



Republic of Kenya

Kenya

Second National Communication to the
United Nations Framework Convention
on Climate Change

Executive Summary



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GOVERNMENT OF KENYA

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FOREWORD

On behalf of the Government of Kenya, it is a privilege and a great honour for me to present Kenya's Second National Communication (SNC) to the Conference of Parties to the UNFCCC. This Communication represents the commitment of the Government of Kenya and its people to address global warming and climate change. At the heart of this Communication is our conviction that all countries must do their part to achieve steep reductions in greenhouse gas emissions and thereby strive to avoid the dangerous, and perhaps catastrophic impacts associated with climate change. With this report, Kenya takes an important step toward meeting our international obligations and ensuring that climate change is considered in our country's policies, activities, and investment plans.

Recognising the problems posed by climate change and the importance of taking the necessary action to mitigate climate change impacts, the Government of Kenya ratified the UNFCCC in 1994. Though Kenya is a minor emitter of greenhouse gases (GHG), the country is negatively impacted by climate change in nearly all its economic sectors, such as agriculture, tourism, transport, industry and forestry. As a developing country that is highly vulnerable to the impacts of climate change, Kenya believes that meeting the climate change challenge lies in sustainable development initiatives that promote strong, clean and climate-resilient economic growth. Adaptation is a necessity for Kenya; and strengthened institutional and human resources are needed to improve capacity to adapt to the impacts of climate change. Kenya has mitigation potential in several sectors like energy, transport, forestry and waste management. Lack of funding limits the exploitation of opportunities to address adaptation and mitigation.

This second national communication assesses Kenya's national circumstances and responses to climate change. This follows the First National Communication that was prepared and submitted to the UNFCCC in 2002. The SNC is the basis for future action in research and offers opportunities for policy development and refinement. The document serves as a useful tool upon which to base decisions concerning climate change and future national development. We look forward to building upon the plans discussed in this Communication in the spirit of global cooperation.

The report contains the greenhouse gas inventory for Kenya and examines potential measures to abate the increase of greenhouse gas emissions. The report also reviews the main findings on the likely impact of climate change and the vulnerability of various economic sectors in the country to these impacts. Finally, possible adaptation measures are presented in the report.

This national effort marks a significant milestone towards capacity building and institutional strengthening, as well as improving national climate information and understanding. However, we are aware and have identified in our Communication the constraints and gaps, and the related capacity building needs. Addressing these constraints will help to further improve future National Communications and enable continuous reporting on a consistent basis and in accordance with the applicable guidelines.

It is the responsibility of my Ministry of Environment, Natural Resources and Regional Development Authorities (MENRRDA) as the national climate change focal point to ensure the full implementation of the strategies and measures for curbing the adverse impacts of climate change and variability on all the sectors of the economy, and to promote sustainable economic growth and development. However, this requires collective efforts among all stakeholders in the public and private sector organisations, including non-governmental organisations (NGOs), civil society, the donor community, and local communities. The Government will provide the necessary support required for the successful implementation of the strategies and measures spelled out in this Second National Communication.

Despite the many challenges encountered during the preparation of this report, valuable experience was gained, national capacity on climate change issues was further developed and many lessons were learnt. A foundation has been laid for sustainability in preparing successive national communications.

On behalf of the Government of Kenya, I would like to express my sincere gratitude to the Global Environment Facility (GEF), and the United Nations Environment Programme (UNEP) as its implementing agency, for their support throughout the preparation of this SNC.

I congratulate all those who have contributed directly and indirectly towards this Communication.



Prof. Judi Wakhungu, CBS

Cabinet Secretary,

Ministry of Environment, Natural Resources and Regional Development Authorities

PREFACE

Kenya ratified the United Nations Framework Convention on Climate (UNFCCC) in 1994, and since then the country has been working towards the achievement of the objectives of the Convention. As a Party to the UNFCCC, Kenya is required to periodically report to the Convention through a National Communication that accounts for common but differentiated responsibilities and specific national and regional development priorities, objectives and circumstances.

Like all parties to the convention, Kenya is obligated to submit national communications as required by the UNFCCC. To fulfil this obligation, Kenya prepared its First National Communication (FNC) to the Conference of the Parties in 2002. This Second National Communication (SNC) is the second assessment of Kenya's situation with regard to national circumstances and responses to climate change. The SNC reflects relevant aspects of Kenya's Vision 2030 and a number of other national sector-specific policy documents. The communication provides an overview of climate change issues for key stakeholders at local, national, regional and international levels.

The Communication was prepared through a national effort and contributions of various stakeholders from government, civil society and the private sector in Kenya organised in three broad thematic working groups (TWG). The participatory process involved numerous institutions and stakeholders, with the TWGs overseeing the implementation of the work programme. The Communication was prepared in accordance with the provisions of the Articles 4.1 and 12.1 of the Convention and the guidelines contained in 17/CP.8 of the Conference of Parties (COP). Preparation of the SNC included numerous technical consultations as well as stakeholder consultations through national workshops. The Government views the process of preparing Kenya's SNC as an opportunity to enrich and enhance the country's capabilities in identifying constraints, gaps, and related financial, technical and capacity needs to adequately fulfil our obligations under the UNFCCC. As well, the process has helped to identify opportunities, as well as threats, that arise as a result of the changing climate.

The SNC builds on the National Climate Change Action Plan, 2013-2017 (NCCAP) and the draft National Adaptation Plan, among others. The updated and improved information brings out the projected high regional and sectoral variability and vulnerability in the country. A high standard of scientific rigour and data quality has been maintained throughout the process. The exercise was coordinated by the National Environment Management Authority (NEMA) on behalf of the Government of Kenya.

The structure of the Communication is based on the guidelines for preparation of national communications from Parties not included in Annex I to the Convention (Decision 17/CP.8). The SNC comprises, as required, information on national circumstances, greenhouse gas (GHG) inventory and measures to mitigate climate change, vulnerability and adaptation to climate change, and other information relevant to the achievement of the objective of the convention, including research, education and systematic observation specific to climate change.

The Communication highlights Kenya's efforts to address climate change. As well, it provides a solid foundation for further work on scientific and policy issues and clearly defines the climate change-related concerns within the national context and identified potential areas for further action.

The SNC notes that Kenya needs to strengthen the coordination, networks and information flows between ministries, different levels of government, civil society, academia and the private sector to have a more efficient integration of climate change variables into poverty reduction and development strategies. It aims to alert policy makers on the importance of mainstreaming climate change issues in policy and legal frameworks. The SNC will help to enhance the capacity of the scientific and research communities to formulate and implement mitigation and adaptation policies, options and actions. The report further highlights the need for awareness raising among stakeholders and decision-makers.

Chapter 1 of the SNC covers Kenya's national circumstances including its governance structures, geographic location, climate, economy, demography, natural resources and biodiversity.

Chapter 2 provides information on Kenya's greenhouse gas (GHG) inventory. The chapter reports greenhouse gas emissions and removals by sinks for the year 2000, as well as additional years between 1995 and 2010.

Chapter 3 provides an analysis of climate change scenarios and impacts, the vulnerabilities of the various regions to the predicted impacts and the proposed adaptation measures. This chapter borrows heavily from the work to develop the NCCAP and Adaptation Plan.

Chapter 4 provides information on climate change mitigation opportunities for Kenya in the various economic sectors. The chapter borrows heavily from the top-down methodology developed and applied in the mitigation analysis of the NCCAP, albeit with updated data.

Finally, Chapter 5 reports on any other information that Kenya considers relevant to the achievement of the objective of the Convention, looking at mainstreaming efforts, technology transfer, research and systematic observation and capacity building.

I express my gratitude to the officials and experts of NEMA, Ministry of Environment, Natural Resources and Regional Development Authorities, other related government departments, civil society organizations, members of the TWGs, the consulting team and individuals for their dedication and commitment in the preparation of the SNC through a participatory process, which included a series of workshops, seminars and meetings involving all key stakeholders.

Finally, I request all officials, experts and stakeholders to make their best efforts to utilise the information and knowledge of this document for our national, regional and global benefit.



Dr. Richard L. Lesiyampe, MBS
Principal Secretary,

Ministry of Environment, Natural Resources and Regional Development Authorities

ACKNOWLEDGEMENT

This SNC has been prepared in fulfilment of Kenya's reporting commitments under the UNFCCC's articles 12.1 and 4.1. The Communication was prepared through the collaborative effort of local and international resource persons. The National Environment Management Authority (NEMA), on behalf of the Ministry of Environment and Natural Resources and the Government of Kenya, acknowledges the assistance received from various institutions and individuals during the preparation and finalisation of Kenya's SNC for submission to the CoP of the UNFCCC.

