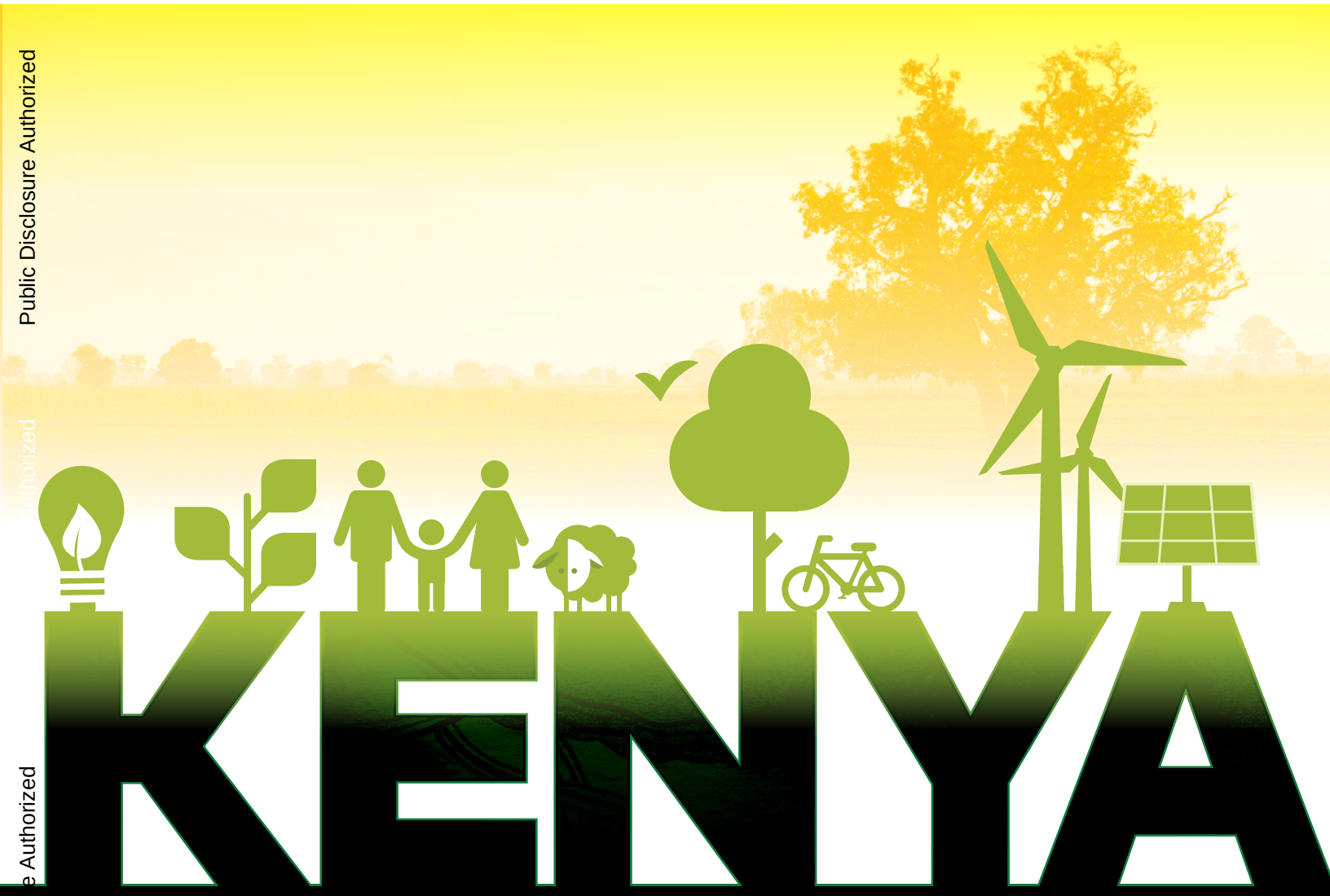
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Kenya Country Environmental Analysis

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Kenya Country Environmental Analysis

