measures will be identified, and NAMA projects developed on these for implementation. Key source categories, based on the latest national inventory rereport, will be prioritized. As it stands now, the objectives are to reduce emissions in the road transport, electricity production, residential, cement production, livestock, wood removals and solid waste sectors while increasing sinks in the forests and soils.

Namibia has been facing a severe problem of encroachment by invader bush in its rangeland, thereby reducing the carrying capacity and profitability of its livestock industry, a major economic engine of the country, practiced by commercial farmers as well as rural communities and indigenous people. In-depth studies have been conducted within the context of Namibia's mitigation strategy of increasing the share of renewable sources of energy, the invader bush showed a high promise for use in the generation of heat and electricity. This activity is in its infancy due to the major constraint of costs of exploitation.

Namibia cannot disregard adaptation to climate change as its consequences can be catastrophic to not only the economy but also to its citizens, especially the poorest and most vulnerable segments of the population as well as the environment and ecosystems which hosts unique biodiversity. Adaptation to climate change has been an unconditional part of the national development system as a means to build resilience. It can be anticipatory or reactive, private or public, autonomous or planned. Government has already acted in these directions with a preference for risk reduction and enhancement of resilience, constituting the medium to long term process, as opposed to the reactive approach. The vulnerability of the economy is clear in light of the regressing contribution to national GDP in two vital sectors. Agriculture, which was contributing more than 5% of national GDP in the past, saw its contribution regressing significantly to 4.5% in 2019. The Fisheries sector contribution to the gross domestic product (GDP) which stood at just below 5% in 2007, declined to around 3% in 2019. This in turn affected the manufacturing industries based on Agriculture and Fishing, threatening food security and the subsistence livelihood of the communities.

These two examples strongly highlight how prone and vulnerable Namibia is to climate change impacts and the prime importance of adaptation. It is thus crucial that Namibia be supported as well as other countries in similar situations to adapt in the short term and build resilience to climate change in the mid to longer term. Numerous adaptation approaches offer win-win situations with concurrent mitigation such as locking of carbon in soils through the adoption of sustainable practices. Provision of necessary

support for implementing adaptation will enable countries to maintain the welfare of the communities while contributing to address the root cause of global warming through stabilization of atmospheric levels not detrimental to ecosystems and socio-economic development.

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