The preparation of the SNC to the Conference of the Parties was funded by the Global Environment Facility (GEF) and implemented by the United Nations Environment Programme (UNEP), for which we are very grateful.

Special gratitude goes to the consulting team, led by ClimateCare, who worked tirelessly to guide the process and to prepare the SNC. Tom Owino of ClimateCare led the consulting team. Seton Stiebert carried out the GHG inventory work and updated the mitigation analysis. Jackie Nyaoro led the preparation of the chapters on Kenya's national circumstances and other issues related to the implementation of the Convention, while Deborah Murphy carried out the final review of the chapters.

Several NEMA staff members were involved in the preparation of the SNC. Special acknowledgement goes to Dr. Kennedy Ondimu for leading the project steering team, Morris Otieno and Dr. Anne Omambia for their efforts to ensure the process did not stall despite the many challenges encountered, as well as spearheading, managing and coordinating the preparation process. Further, The Late Anne Sirengo played a very significant role in coordinating this project before she met her untimely death on 21st June 2014. Special thanks go to Felix Mugambi for his layout and Computer Graphic Design (DTP).

Members of the Thematic Working Groups, various national institutions, government departments, academic institutions, private sector organisations, civil society organizations and development partners provided expertise and data for the preparation of the SNC. Their contributions are greatly appreciated. Special acknowledgement goes to the International Institute for Sustainable Development (IISD) and the Energy Research Centre of the Netherlands (ECN) for developing the methodology applied for the mitigation chapter of the SNC, and the Climate Change Secretariat at the Ministry of Environment and Natural Resources for leading the preparation of the draft National Adaptation Report which provided invaluable input for the vulnerabilities and adaptation section of this communication.

We gratefully acknowledge the Global Environment Facility (GEF), United Nations Environment Programme (UNEP) and all other contributors for their steadfast support and assistance.



Prof. Geoffrey Wahungu
Director General, National Environment Management Authority

Abbreviations:

ASALs	Arid and Semi-Arid Lands
ATAR	Adaptation Technical Analysis Report
CDKN	Climate Development Knowledge Network
CH ₄	Methane
CO	Carbon Monoxide
CO ₂	Carbon Dioxide
CoP	Conference of the Parties
DRSRS	Department of Resource Surveys and Remote Sensing
FNC	First National Communication
GCM	General Circulation Model
GEF	Global Environment Facility
GHG	Greenhouse Gas
GoK	Government of Kenya
HFCs	Fluorinated Hydrocarbons
ICPAC	IGAD Climate Prediction and Applications Centre
IGAD	Intergovernmental Authority for Development
IMTR	Institute for Meteorological Training and Research
IPCC	Inter-Governmental Panel on Climate Change
ITCZ	Inter Tropical Convergence Zone
IUCN	International Union for the Conservation of Nature
KMD	Kenya Meteorological Department
LECB	Low Emission Capacity Building
LULUCF	Land-Use, Land-Use-Change and Forestry
MDG	Millennium Development Goals
MENRDRA	Ministry of Environment, Natural Resources and Regional Development Authorities
N ₂ O	Nitrous Oxide
NAMAs	Nationally Appropriate Mitigation Actions
NAP	Draft National Adaptation Plan
NCCAP	National Climate Change Action Plan
NCCRS	National Climate Change Response Strategy
NCCS	National Climate Change Secretariat
NEMA	National Environment Management Authority
NMVOC	Non-Methane Volatile Organic Compounds
NO _x	Nitrogen Oxides
PHC	Primary Health Care
RCM	Regional Climate Model
SNC	Second National Communication
SO ₂	Sulphur Dioxide
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change

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Introduction

Climate Change is the most serious global challenge of our time. Kenya ratified the United Nations Framework Convention on Climate Change (UNFCCC) in 2005. As a Party to the Convention, Kenya has implemented initiatives to meet its obligations and commitments, including the development of its First National Communication (FNC) that was prepared in 2002 with support from the Global Environment Facility (GEF) through the United Nations Environment Programme (UNEP).

The FNC included preparation of a Greenhouse Gas (GHG) Inventory for the reference year 1994 in compliance with Articles 4 and 12 of the UNFCCC and in accordance with the Intergovernmental Panel on Climate Change (IPCC) Guidelines of 1996. While the FNC provided a good description of the country's circumstances and a basis for future studies on climate change, gaps in and paucity of data significantly constrained the quality of the GHG inventory work for the base year 1994. The FNC also reported the results of initial studies on the country's vulnerability to climate change.

Kenya's 2010 National Climate Change Response Strategy (NCCRS) recognised the impact of climate change on Kenya's development. The National Climate Change Action Plan (NCCAP) 2013-2017, launched in 2013, was a logical follow up to the NCCRS. Additionally, Kenya has prepared a draft National Adaptation Plan (NAP), which is expected to be finalized in 2015. Through the implementation of these plans, Kenya plans to reduce vulnerability to climate change and improve the country's ability to take advantage of the opportunities offered by climate change. Among other things, the NCCAP identifies priority mitigation and adaptation measures and provides information on how to integrate these options in national development plans. In addition, the NCCAP explores financial instruments and sources available, such as public and private sector funding, multilateral initiatives, carbon markets and other sources of funding.

Kenya's commitments as a Non-Annex I Party to the UNFCCC include the preparation of this Second National Communication (SNC). This SNC reports GHG emissions and removals by sinks for the year 2000, as well as additional years between 1995 and 2010, following IPCC guidelines. This Communication has borrowed heavily from prior work in the NCCAP and the draft NAP. While the mitigation report of this Communication has applied the top-down approach of the NCCAP, the data used have been updated.

This Communication was supported by the Global Environment Fund (GEF) through the United Nations Environment Programme (UNEP). The funds received allowed the improvement of the emissions inventory, and supported the Consultant's work in the preparation of the reports, and the stakeholder reviews and validation of the work that was necessary to deliver a good quality SNC. The National Communication process included individual and public consultations with representatives from government institutions, academia, the private sector and non-governmental organisations, in order to capture their opinions and ensure inclusiveness.

What Are Kenya's National Circumstances With Regard To Climate Change?

The Republic of Kenya is a unitary state with a multi-party devolved two tier government system consisting of a national government and 47 county governments. While the Government of Kenya (GoK) has the overall responsibility for ensuring that programmes are put in place to deliver its obligations under the UNFCCC, all the administrations under the national and county governments play a part in meeting these obligations.

Kenya has a total area of 582,646 km², consisting of 11,230 km² of water surface and 571,416 km² of land area. About 85 per cent of the land area is classified as Arid and Semi-Arid Lands (ASALs) with a fragile ecosystem and where land use is largely pastoral. The country is situated between 5°N and 5°S latitude and 38°E and 40°E longitude with varied landforms types that are divided into plains, escarpments, hills, and low and high mountains. It is bordered by landmass to the north, west and east with the Indian Ocean to the southeast.

Kenya is a lower middle-income country with an estimated national Gross Domestic Product (GDP) of US\$ 60.9 billion in 2014.

After years of stagnant economic growth in the 1980s and 1990s, the GDP growth peaked in 2007 at 7.1 per cent. Post-election violence in early 2008 compounded with drought, high global energy and food prices, among other challenges, reduced GDP growth to 1.5 per cent in 2008. The economy rebounded in 2010 with GDP showing growth rates of about 6 per cent, with a slight decline to 4.7 per cent in 2013. The natural resource sectors account for 42 per cent of GDP while the services sector contributes about half of the GDP. The industry sector contributes the remaining 10 per cent. Most of the sectors are highly sensitive to the consequences of climate change because of their dependence on the natural environment.

Kenya's population, having grown from 37.7 million in 2009 to 41.8 million in 2013, is projected to reach 46.7 in 2017. About 67.7 per cent of the country's population resides in the rural areas and relies predominantly on an ever-degrading environment and scarce natural resources for their livelihoods. However this situation is changing with an increase in rural-urban migration. The urban population increased from 5.4 million in 1999 to 12.2 million in 2009 and is projected to reach 17.64 million in 2017. Equally the country has a high population density that increased from 66.4 to 71.2 persons per km² between 2009 and 2012, and is projected to reach 80.3 persons per km² by 2017. The increase has led to a substantially increased pressure on land for settlement and support for livelihoods. Despite the government efforts to reverse the poverty situation, in 2012, 49.8 per cent of the total population was living below the poverty line (below 1 USD a day), with the level being higher in rural areas at 55.0 per cent than in urban areas estimated at 35.5 per cent. The poor continue to lack critical services such as access to quality healthcare, water supply and education. Economic gains have largely benefited the wealthiest quantile contributing to the country's social and economic gap (inequality) with great disparities between the rural and urban. The bulk of those living below poverty line are more vulnerable to climate change.