September 2019

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Abbreviations

ASAL	Arid and semi-arid land
BOL	Build, Operate and Lease
BOS	Build, Operate and Sell
BOT	Build, Operate and Transfer
CBO	Community-based organization
CCAFS	Climate Change Agriculture and Food Security
CD	Country Director
CEA	Country Environmental Assessment
CEAP	County Environment Action Plan
CEC	County Environment Committee
CFA	Community Forest Association
CFSK	Computer for Schools Kenya
CGIAR	Consultative Group for International Agricultural Research
CIDP	County Integrated Development Plan
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CoED	Cost of Environmental Degradation
COPs	Conference of the Parties
CPA	Charcoal Producer Association
CPC	Clean Production Centre
CPE	Council for Pastoralists' Education
CSA	Climate smart agriculture
DANIDA	Danish International Development Agency
DRM	Disaster Risk Management
EA	Environmental Audit
EAP	Environmental Action Plan
EAWS	The East African Wildlife Society
EIA	Environmental Impact Assessment
EMCA	Environmental Management and Coordination Act No. 8 of 1999
ENR	Environment and natural resources
ENRM	Environmental and natural resource management
ENSO	El Niño Southern Oscillation
EPI	Environmental Performance Index
ERMCSD	Environmental Resources Management Centre for Sustainable Development
ERPA	Emission Reduction Purchase Agreement

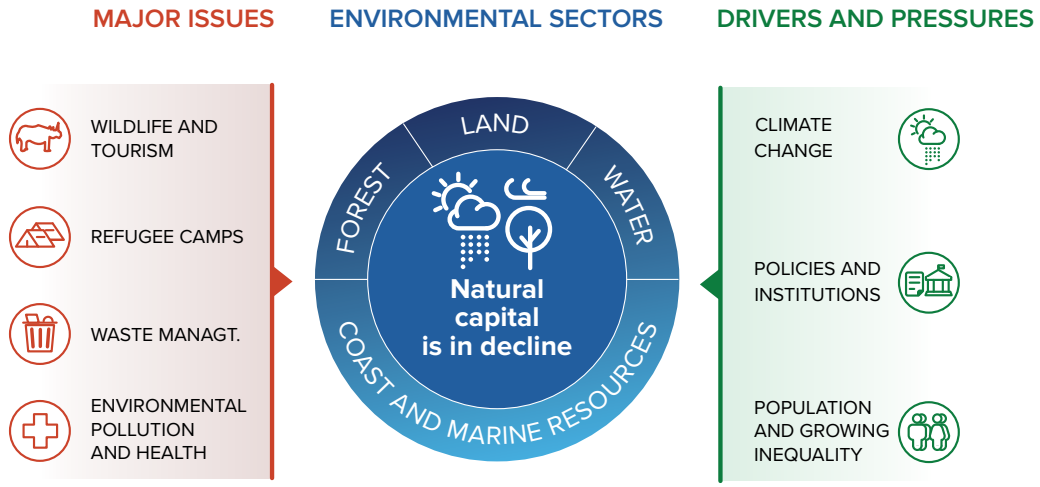
ESMPs	Environmental and Social Management Plans
FAO	United Nations Food and Agriculture Organization
FiT	Feed-in tariff
FMNR	Farmer managed natural regeneration
GBD	Global Burden of Disease
GDP	Gross domestic product
GEF	Global Environment Facility
GHG	Greenhouse gas
GoK	Government of Kenya
HAP	Hazardous air pollution
ICT	Information and communication technology
IK	Indigenous knowledge
IMF	International Monetary Fund
IPCC	Intergovernmental Panel on Climate Change
ISFM	Integrated soil fertility management practices
IUCN	International Union for Conservation of Nature
KAF	Green Africa Foundation
KALRO	Kenya Agricultural and Livestock Research Organization
KAM	Kenya Association of Manufacturers
KCIC	Kenya Climate Innovation Center
KeFS	Kenya Fisheries Service
KEPSA	Kenya Private Sector Alliance
KFMP	Kenya Forestry Master Plan
KFS	Kenya Forest Service
KFWG	Kenya Forest Working Group
KIPPRA	Kenya Public Policy Research and Analysis
KMD	Kenya Meteorological Department
KNBS	Kenya National Bureau of Statistics
KWS	Kenya Wildlife Service
KWWG	Kenya Wetlands Working Group
LADA	Land Degradation Assessment
LPG	Liquefied petroleum gas
LULC	Land use and land cover
LUCF	Land use change and forestry
MALFI	Ministry of Agriculture, Livestock, Fisheries and Irrigation
MEA	Multilateral Environmental Agreement
MENR	Ministry of Environment and Natural Resources (now MoEF)
MEST	Ministry of Education, Science and Technology
MIS	Management Information System
MICNG	Ministry of Interior and Coordination of National Government
MOE	Ministry of Energy