Kenya's climate varies considerably across the country. It is hot and humid at the coast, temperate inland, and very dry (of arid nature) in the north and northeast parts of the country. The climate is strongly influenced by the circulation system of Inter Tropical Convergence Zone (ITCZ) and its

geographic location. This has shaped the occupation of its land and partly contributes to its socioeconomic differences. The western, central and coastal regions, which are primarily rain fed, and comprised of productive agricultural land occupies less than 20 per cent of the country's land area and carries the majority (approximately 90 per cent) of the country's population. The ASALs, occupying 80 per cent of land area, are sparsely populated carrying the remaining 10 per cent of Kenya's population.¹

The natural resource base, mainly forests, wetlands, dry lands, and aquatic and marine resources are under stress due to a variety of forces such as population pressure, deforestation, coastal modification, ongoing degradation of the eco-systems, unsustainable use and poor governance of these resources. The stresses are beginning to threaten vulnerable habitats, biodiversity and even livelihoods and long-term food security for a large proportion of Kenyans.

Partly due to El Niño and La Niña episodes, Kenya is prone to cyclical prolonged droughts and serious floods, with climate change increasing the intensity and frequency of these events. These repeated patterns of droughts and floods have large negative impacts and high economic costs. The potential impacts of such events have been exacerbated by socio-economic trends as much as climate. A significant part of the damage from floods is attributed to the increase in population, urbanization, and value assets in flood-prone areas. Changes in the terrestrial system, such as deforestation and loss of natural floodplain protection, also contribute to economic losses.

Biodiversity: Kenya is endowed with an enormous diversity of wildlife and the country ranks second in Africa in terms of mammalian species diversity. Wildlife-based tourism contributes about 70 per cent of the gross tourism earnings, 25 per cent of GDP and 10 per cent of total formal employment. Wildlife-based tourism will be challenged by climate risks particularly changes in wildlife migration patterns and species diversity.

Forests: Kenya's national forest cover has varied from 7.9, 5.9 and 7 per cent in 1990, 2000 and 2010, respectively. The decreasing forest cover, between the years 1990 to 2000, was attributed to unsustainable utilization and conversion of forest land to other land uses.

Forests serve as safety nets, particularly for poor households. Forests provide important ecosystem services such as reducing soil erosion, climate regulation, natural pest control, preserving water availability and quality, food, wood fuel, fodder, pasture, medicines and an important wildlife habitat.

The sector is vulnerable to climate change, which is expected to have marked effects on composition, growth rates, and regenerative capacities with the associated implications on livelihoods and human development.

Water: Kenya was categorised as a water scarce country in 1992 with available water resources of 647m³ per capita, which was below the international acceptable threshold of 1,000m³. The country's water scarcity index has worsened with rapid population growth, and is expected to fall from approximately 586 m³ per capita in 2010 to as low as 293 m³ per capita by 2050. As a water-scarce country, Kenya is critically exposed to the adverse effects of climate change. This has serious implications for Vision 2030 flagship projects particularly in the tourism, agriculture and industry sectors which will require additional water.

Agriculture: The agricultural sector is the primary source of livelihoods for the majority of Kenyans and a backbone of the economy. The sector consistently contributes an average of 24 per cent to the

national GDP. Due to a scarcity of potential agricultural land, the sector has come under pressure from population increase leading to subdivision of land into small-scale rain-fed farms that are difficult to run sustainably. 75 per cent of the total agricultural output is produced on these small-scale farms rendering the sector highly vulnerable to extreme weather events and the changing climatic conditions of shifting rain patterns and drought. Climate change is adversely affecting the stability of the sector.

Energy: Energy is a key component for the Kenyan economy and its population's standard of living. The country's economic growth and better quality of life for its citizens require adequate and reliable supply of energy. Currently, there are constraints in energy supply, which include low access to modern energy services, high cost of energy, irregular supply and high cost of energy investments. Biomass (including wood fuel, charcoal, and agricultural waste), petroleum and electricity are the three main sources of energy in the country. About 87 per cent of the country's domestic energy demand is met by biomass particularly wood fuel, which provides 90 per cent and 85 per cent of rural and urban households' energy requirement, respectively. The need for wood has led to substantial deforestation and land degradation. Access to modern energy services is required to reduce the wood fuel dependency.

Hydropower, which constitutes over half of the total effective grid connected electricity, is highly vulnerable to variations in hydrology and climate. Poor rains result in hydroelectricity shortfalls, leading to more costly and GHG-intensive electricity generation through diesel. Geothermal accounts for 12.2 per cent of the electricity mix and the remaining 29.7 per cent is predominantly petroleum-based thermal generation. Kenya's National Energy Policy 2014, which has been formulated within the framework of Vision 2030, encourages diversification of electricity sources, including addition of geothermal (1,646MW), natural gas (1,050MW), wind (630MW) and coal (1,920MW). This new plan, despite potentially increasing GHG emissions from coal, aims to improve energy security and reduce the recent trend of oil thermal comprising the largest portion of new capacity.

Health: Kenya has made progress in health care especially in tackling communicable diseases such as HIV-AIDs, tuberculosis and malaria, and improving access to maternal health services. About 52 per cent of the country's population has access to basic health services within 5 km. Access to basic Primary Health Care (PHC) and referral services, however, still remains a significant challenge. Significant disparities in service availability exist between rural and urban areas and in hard to reach areas. Maternal deaths and child malnutrition remain major challenges in the country. Climate change has potential negative impacts on the sector. The GoK identified malaria, Rift Valley fever, malnutrition, water borne diseases (such as cholera), scabies, jiggers and lice infestations as some of the negative impacts likely to grow due to climate change.

Education: Education in the country has had a remarkable increase in access and participation rates. Primary education recorded the highest progress, while access rates at pre-primary, secondary and tertiary education remain low relative to sub-Saharan average of 7%. The GoK plans to address issues related to access, focusing on addressing low enrolment in areas below the national average, retaining students in school up to 18 years, providing education more effectively through a digital platform, and matching education and training with the demand for the skills required in the workplace.

Climate Change Indicators

There is increasing evidence that climate change is directly affecting the social, economic and environmental status of the country. The World Bank affirms that "poverty and vulnerability to climate change remain the most critical development challenges facing Kenya."

What Are Kenya's Greenhouse Gas (GHG) Emission Levels?

Kenya's GHG emissions and removals by sinks for the year 2000, as well as additional years between 1995 and 2010 have been reported in accordance with the recommendations of the IPCC.

In October 2002, Kenya submitted its first inventory with Kenya's FNC. The FNC inventory was prepared for the reference year 1994 in compliance with Articles 4 and 12 of the UNFCCC and in accordance with the IPCC Guidelines of 1996.

A description of the appropriate methodologies used and an analysis and interpretation of the data generated on anthropogenic greenhouse gas emissions and sinks, on a sector-by sector basis, for Kenya is provided in the SNC. The greenhouse gas Inventory was prepared on an individual sector basis for the Energy, Industrial Processes, Solvent and Product Use, Agriculture, Land Use, Land-Use Change and Forestry (LULUCF), and Waste Sectors. The greenhouse gases included are Carbon Dioxide (CO₂), Methane (CH₄), Nitrous Oxide (N₂O) and partially fluorinated hydrocarbons (HFCs) not covered under the Montreal Protocol. Indirect greenhouse gases including Non-Methane Volatile Organic Compounds (NMVOC), Carbon Monoxide (CO) Nitrogen Oxides (NO_x) and Sulphur Dioxide (SO₂) are also reported as they have an important influence on chemical reactions in the atmosphere.

The *IPCC Revised 1996 Guidelines for National Greenhouse Gas Inventories* (Volumes 1, 2 and 3) and the *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* were used as the basis to undertake the necessary calculations on GHG emissions and removals. The use of these IPCC Guidelines for all years fulfills the objective of the COP for the use of comparable methodologies. In accordance with the guidelines, CO₂ emissions from international bunkers and burning of biomass are not included in the national totals, but are reported separately as memo items in the inventory.

The calculation of emissions was assisted using UNFCCC's Non-Annex I National Greenhouse Gas Inventory Software (version 1.3.2). For purposes of verification and transparency, the inventory for Kenya includes the completed relevant IPCC Worksheets for all sectors, in addition to the Summary Report Sheets, used to prepare the Inventory Report (provided as appendices to this report). Complete documentation of methods, activity data and emission factors along with references of all data sources are provided in individual sector reports. This level of documentation greatly assists in the transparency of the inventory and will aid in the preparation of future inventories.

While reporting the GHG inventory, care has been taken to include consideration of the methodology used, the quality assurance/ quality control (QA/QC) measures applied, the results of the key source analysis and Tier 1 quantification of uncertainties associated with the estimates.

In 2000, Kenya's total GHG emissions were 54,955 Gg CO₂ equivalent (approximately 55 million tons of CO₂ eq.) coming from all the UNFCCC sectors apart from solvents and other product use sector, which had no GHG emissions (See Table 1 below which shows the national emissions by sector and type of greenhouse gas for the year 2000).

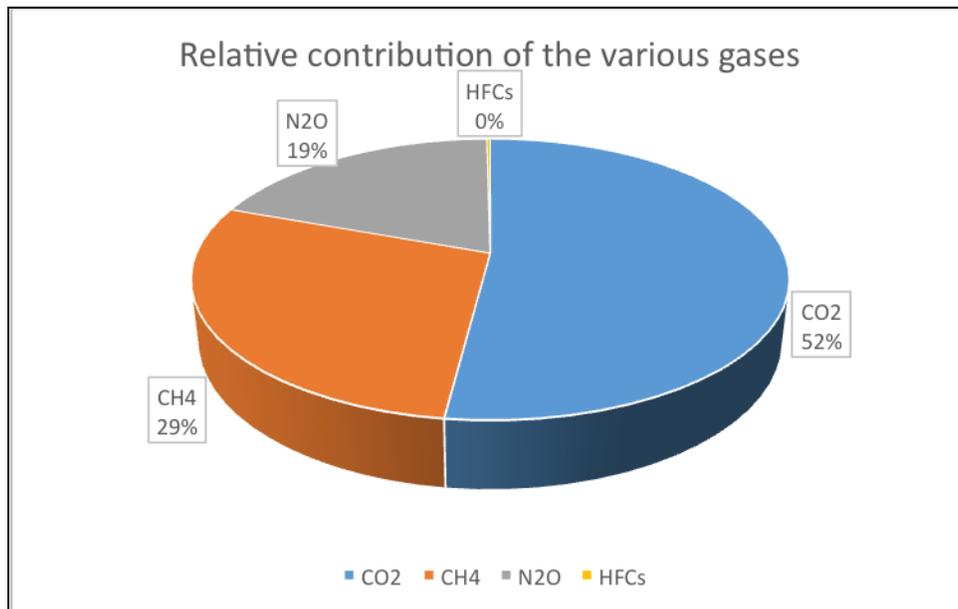
Table 1: Emission Patterns by Sector and GHG Type

No.	Sector	2000 Emissions (CO ₂ e - Gg)				TOTAL	TOTAL as %
		CO ₂	CH ₄	N ₂ O	HFCs		
1	ENERGY SECTOR	7,227	1,932	601		9,760	17.76
2	INDUSTRIAL PROCESS SECTOR	694			118	812	1.48
3	SOLVENT AND OTHER PRODUCT USE					-	-
4	AGRICULTURE SECTOR	-	13,041	9,498		22,539	41.01
5	LAND USE, LAND-USE CHANGE AND FORESTRY	20,571	57	9		20,637	37.55
6	WASTE	7	697	502		1,205	2.19
	TOTAL	28,499	15,726	10,611	118	54,955	100

The LULUCF sector was a net emitter in 2000, contributing approximately 20,000 Gg CO₂ equivalent (or approximately 20 million tons of CO₂ equivalent) or about 38 per cent of the total emissions.

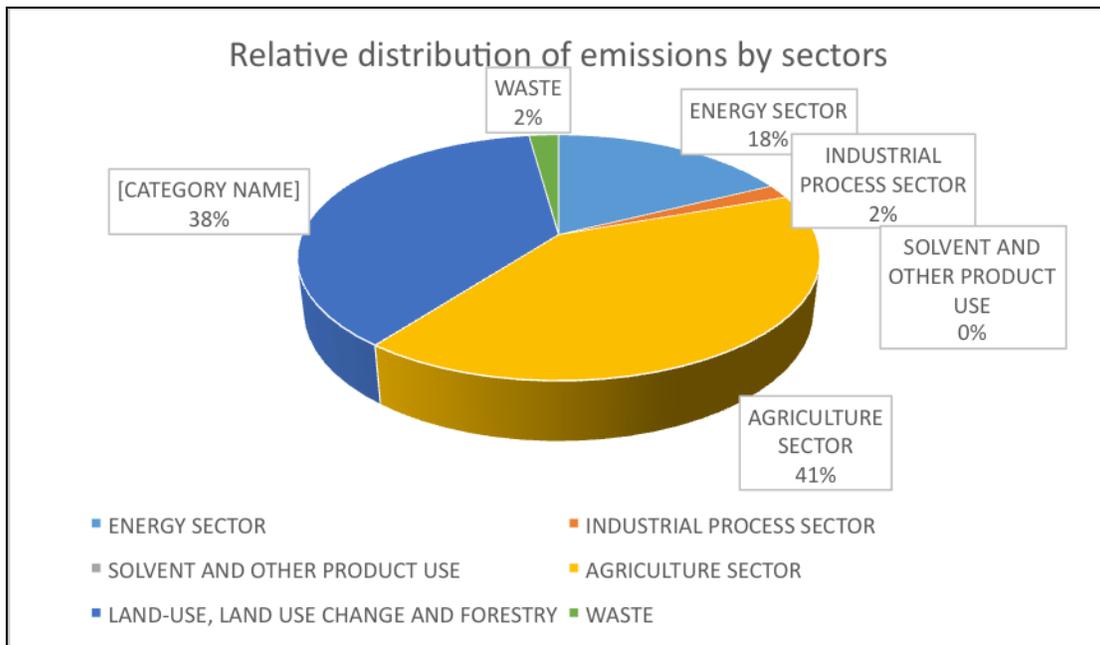
The total amount of CO₂, CH₄, N₂O and HFCs emitted were 28,499 Gg, 15,726 Gg, 10,611 Gg and 118 Gg respectively, totalling to 54,955 Gg CO₂ equivalent. Figure 1 below shows the relative contribution of the various gases to the total national GHG emissions for Kenya. The largest contributing to GHG was carbon dioxide followed by methane.

Figure 1: Relative contribution of the various gases in 2000



Sectorally, the largest contributor to the national GHG emissions in 2000 was Agriculture, followed by LULUCF and Energy (See Figure 2 below).

Figure 2: Relative distribution of emissions by sectors in 2000



The relative emissions of CO₂ from LULUCF to the total GHG emissions excluding LULUCF was by far the largest in 2000. CO₂ was 99 per cent of the total emissions from the LULUCF sector. Emissions of CH₄ and N₂O originated mainly from the agriculture sector – 82 per cent of total CH₄ and 89 per cent of the total N₂O emitted in 2000 were from the agriculture sector. The synthetic gases (HFCs) were entirely emitted from the industrial processes.

How Is Kenya Vulnerable To Climate Change And What Are The Country's Adaptation Options?

Although Kenya has little historical or current responsibility for global climate change, and emissions are insignificant relative to the global emissions, the country is highly vulnerable to its impacts.

Kenya, being a developing country with a majority of the population dependent on climate-sensitive sectors, has low adaptive capacity to withstand the adverse impacts of climate change. The situation is further aggravated by poor infrastructure, weak institutional mechanisms, and lack of financial resources. Therefore, adaptation to climate change is a priority of the country.

In this SNC, the chapter on Assessment of Vulnerabilities and Adaptation to Climate Change in Kenya, assesses past climate trends, possible future climate scenarios in the country, the risks and vulnerabilities associated with the trends. Adaptation actions are then proposed.

The chapter draws on existing assessments and research through desk research, supplemented with expert interviews. The chapter draws extensively from prior work including the NCCRS, NCCAP, ATAR and Draft NAP, and includes updated research where available.

Climate Change Scenarios

In Kenya, the observed temperature trends indicate an increase in the mean annual temperature by approximately 1°C since 1960. The average number of hot days per year has increased by approximately 15.6 per cent between 1960 and 2003, with the rate of increase being highest in March to May. The average number of hot nights per year has increased by approximately 31 per cent for the same period, with the rate of increase being highest from September to November. The average number of cold days and nights has decreased by 4.4 per cent and 11.5 per cent, respectively. The rate of decrease of cold days is highest in September to November while the rate of decrease of cold nights is highest from December to February.