MoEF	Ministry of Environment and Forestry (formerly MENR)
MOH	Ministry of Health
MoWI	Ministry of Water and Irrigation
MOWS	Ministry of Water and Sanitation (formally MoWI)
µg/m3	Micrograms per cubic meter
MPA	Marine protected areas
MTIHUD	Ministry of Transport, Infrastructure, Housing and Urban Development and Public Works
MTP	Medium-Term Plan
NAP	National Adaptation Plan
NCCAP	National Climate Change Action Plan
NCCRS	National Climate Change Response Strategy
NDC	National Determined Contribution
NDMA	National Drought Management Authority
NEAP	Second National Environment Action Plan
NEDI	Northeastern Development Initiative
NEMA	National Environment Management Authority
NEP	National Energy Plan
NEP	National Energy Policy
NETFUND	National Environment Trust Fund
NGO	Nongovernmental organization
NIP	National Implementation Plan
NNE	North and North-Eastern counties
NPDM	National Policy for Disaster Management
NTFP	Non-timber forest product
OECD	Organisation for Economic Co-operation and Development
PDNA	Kenya Post-Disaster Needs Assessment
PES	Payment for Environmental Services
PM	Particulate matter
POP	Persistent Organic Pollutant
PPP	Purchase power parity
REDD+	Reducing Emissions from Deforestation and Forest Degradation
RR	Relative risk
SDG	Sustainable Development Goals
SEA	Strategic Environmental Assessment
SEI	Stockholm Environment Institute
SESA	Strategic Environmental and Social Assessment
SLM	Sustainable Land Management
SME	Small and medium enterprise
SoER	State of environment report
SPI	Species Protection Index

SREP	Scaling Up Renewable Energy in Low Income Countries Program
TEV	Total Economic Value
TEEB	The Economics of Ecosystems and Biodiversity
UN	United Nations
UNCBD	United Nations Convention on Biological Diversity
UNCCD	United Nations Convention to Combat Desertification in Those Countries Experiencing Serious Drought and or Desertification, Particularly in Africa
UNCED	United Nations Conference on Environment and Development
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNICEF	United Nations International Children's Fund
UNISDR	United Nations Office for Disaster Risk Reduction; UN International Strategy for Disaster Reduction
UON	University of Nairobi
WASH	Water, Sanitation and Hygiene
WCED	World Commission on Environment and Development
WDI	World Development Indicators
WHO	World Health Organization
WMI	Wangari Maathai Institute for Peace and Environmental Studies
WRI CAIT	World Resources Institute's Climate Analysis Indicators Tool
WRUA	Water Resource User Associations
YLL	Years of life lost

Infographic

Kenya's environmental sectors, drivers and issues



Kenya's poverty and environmental problems lie at the nexus of population growth, inequality, and high dependence on natural resource–based incomes.

The infographic shows the story of the relationship between a declining natural capital and Kenya's environmental challenges. These include degrading land and water resources, coast and marine resources under threat, and increasing levels of pollution.

Pressures from a changing climate and the pressing need to build the capacity to implement existing policies further exacerbate this already deteriorating situation.

Kenya at a glance

Kenya is a country in East Africa that sits across the equator, has a coastline on the Indian Ocean, and a total geographical area of 580,367 square kilometers. Its geographical features include savannah, lakes, mountains, highlands, and the Great Rift Valley. Arid and semi-arid lands make up roughly 80 percent of Kenya's land area.

Kenya's total population, urban populations, and population density have increased steadily since 1990. The population is currently around 52 million and growing at a rate of about 2.5 percent per year. The growing population is putting great pressures on the environment and economy.

Natural resources remain important to Kenya's productive sectors, and agriculture continues to be the main source of livelihood for a large proportion of the rural population. Renewable natural capital makes up approximately 35 percent of Kenya's wealth.

Kenya is a chronically water scarce country with one of the lowest natural replenishment rates in the world.[1] Around 90 percent of the country is either arid or semi-arid, rainfall patterns are highly variable, and climate change is likely to exacerbate these stresses.