Observations of rainfall for Kenya as a whole do not show statistically significant trends linked to climate change. Observed climate trends show that on average, northern parts of the country have become wetter, while southern Kenya has become drier. This is largely due to variations in the 'short rains' that fall from October to December, although this is subject to considerable uncertainty.

Based on climate model output, Kenya may see a general trend towards warmer, wetter conditions in the coming decades.

It is projected that mean annual temperature may increase by between 0.8 and 1.5°C by the 2030s and 1.6°C to 2.7°C by the 2060s. The frequency of hot days is projected to increase by 19-45 per cent, and the frequency of hot nights by 45-75 per cent by the 2060s. Projections suggest a decrease in the number of days and nights that are considered 'cold' in the current climate. Cold days and nights are expected to become very rare.

General Circulation Models (GCMs) suggest that there may be increases in average annual rainfall in Kenya by the 2060s. However there is considerable model disagreement with a range of projections varying from a 5 per cent decrease to a 17 per cent increase by the 2030s and no change to a 26 per cent increase by 2060s. The increase in total rainfall is projected to be largest from October to December.

For Kenya, Regional Climate Models (RCMs) suggest that during the 'long rains', Kenya could experience a significant increase in rainfall with the largest increase occurring over the highland districts and the coastal region. During the 'short rains' an increase in rainfall could predominantly affect the region to the west of the Rift Valley. The rest of the country could experience slightly decreased rainfall in isolated pockets. This is in contrast to the GCM average results, which suggest wetter conditions during the 'short rains'. The northeast of the country is projected by the RCM to become significantly drier on an annual basis. This is in contrast to the GCM projections that suggest that the north of the country may become wetter, but is in line with observed rainfall trends since 1960.

Table 2 below provides a summary of the climate change projections in Kenya relative to the baseline period 1961 to 1990.

Table 2: Summary of GCM and RCM based climate change projections in Kenya (relative to a 1961-1990 baseline and based on the mid-range A1B emissions scenario unless otherwise stated).

Climate Variable	2030s	2050s and beyond
Temperature	<p>No GCM simulations suggest temperatures in the future will be cooler than present.</p> <p>Mean annual temperatures are projected to increase by between 0.8 - 1.5°C across the country by the 2030s.</p> <p>Droughts are projected to become more extreme over the coming decades.</p>	<p>Mean annual temperature may increase by between 1.6 to 2.7°C by the 2060s.</p> <p>There is good GCM agreement that temperatures may increase by 3°C by 2100.</p> <p>Droughts are considered likely to occur with similar frequency to the present but with increased severity. This is linked to increases in temperature affecting evaporation rates rather than reduced precipitation.</p> <p>GCM projections indicate that hot days could occur on 19-45% of days by the 2060s.</p> <p>Under emissions scenarios A2 and A1B, GCM projections suggest that there will be no cold days or nights by the 2090s.</p>
Precipitation	<p>Rainfall seasonality is projected to remain the same.</p> <p>There is considerable GCM disagreement over the extent of mean annual rainfall change. Projections range from a 5% decrease to a 17% increase by the 2030s.</p> <p>Almost all the GCM simulations show wetter conditions in October to December.</p> <p>The RegCM3 regional model predicts that increased rainfall in northern Kenya could be restricted to areas west of the Rift Valley.</p>	<p>Rainfall seasonality is considered likely to remain the same.</p> <p>There is considerable disagreement between GCMs over the extent of mean annual rainfall change, ranging between no change to a 26% increase by 2050s.</p> <p>The RegCM3 regional model indicates there may be greater rainfall in the west of the country (A2 emissions scenario, 2090s).</p> <p>Rainfall events in the short and long rainy seasons are considered likely to become more extreme (A2 emissions scenario, 2090s).</p>

Source: NCCAP (2013-2017); GoK and ATAR

Climate Change Impacts and Vulnerability

Kenya is extremely susceptible to climate-related effects and extreme weather events pose serious threats to the socio-economic development of the country. The key drivers of the economy are primarily natural resource based and are climate sensitive. The cumulative impacts of climate change over the next two to three decades have the potential to reverse much of the progress made towards the attainment of the Millennium Development Goals (MDGs) and Vision 2030. The costs of climate change impacts, especially droughts and floods, could be equivalent to 2.6 per cent of Kenya's annual GDP by 2030, with devastating consequences on the environment, society and the wider economy.

While floods are generally associated with higher damage to public infrastructure assets, the burden of drought falls more heavily on people, communities and the private sector.

The climate change impacts and risks to Kenya's economy for particular sectors are summarized below.

Water Resources: This is already affected by inter- and intra-annual rainfall variability, including the extremes of flooding and drought. Climate change may further reduce the availability of water resources through altered rainfall patterns, higher evaporation, lower lake levels, accelerated loss of glaciers and rising sea level.

Food Security: The agriculture, livestock and fisheries sector is key for Kenya in terms of employment, food security, livelihoods and economic development. Climate change has the potential to significantly affect agriculture-based livelihoods by challenging the sustainability of current arable, pastoral and fishing practices.

Coastal Zones: Increases in sea surface temperature, sea level rise and coastal erosion are likely to put additional pressure on coastal ecosystems, including islands, estuaries, beaches, coral reefs and marine biodiversity. Coral reef ecosystems are particularly vulnerable to climate change impacts, with associated consequences for the livelihoods of millions of people depending on those ecosystems for food, income and shoreline protection. In coastal locations, ports and transport infrastructure is particularly exposed due to flooding, together with tourism assets and settlements situated close to the coast.

Human Health: Climate change is expected to put human health at risk by exacerbating the magnitude and occurrence of existing impacts, such as heat stress, air pollution, asthma, vector-borne diseases (such as malaria, dengue, schistosomiasis – also referred to as swimmer's itch or snail fever – and tick-borne diseases), water-borne and food-borne diseases (such as diarrhoeal diseases).

Forestry and Wildlife: Anticipated impacts of climate change on biodiversity include shifting of ecosystem boundaries, change in natural habitats and sharp increases in extinction rates for some species.

Urban and Housing: Climate change is likely to make rural livelihood strategies and living conditions increasingly challenging and as a result is likely to exaggerate the current rural-to-urban migration trend. Specific risks and challenges for communities, especially those living in urban environments and particularly the most vulnerable, include river and flash flooding, with flood-related fatalities constituting 60 per cent of disaster victims in Kenya. Extreme events also have indirect impacts through water scarcity and quality issues and food insecurity.

Arid and Semi-Arid Lands: Over the past few decades, transformations in the ASALs have impacted the livelihoods of the pastoralists. The migration of rural communities from the congested high-potential areas and the dry arid areas to cities has contributed to overpopulated slums and settlements that lack basic services. Implications for women included the additional burden of sustaining household food,

water and human security. School attendance rates for children has decreased, child labour increased and conflicts over resources have intensified in such situations.

Tourism: Climate variability and climate change, partnered with broader environmental degradation, has the potential to significantly affect the tourism sector, including wildlife tourism. With its close connections to the environment and climate itself, tourism is considered to be a highly climate-sensitive industry.

Manufacturing, Transport and Trade: Impacts to critical supporting infrastructure, such as energy, water, communications and transport, have the potential to reverberate into the private sector, with consequences for business continuity, revenue, workforce and associated supply chains. Climate-induced changes affecting productivity and crop diversity, in the tea, coffee and horticulture sectors, have implications for exports and imports.

Infrastructure (for Energy and Transport): Climate change has the potential to compromise infrastructure design, function and performance across a range of settings. In coastal locations, ports and transport infrastructure is particularly exposed. Riverine flooding and landslides have the potential to cause significant damage to physical infrastructure such as roads, bridges, water pipelines and power lines.

Adaptation

In response to the climate change threat, Kenya has been developing an Adaptation Plan. The development of the draft National Adaptation Plan (NAP) included the development of criteria used to identify priority actions under each Medium Term Plan theme. The criteria were weighted to ensure actions addressing existing vulnerabilities scored highly, while also giving emphasis to preparing for continuing climatic change, impacts and risks. Projected changes will be, addressed through, for example, no and low regrets measures, and incorporation of climate knowledge into decisions regarding long-lived fixed assets, and where a long lead-in decision timeline is required.