Kenya's economic growth is accelerating. Gross domestic product (GDP) is currently growing at 5.3 percent per year, and Kenya has now achieved low-middle-income status. However, recent gains in income and growth are not shared evenly, leading to increased inequality.

Kenya's climate ranges from tropical along the coast to temperate inland to arid in the north and northeast of the country. The country is situated within the Intertropical Convergence Zone and has two rainy seasons every year, from March/April to May/June and from October to November/December.

Kenya's climate is already changing with widespread warming observed. Shifts in weather patterns are reducing agricultural production. Kenya's drought and food insecurity cycle has shrunk from once every 20 years in the 1980s to almost every year.

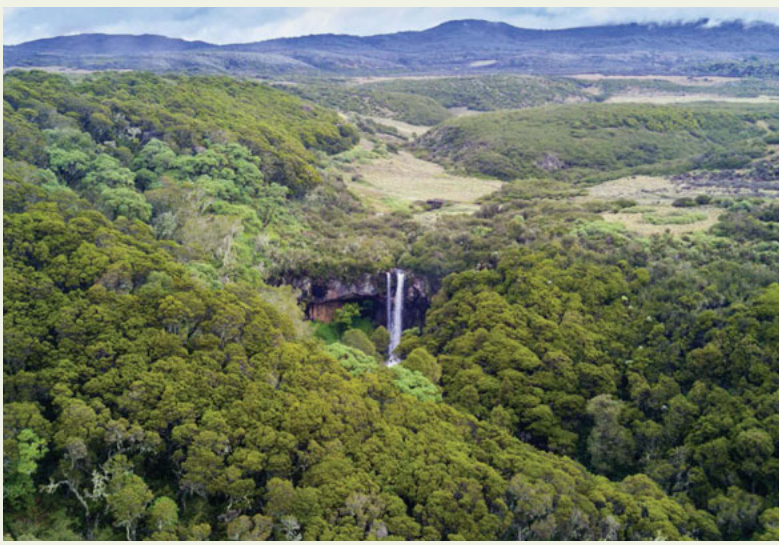
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1 Mogaka et al. 2006. *Climate Variability and Water Resource Degradation in Kenya: Improving Water Resources Development and Management.*



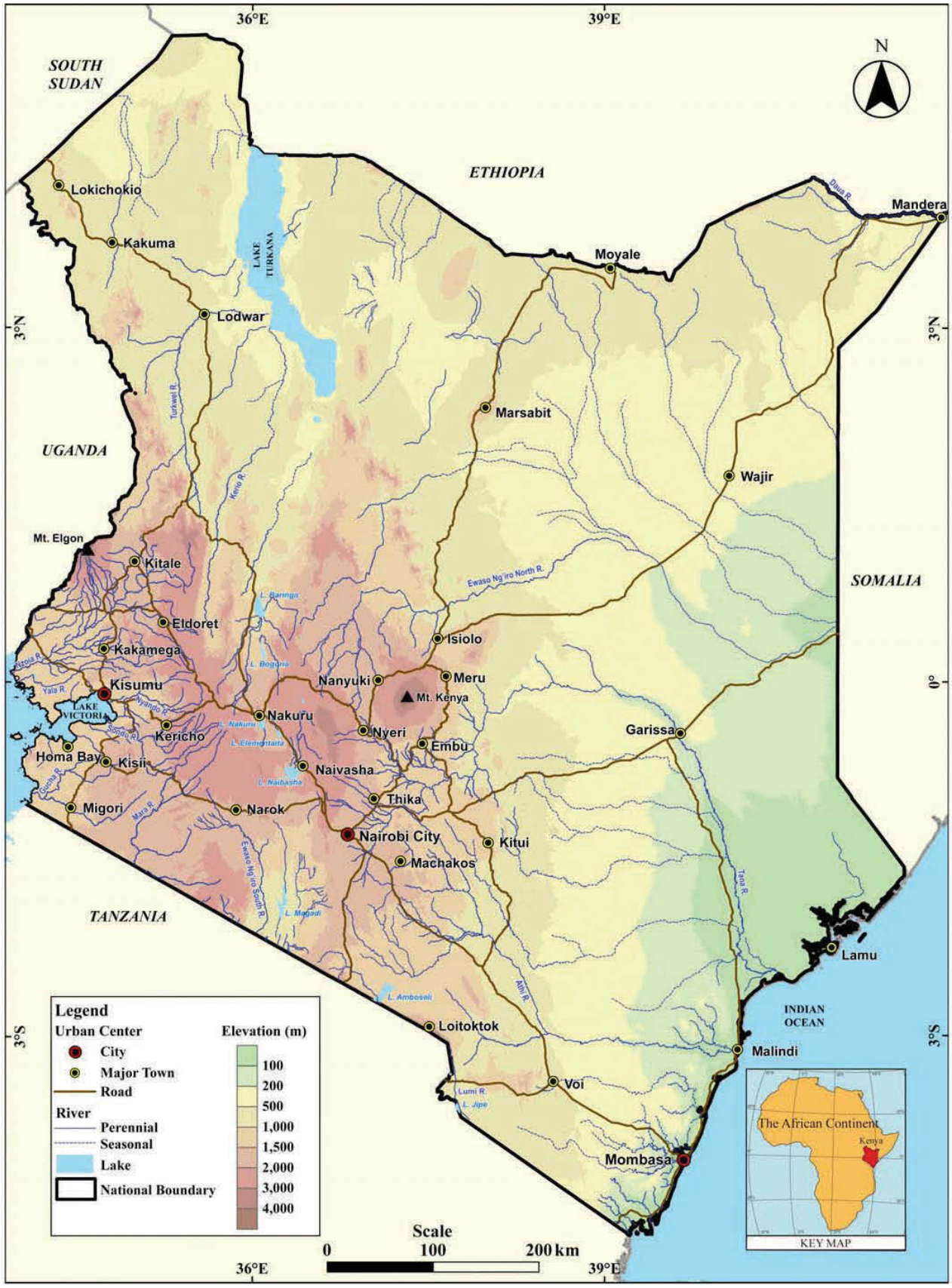






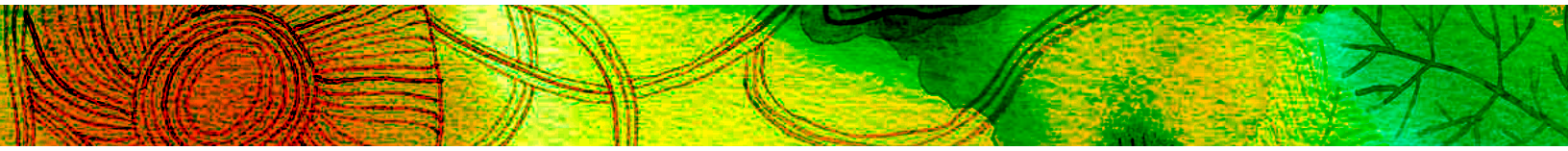
Kenya’s economy is highly dependent on its rich and diverse natural resources.

FIGURE 1. Map of Kenya



Source: MEWNR 2013.[2]

2 MEWNR 2013. *The Project on the Development of the National Water Master Plan 2030.*



Executive Summary

The Kenya Country Environmental Analysis (CEA) presents recent findings and trends on key environmental challenges and opportunities. The CEA identifies a set of recommendations that are necessary to both strengthen the country's environmental management capabilities and ensure that environmental issues are adequately incorporated into broader development initiatives and investments.

Urgent action is required to ensure Kenya successfully balances short-term economic gains with a longer-term sustainable development pathway.

- The foundations for sustainable growth already exist at policy level. The focus should now be on implementing these policies effectively.
- Actions to protect the environment and sustainably manage Kenya's natural capital assets are key to maintaining economic growth—a prerequisite to reducing poverty and inequality and improving public health.

CONTEXT

The core of Kenya's poverty and environmental problems lies at the nexus of population growth, inequality, and high dependence on natural resource–based incomes. A rapidly rising population increases the numbers of people seeking natural resource–based livelihood opportunities placing further pressures on already fragile ecosystems. Climate change is accelerating the impact of existing vulnerabilities to environmental shocks such as floods, droughts, and heatwaves.

Kenya's economy has always depended heavily on environmental goods and services. Kenya's economic growth is intensifying, and it is crucial that environmentally sustainable approaches are part of this process. In addition, Kenya's diverse regional landscapes create the necessity for versatile environmental regulatory policies which can be adapted to suit local environmental conditions, challenges, and opportunities.