The draft NAP recommends the development of an adaptation monitoring and evaluation (M&E) system. This system will help to ensure that the benefits of interventions aimed at building adaptive capacities and enhancing resilience are being realised. A feedback mechanism will ensure that learning is used to improve the adaptation planning in GoK sector plans and programmes.

The Adaptation section of this SNC includes information setting out priority adaptation actions identified and elaborated in the NAP. The priority adaptation actions are listed below in Table 3. These priorities are based on risk and vulnerability assessments across the MTP II sectors, and build on NCCAP priority actions in a wide range of sectors. For details, reference is made to the NCCAP and the ATAR.

Table 3: Adaptation priorities identified and elaborated in the NAP

MTP SECTOR	PRIORITY ADAPTATION ACTIONS
1. Energy	Increase the resilience of current and future energy systems*
2. Science, Technology and innovations	Support innovation and development of appropriate technologies that promote climate resilient development*
3. Public sector reforms	Integrate climate change adaptation into the public sector reforms
4. Human Resource Development, Labour and Employment	Enhance adaptive capacity and resilience of the informal private sector
5. Infrastructure	Climate proofing of infrastructure (energy, roads, buildings, ICT)*
6. Land Reforms	Mainstream climate change adaptation in land reforms*
7. Education and training	Enhance awareness, education and training in climate change adaptation across public and private sectors
8. Health	Strengthen integration of climate change adaptation into the health sector*
9. Environment	Enhance climate information services
	Enhance the resilience of ecosystems to climate variability and change*
10. Water and irrigation	Mainstream of climate change adaptation in the water sector by implementing the National Water Master Plan (2014)*
11. Population, urbanisation and housing	Enhance the adaptive capacity of the population, urbanisation and housing sector*
12. Gender, Vulnerable Groups and Youth	Strengthen the adaptive capacity of vulnerable groups (lactating women, children under 5, elderly, sick, physically challenged) through social safety nets and insurance schemes
13. Tourism	Enhance the resilience of the tourism value chain
14. Agriculture, livestock development and fisheries	Enhance the resilience of the agriculture, livestock and fisheries value chains by promoting climate smart agriculture and livestock development*
15. Private Sector/ Trade; Manufacturing; Business Process Outsourcing, Financial services	Create enabling environment for the resilience of private sector investment, demonstrate an operational business case*
16. Oil and mineral resources	Integrate climate change adaptation into the extractive sector, including climate proofing of infrastructure*
17. Devolution	Mainstream climate change adaptation into county integrated development plans

* Denotes adaptation actions that have mitigation co-benefits.

What Are Kenya's Options For Reducing GHG Emissions

Although developing countries are not required to take on emission reduction commitments, Kenya views climate change mitigation as a means to sustainable development. Low-carbon analysis facilitates the implementation of mitigation projects, strengthening of institutional and human capacity-building and the prioritisation and evaluation of social, economic and environmental programmes.

In the SNC, the chapter on mitigation of GHG emissions describes the low-carbon assessment undertaken in the six mitigation sectors: energy, transport, industry, agriculture, forestry and waste management. Detailed scenario analysis of the sectors was carried out during the NCCAP process in 2012. Therefore, this report does not undertake new low-carbon development scenarios, but improves the NCCAP analysis by applying updated data.

Methodology for Mitigation Assessment

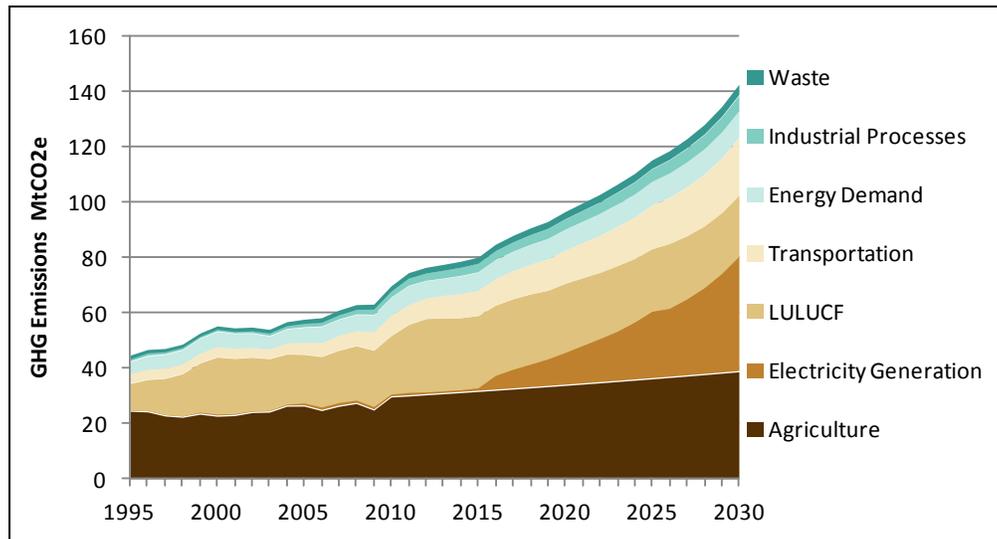
The last official GHG emissions inventory for Kenya was completed for the year 1994 and used in the FNC in 2002. The mitigation analysis for the SNC therefore started with the development of an inventory of historical greenhouse gas emissions for 2000 to 2010. Emissions were then projected out to 2030 to form the reference case. Table XX shows the GHG emission trends (1995 to 2030) by sector, which are further illustrated graphically in Figure 3 below, emissions to increase from 44 million tonnes of carbon dioxide equivalent (MtCO₂e) in 1995 to 142 million MtCO₂e in 2030. This reference case forms the baseline against which abatement potential is estimated for the six mitigation sectors.

Projections of the baseline emissions to 2030 for each sector, illustrated in Figure 4 below, are used as the baseline case against which it is possible to demonstrate the expected abatement potential in each of the six major mitigation sectors (with energy examined from two perspectives: electricity supply and energy demand). In the reference case, emissions increase up until 2030 in all sectors except LULUCF.

Table 4: National GHG Emission Trends by Sector (1995 to 2030)

Sector	Baseline Emissions (MtCO ₂ e)							
	1995	2000	2005	2010	2015	2020	2025	2030
Agriculture	24	23	26	30	32	34	36	39
Electricity Generation	0	1	1	1	1	12	24	42
LULUCF	10	21	18	21	26	25	23	22
Transportation	4	4	4	7	9	12	16	21
Energy Demand	4	5	5	6	7	8	9	10
Industrial Processes	1	1	1	2	3	4	5	6
Waste	1	1	2	2	2	3	3	4
TOTAL	44	55	57	70	80	96	115	142

Figure 4: Emission Baseline Projection for Kenya (MtCO₂e)



The analysis of low-carbon development opportunities looked at mitigation potential, costs and sustainable development benefits. The analysis concluded with the identification of priority actions that can enable low-carbon development.

The low-carbon (mitigation) options were then assessed and those options that offered the greatest opportunity for emissions reductions, aligned with Government of Kenya priorities, and offered significant sustainable development benefits were prioritized. The mitigation options in each sector were analysed in detail to create a wedge analysis, which demonstrated how these low-carbon options could help to bend down emissions.

The technical mitigation reports of the NCCAP, and their updates during the SNC process, provide full details of a range of mitigation actions. The choice of actions has not been affected by the updated data; however, the mitigation potentials of the actions have been adjusted by applying updated data to the model. The identified big wins are expected to have a significant impact on sustainable socio-economic development, adaptation and mitigation in Kenya. They include:

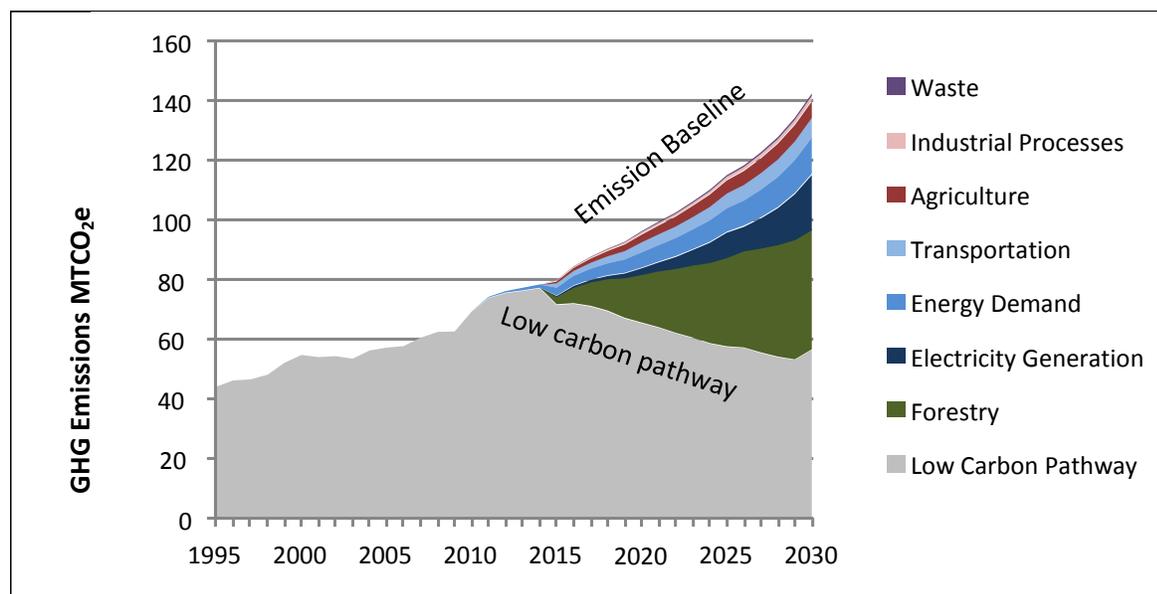
- Restoration of forests on degraded lands and reforestation of degraded forests
- Geothermal power generation
- Climate smart agriculture and agroforestry
- Improved cookstoves
- Mass rapid transit system in Nairobi, including bus rapid transit with light rail transit corridors

These 'big win' opportunities capture over two-thirds of the mitigation potential out to 2030.

Mitigation Scenarios

Figure 5, indicates the composite mitigation abatement potential of the low-carbon development opportunities in six sectors. The biggest mitigation potential by 2030 is in the forestry sector followed by electricity generation.

Figure 5: Composite abatement potential for all sectors for Kenya (technical potential) in MtCO₂e



Energy: The analysis of six low carbon development options for electricity supply indicated that geothermal power has by far the largest abatement potential (14 MtCO₂e per year) in 2030, with other technologies varying between 0.5 and 1.4 MtCO₂e. Geothermal power can provide low-cost base load generation, facilitate economic activity and development, as well as reduce the current reliance on hydropower thereby improving climate resilience.

In regard to energy demand, direct fuel combustion of biomass from wood sources, such as fuelwood and charcoal, is the dominant fuel source in Kenya (for domestic usage) accounting for almost 70 per cent of primary, non-electricity, non-transport energy demand. Eight low carbon development options were analysed in the energy demand sector. Improved cookstoves that reduce the volume of biomass required for cooking have the largest potential for GHG emission reductions, 5.22 MtCO₂e a year in 2030. Replacing kerosene lamps with renewable lighting technologies, using liquefied petroleum gas (LPG) instead of fuelwood for cooking, and cogeneration of heat and power in agriculture were also found to have significant abatement potentials of over 1.64 MtCO₂e a year in 2030.

Transport: Seven low carbon development options were analysed for the transport sector. The option with the largest mitigation potential is the development of an extensive mass transit system for greater Nairobi in the form of bus rapid transit (BRT) corridors, complemented by light rail transit (LRT) in high thoroughfare corridors. This public transport system has an abatement potential of approximately 2.8 MtCO₂e a year by 2030. The second largest mitigation potential is the introduction of biodiesel, with a 10 per cent blend requirement having a potential of approximately 1.2 MtCO₂e a year in 2030. The abatement potentials for the other low-carbon development options vary between 0.5 and 0.8 MtCO₂e a year in 2030.

Industrial Processes: 95 per cent of industrial process emissions in Kenya are created by two industries: cement manufacturing (1.9 MtCO₂e in 2010) and charcoal manufacturing (0.8 MtCO₂e in 2010). Process emissions from cement manufacturing can be reduced by replacing clinker in the cement mix with alternative materials. The most significant low carbon development opportunity is the introduction of

more efficient kilns for charcoal production, with an abatement potential of 1.56 MtCO₂e per year in 2030. Sustainable development benefits include reduced fuelwood demand leading to lower levels of deforestation and increased productivity.

Agriculture: Agricultural emissions (the largest source of GHG emissions in Kenya) are likely to increase from 30 MtCO₂e in 2010 to 35 MtCO₂e in 2030, largely driven by livestock methane emissions and land use change.

Agricultural low carbon development options have the potential to abate in the order of 5.54 MtCO₂e per year in 2030. The most significant reduction can be achieved through agroforestry, which has an abatement potential of 4.16 MtCO₂e per year in 2030. Other low carbon development options include conservation tillage and limiting the use of fire in range and cropland management, with abatement potentials of over 1.09 and 0.29 MtCO₂e per year in 2030, respectively.

Forestry and Other Land Use: Forestry and other land use related emissions accounted for 21.1 MtCO₂e in 2010, or about 32 per cent of national emissions. Emissions primarily originate from deforestation, where forests are cleared for fuelwood and charcoal production or to create agricultural land. Emissions are expected to increase to 26 MtCO₂e in 2015 and then decline to 22 MtCO₂e by 2030.

The most significant abatement potential can be achieved through restoration of forests on degraded lands. Abatement potential of 32.56 MtCO₂e per year by 2030 is likely through conservation and sustainable forest management interventions. Restoration of degraded forests has an abatement potential of 6.06 MtCO₂e per year by 2030, and reducing deforestation and forest degradation potentially can abate 1.57 MtCO₂e per year by 2030.

Waste: Landfills and sewage treatment plants generate GHG emissions through the production of methane. Waste-related GHG emissions are expected to increase from 2 MtCO₂e per year in 2010 to 4 MtCO₂e in 2030.

Landfill gas methane capture, with an abatement potential of 0.78 MtCO₂e in 2030, is the main low carbon development opportunity.

Other Information

This chapter of the SNC provides other information considered relevant for the implementation of the UNFCCC in Kenya.

The following are discussed in the chapter:

- Steps taken to integrate climate change into the relevant social, economic and environmental policies
- Key policies containing measures to mainstream climate change
- Technology Transfer
- Research and Systematic Observation
- Education Training and Awareness
- Capacity Building
- Constraints, Gaps and Related Financial, Technical and Capacity Needs in Implementation of the Convention.

What Additional Steps Is Kenya Taking To Integrate Climate Change Into Relevant Policies?

The Government of Kenya, recognising the growing threat that climate change poses for its near- and long-term development agenda, has improved its capacity to mitigate and adapt to the impacts of climate change. A policy and institutional framework to guide the country toward a low carbon climate resilient development pathway is under development. Kenya's governance structure has been informed by the global and regional commitments and obligations, such as UNFCCC (1992), Africa's African Climate Change Strategy (2011) and East Africa's Climate Change Policy, Strategy and Master Plan (2011).

The first national policy document on climate change, the National Climate Change Response Strategy (NCCRS), has improved understanding of the issue and has guided policy decisions since its launch in 2010. To operationalize the NCCRS, Kenya has prepared the National Climate Change Action Plan 2013-2017 (NCCAP).

The NCCAP views climate change as a crosscutting issue to be mainstreamed in national planning and development processes, and in policy decisions across all sectors of the economy. The NCCAP sets out priority adaptation and mitigation actions that will help Kenya move toward a low carbon climate resilient development pathway. Effective implementation will be supported through the establishment of an enabling governance structure including a climate change policy and law, a funding mechanism and investment framework, a capacity development and management framework, and a national performance and benefit measurement system.

The Government of Kenya has moved to implement a number of actions in the NCCAP, including improved drought management and promotion of renewable energy. The Ministry of Planning and Devolution (MOPD) has included indicators to track progress in mainstreaming climate change in its Second Handbook of National Reporting, which helps the government monitor progress toward the goals of the Second Medium Term Plan of Vision 2030.

A Climate Change Bill is expected to be enacted into law in 2015. This Bill includes establishment of a National Climate Change Council that has responsibility for coordination of climate change actions, including mainstreaming climate change in national and county budgets, plans and programs. A draft Climate Change Framework Policy and a National Policy on Climate Finance are expected to provide guidance on mainstreaming to national departments and country governments.

Key policies containing measures to mainstream climate change

Other relevant national policies and legislation that contain measures that enable mainstreaming of climate change are included in Table 5 below.