Kenya has a wide range of progressive environmental policies, but implementation remains a challenge. Implementation is often characterized by weak technical and managerial capacity, poor coordination, and inadequate funding. Political commitment does not always match the urgency of policy rhetoric. This is partly because the benefits to improved environmental management are often slow to mature and do not match short-term election cycles. Devolution has added to the challenge. While the responsibility for implementing environmental policies has moved to counties, there is not necessarily a parallel transfer of appropriate technical expertise. While institutional coordination remains weak, inadequate budget allocations and slow budgetary transfers are common. This is a problem for the county administrations and hampers the implementation of environmental (and other) policies and plans.

In the last decade, Kenya's economic growth has accelerated. The proportion of Kenyans living on less than the international poverty line (US$1.90 per day in 2011 purchasing power parity (PPP)) has declined from 46.8 percent in 2005/06 to 36.1 percent in 2015/16.[3] During the last decade, annual growth averaged 5.3 percent.[4] In 2014, the country reached low-middle-income status. However, the recent gains in income and growth are not shared evenly across the population, leading to increased inequality.

To balance short-term economic gains and long-term sustainable development in Kenya requires measures that can address the tensions that protecting the environment imposes on options to reduce poverty, grow the economy, and improve public health. The growth of Kenya's largest sector, agriculture, relies heavily on the health of the environment. Yet, many activities undertaken to advance economic development place direct stress on the environment.

Improving the management and utilization of Kenya's rich natural capital resources will boost both growth and development in key sectors of the economy, such as agriculture, tourism, and forestry. However, achieving these potential benefits requires a step change in institutional coordination, financial allocations and flows, and capacity development.

Population pressure adds to Kenya's environmental stress and degradation. Kenya's current population is now around 52 million, compared with 8.5 million at independence in 1963. This increase in population has progressively increased demand on the country's natural resource base, as forests, wetlands, and wildlife habitats are converted into agricultural land. In pastoral areas, increased human populations restrict historic movement patterns and the resulting overgrazing deteriorates pastures and rangelands.

Climate change

Over the past 50 years, weather patterns have changed, and widespread warming has been observed. Changes in precipitation patterns are less clear, although a general increase in rainfall events from September to February has been observed. Any significant increase in precipitation will lead to an increased flood risk.[5] Regional projections based on global circulation models indicate that, compared to the period 1986–2005, Kenya's temperature will increase by around 1°C during the 2020s and up to 3°C by 2100.[6]

Climate change is also reducing agricultural production, and food insecurity is on the rise. Kenya's drought and food insecurity cycle[7] shrank rapidly from every 20 years in the 1980s to now being almost an annual event. The latest drought started in 2016 and is still ongoing in 2019. In 2017, the Government of Kenya (GoK) declared the drought a national disaster with an estimated 3.5 million people in need of immediate, short-term emergency food relief.[8] Increased water storage infrastructure is required to manage the impact of future climate change on the country's crops and to protect food security.

Recent studies have suggested that the annual gross domestic product (GDP) losses linked to adverse weather are already high and will be even higher in the future. An analysis of Kenya's climate risks suggests that by 2030 the impacts of climate change will cost the equivalent of 2.6 percent of Kenya's annual GDP.[9]

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3 World Bank. 2018a. *Kenya Economic Update.*

4 See World Development Indicators: https://data.worldbank.org/data-catalog/world-development-indicators

5 Parry et al. 2012. *Climate Risks, Vulnerability and Governance in Kenya: A review.*

6 World Bank. 2019a. *Climate Change Knowledge Portal—Kenya.*

7 A food insecurity cycle is the period between the end of one period of food insecurity and the beginning of the next.

8 IFRC. 2019. *Emergency Plan of Action Final Report—Kenya: Drought Appeal.*

9 Parry et al. 2012. *Climate Risks, Vulnerability and Governance in Kenya: A review.*

Wealth and natural capital

Kenya is heavily dependent on its renewable natural capital (35 percent of total wealth), mostly cropland and pastureland. Kenya's total wealth increased very little over the 20 years up to 2014 and declined per capita. It is one of only ten countries in Africa where wealth per capita has declined.[10] The country's future growth will depend on the improved productivity and sustainable management of its natural capital.

It is likely that, at this time, the current methodology for calculating Kenya's total wealth results in an overestimation because it does not take account of natural capital losses. Currently, agricultural and forest degradation, including the loss of ecosystem services, are not captured in the wealth accounts. The impacts of climate change also are not currently factored into the valuation of natural capital.

Policies, laws, and institutions

Kenya has been proactive and dedicated to supporting the environment. It has developed a range of environmental policies and laws, and created the institutional frameworks needed to implement these policies and laws.

However, Kenya's environmental ambitions are frustrated by constraints on its capacity to execute, monitor, and enforce existing environmental regulations. Devolution has dramatically increased these challenges as many of these responsibilities are devolved to counties, where appropriate technical and managerial capacity is often limited. At the same time, the flow of funds from central government can be slow, undermining implementation capabilities. For example, few counties undertake comprehensive assessments of environmental impacts prior to developing new infrastructure. In addition, interagency cooperation and communication flows between national and county governments are weak, and this prevents the effective information sharing and collaboration required to support environment and natural resource sectors.

Institutional reforms that support decentralized governance have increased localized regulations. Diverse geographic and socioeconomic characteristics force each of Kenya's 47 counties to determine their own unique path to achieve sustainable growth. The results are diverse approaches, tailored to local conditions, to address environmental challenges such as pollution and natural resource degradation. The devolution reform recognizes this diversity as the basis for future development.

Environmental pollution and health

Every year, environmental pollution causes or contributes to around 60,000 deaths in Kenya and costs the country at least 4.4 percent of its GDP.[11] Unsafe water and sanitation health (WASH) is linked to about 60 percent of these deaths. Household air pollution is the next largest factor and is linked to around 30 percent of these deaths.[12] Children under five years and adults over 60 face the greatest risk. The mortality rates are three times higher in the North and North-Eastern (NNE) than at the coast, and this is attributed to the greater number of people using solid fuel for cooking. Compared to neighboring countries, Kenya has a slightly lower rate of mortality attributed to environmental risks. However, due to poor water supply infrastructure, especially in the most populated counties, mortality attributed to inadequate WASH is about 40–50 percent higher than in neighboring countries.

Impact of refugee camps

Kenya's refugee camps are putting huge pressures on the fragile semi-arid environment they are located in. Kenya hosts 471,000 refugees, 88 percent of whom live in and around the Kakuma refugee camp in Turkana and Dadaab refugee camps in Garissa. Harvesting trees and shrubs for wood fuel and construction is an important driver of environmental degradation and alien invasive species, particularly *Prosopis*, that take advantage of the degraded environment. The large refugee populations also add pressure on limited water resources. Competition for natural resources can spill over into social conflicts that undermine rehabilitation efforts.

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10 Lange et al. 2018. *The Changing Wealth of Nations 2018: Building a Sustainable Future.*

11 Strukova. 2017. *Cost of Environmental Degradation in Kenya.*

12 IHME. 2016. *Global Burden of Disease Study 2015 (GBD).*

ENVIRONMENTAL SECTORS

Land

Land degradation, made worse by poor land use practices and exacerbated by climate change, is a major challenge for Kenya. Land degradation results in a loss of land productivity and a decrease in ecosystem services such as flood control and landslide prevention. A 2016 study[13] identified that 88.6 percent of the country's land mass suffered from land degradation. Around 12 million people, close to 25 percent of the Kenyan population, subsist on land that is being degraded. Both smallholder farming and livestock production are particularly vulnerable to the effects of land degradation.[14]

Land degradation has significant cost implications for Kenya's economy. A 2016 study[15] estimated that between 2000 and 2009 the annual cost of land degradation was nearly 5 percent of GDP. Another study[16] placed the cost of land degradation in crop producing counties at around US$308 million for 2015. GoK's 'Vision 2030' identifies land degradation as a high priority and aspires to promote sustainable land use as part of proposed land reforms.

Forests

Kenya's forests are mainly in decline with large areas of tree cover succumbing to the pressures of human activity and climate driven changes—although there is some revival of forested areas, particularly plantations.[17] Kenya's total forest cover currently stands at 7.8 percent, a small increase since 2013.[18] Human activity, particularly agricultural expansion and urbanization, is one of the main drivers of the depletion of Kenya's forests. Many of these activities are driven by poverty. Examples of this are the use of wood for energy, expansion into forests, wetlands and hillsides caused by reductions in soil fertility, and an expanding illegal trade in forest products. Increased human activity in forest areas also leads to an increased fire risk.