Table 5: Key National Policies and Initiatives

Policies	Measures to mainstream climate change
Constitution of Kenya (2010)	A clean and health environment (Articles 42, 69 and 70) is a fundamental right under the Bill of Rights. The Constitution establishes the right to food security while emphasizing sustainable and productive management of land and natural resources, such as a goal of tree cover of 10 per cent of the country's land area.
Vision 2030 (2008)	Encapsulates flagship programmes and projects with aspects of adaptation and mitigation.
National Policy for the Sustainable Development of Northern Kenya and other Arid Lands (2011)	Focuses on climate resilience requiring government to find solutions to address climate challenges and to come up with measures to manage drought and strengthen livelihoods.
National Disaster Management Policy, 2012	Aims to increase and sustain resilience of vulnerable communities to hazards.
Environmental Management and Coordination Act (1999)	Provides the framework for the management of the environment.
Kenya Forestry Master Plan (1995-2020)	Recognises the environmental role of forests including water values, biodiversity values, climate change values through carbon sequestration and other environmental services.
Water Act (2002)	Provides the overall governance of the sector, and recognises the climate change implications on health, sanitation and water.
Agricultural Sector Development Strategy (2010-2020)	Provides framework for transforming agriculture into a modern and commercially viable sector. Notes that addressing food security will require addressing the challenge of over-dependence on rain fed agriculture.
Energy Policy and Act (2004)	Encourages implementation of indigenous renewable energy sources to enhance the country's electricity supply capacity. The policy is implemented through the Energy Act of 2006, which provides for mitigation of climate change, through energy efficiency and promotion of renewable energy.
Integrated National Transport Policy (2010)	Provides for transport solutions that have relevance to climate change mitigation

Technology Transfer

Kenya's climate change technology needs are diverse and their deployment requires a range of activities. Kenya has undertaken two Technology Needs Assessments (TNAs), in 2005 and 2013. The latter prioritised Environmental Sustainable Technology (EST) needs for mitigation and adaptation and developed their technology action plans (TAPs). The TNAs determined that priority technologies have high socio-economic or sustainable development benefits, and target the energy, waste, agriculture and water sectors in rural communities. The key technologies are: solar home systems, solar dryers, bio-digesters, drought resistant sorghum, roof-surface water harvesting and drip irrigation.

The priority technologies have been deployed Kenya, but widespread diffusion has been limited by such barriers as:

- High cost of purchase, installation and maintenance
- Weak policies and lack of standards
- Limited information and awareness.

Successful diffusion requires robust outreach and awareness raising through training and knowledge transfer systems.

Research and Systematic Observation

Various institutions in Kenya undertake systematic observation and coordinate climate and climate change-related research activities and programmes in the country. The Kenya Meteorology Department (KMD), working closely with Africa's IGAD Climate Prediction and Applications Centre (ICPAC) and the Institute for Meteorological Training and Research (IMTR), has the overall mandate to carry out climate

and climate change-related research. The country hosts a number of observational stations and an extensive communication network covering a Regional Telecommunications Hub (RTH) that collects observational data originating from its own and associated National Meteorological Centres (NMCs) and relaying such data directly to the global Main Telecommunication Network (MTN). Despite Kenya's extensive observational network, a lean meteorological budget has not only limited the effective coverage of the country but has also impacted negatively on its quality. Climate monitoring networks in the ASALs – an area with high need - are extremely limited. Funding is required to establish an adequate observational infrastructure.

Education, Training and Public Awareness

Climate change issues receive minimal consideration in Kenya's formal education system. The level of awareness of climate change issues and impact is low across the country. The NCCAP recommends increasing awareness and mainstreaming of climate change issues in education curriculum, but action in this area has not progressed. In addition, high quality scientific research is needed to update available knowledge and build confidence in mainstreaming climate change information in decision making. The MENRRDA is in the process of developing a Climate Information Centre, which is expected to begin to fill information gaps when operational.

Capacity Building

Numerous capacity building initiatives in climate change have been undertaken in Kenya, including through the GEF and the UNDP Low Emission Capacity Building programme. The areas of focus include institutional strengthening, establishment of national focal points, national climate change programmes, greenhouse gas inventories, and vulnerability and adaptation assessments, amongst others. The NCCAP recommended the development of a National Framework for Climate Knowledge Management and Capacity Development to improve coordination and implementation of capacity building initiatives.

Constraints, Gaps and Related Financial, Technical and Capacity Needs

Improved capacity to prepare and improve National Communications (NCs) on a continuous basis is a key need. This includes improved monitoring networks and data capture systems. Throughout the SNC process, and especially during the development of the GHG inventory, data availability and quality and structures of data management were found to be inadequate. Adequate funding is a key need to enable the required staff training and improve organisational arrangements.

Other important gaps and constraints include the need for improved predictions of potential climate change at smaller scales, the development of appropriate impact simulation models, and improved forecasting and early warning systems. Improved communication among scientists, journalists, policy-makers and other stakeholders can help to improve awareness.

The Government of Kenya has improved its capacity to manage climate change and is working to improve legal and institutional framework. With the passing of the Climate Change Bill, funding and capacity building will be required to enable the MENRRDA and other institutions such as NEMA and the National Treasury to effectively fulfil their expanded mandates.

Conclusions and Recommendations

This is Kenya's Second National Communication (SNC) to the Conference of Parties to the UNFCCC, which is a follow-up to the First National Communication that was prepared and submitted to the UNFCCC in 2002. It represents the commitment of the Government of Kenya and its people to address global warming and climate change. At the heart of this Communication is Kenya's conviction that all countries must do their part to achieve steep reductions in greenhouse gas emissions and thereby strive to avoid the dangerous, and perhaps catastrophic, impacts associated with climate change.

This SNC reflects the relevant aspects of Kenya's Vision 2030 and a number of other national sector-specific policies. The communication provides an overview of climate change issues for key stakeholders at local, national, regional and international levels. The SNC has assessed Kenya's national circumstances and responses to climate change. The report contains the greenhouse gas inventory for Kenya and examines potential measures to abate the increase of greenhouse gas emissions as the country pursues her development goals. The report has also reviewed the main findings on the likely impact of climate change and the vulnerability of various economic sectors in the country to these impacts. Finally, possible adaptation measures have presented in the report.

For Kenya, adaptation to climate change remains the top priority to reduce vulnerability and enhance resilience of the social and bio-physical systems, especially the vulnerable communities and groups. Similarly in the SNC, mitigation actions that deliver sustainable development benefits have been identified as Kenya aims to realise Vision 2030 through a low carbon climate resilient development pathway.

The Government views the process of preparing Kenya's SNC as an opportunity to enrich and enhance the country's capabilities in identifying constraints, gaps, and related financial, technical and capacity needs to adequately fulfil the country's obligations under the UNFCCC. The document serves as a useful tool upon which to base decisions concerning climate change and future national development, policy development and refinement, as well as actions in research.

This national effort marks a significant milestone towards capacity building and institutional strengthening, as well as improving national climate information and understanding. Despite the many challenges encountered during the preparation of this report, valuable experience was gained, national capacity on climate change issues was further developed and many lessons were learnt. A foundation has been laid for sustainability in preparing successive national communications, and with this report, Kenya not only takes an important step toward meeting her international obligations but also ensures that climate change, which is a cross-cutting development issue, is considered in the country's policies, activities, and investment plans. The SNC will help to enhance the capacity of the scientific and research communities to formulate and implement mitigation and adaptation policies, options and actions.

For effective climate action (addressing climate change risks and maximising the opportunities it presents), the need for high level political goodwill and support cannot be overemphasised. In addition, collective efforts is necessary among all stakeholders in the public and private sector organisations, including non-governmental organisations (NGOs), civil society, the donor community, and local communities. To this end, it is recommended that the Government of Kenya continues to strengthen institutional and human resources needed to improve capacity to adapt to the impacts of climate change and to address climate change mitigation. It is also recommended that Kenya

continues to work on structures that will enhance the countries capacity to effectively attract and utilise international climate finance as a means of narrowing the funding gaps in the exploitation of opportunities to address adaptation and mitigation. The gaps, and the related capacity building needs that have been identified in the SNC have to be addressed to further improve future National Communications and enable continuous reporting on a consistent basis, and in accordance with the applicable guidelines. Also needed is the continued strengthening of the coordination, networks and information flows between ministries, different levels of government, civil society, academia and the private sector to have a more efficient integration of climate change variables into poverty reduction and development strategies.

Lastly, government officials, experts and stakeholders are requested to make their best efforts to utilise the information and knowledge of this document for national, regional and global benefit. For this to happen, awareness raising among stakeholders and decision-makers will be required.

¹ Source: http://www.fao.org/fileadmin/user_upload/drought/docs/BLBL_3Kenya.pdf



nema National Environment Management Authority