Unsustainable charcoal production activities also contribute to deforestation in Kenya. Charcoal production is an important source of income with approximately 70 percent of Kenyan households burning biomass for cooking and heating.[19] However, the wood fuel resource base is rapidly shrinking as demand exceeds supply of local wood fuel. In addition, the use of inefficient technologies further exacerbates this unsustainable demand for fuel.

However, forests and forest products make an important contribution to Kenya's economy. The forest industry (formal and informal) directly employs an estimated 750,000 Kenyans and indirectly benefits at least 4 million more.[20] Government figures suggest forests' contribution to the Kenyan economy is 3–3.6 percent of GDP.[21] However, these figures exclude the sector's contributions to household energy, and the values of non-timber forest products and ecosystem services. For example, charcoal production and trade has an estimated annual market value of over K Sh32 billion and supports the livelihoods of up to 2 million people.[22] If all added values of forests are factored in, the contribution of forests expands to about 39 percent of GDP.[23]

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13 MENR. 2016b. *Land Degradation Assessment (LADA) in Kenya.*

14 NEMA. 2015. *Second National Communication to the United Nations Framework Convention on Climate Change (UNFCCC).*

15 Mulinge et al. 2016. *Economics of Land Degradation and Improvement in Kenya. In Nkonya et al. 2016. Economics of Land Degradation and Improvement—A Global Assessment for Sustainable Development.*

16 Strukova. 2017. *Cost of Environmental Degradation in Kenya.*

17 NB: There are some differences between data sets on Kenya's forest cover. This is due to different criteria used to define 'forest cover'. FAO data on forest cover is reflected in the World Bank data portal. Kenya Forest Services data differs to some degree on absolute numbers—but the trend is similar.

18 World Bank. 2019b. *Forest Area (% of Land Area).*

19 Mutimba and Barasa. 2005. *National charcoal survey: Exploring the potential for a sustainable charcoal industry in Kenya.*

20 MENR. 2016f. *National Assessment of Forest and Landscape Restoration Opportunities in Kenya.*

21 MENR. 2016e. *National Forest Programme of Kenya 2016–2030.*

22 Mutimba and Barasa. 2005. *National charcoal survey: Exploring the potential for a sustainable charcoal industry in Kenya.*

23 UNIQUE. 2018. *Land and natural resources degradation in the Arid and Semi-Arid Lands, Kenya.*

Water

Kenya is a chronically water scarce country with one of the lowest per capita natural replenishment rates[24] in the world.[25] Long-standing problems of water scarcity, water quality, and water conflict are getting worse.[26] Around 90 percent of the country is either arid or semi-arid, rainfall patterns are highly variable, and climate change is likely to exacerbate these stresses. Future water demand is projected to grow rapidly,[27] and water stress is already noticeable at local levels in both arid and water-rich regions. The drivers of Kenya's emerging water crisis are a complex mix of droughts, forest degradation, floods, poor management of water supply, water contamination, and population growth. Catchment degradation, which increases the risk of droughts and floods, is the most widely faced challenge.

Water degradation costs Kenya at least US$82.9 million every year.[28] This is the cost of maintaining water quality and quantity and the increased cost of maintaining reservoirs. However, these costs do not tell the whole story as they do not fully account for the cost attributable to infestations and management of aquatic invasive species (e.g., water hyacinth) or the cost of water degradation in the NNE counties.

Government policy initiatives[29] target the rehabilitation of all Kenya's water catchment zones and water catchment towers. Unfortunately, the lack of compliance with policies remains a serious concern, with frequent cases of wetlands converted to agricultural, residential, or industrial development.

Coast and marine

Kenya's rich and diverse marine and coastal ecosystems are under threat. Lack of governance and high population growth rate result in unsustainable management of the country's coastal and marine resources. Pressures include the over-exploitation of fisheries and mangroves, urbanization, tourism development and expansion, agriculture, manufacturing and processing, transportation and industrialization, including mining for sand and oil and gas exploration. Climate change (resulting in increases in sea temperature, irregular precipitation, sea level rise, increased frequency of severe storms, and ocean acidification and sedimentation)[30] make an already precarious situation worse.

The blue economy (economic activities linked to oceans, seas, and coasts)[31] is worth about US$4.4 billion every year (roughly 5.5 percent of GDP) with US$4.1 billion of that coming from the tourism sector.[32] GoK has prioritized the blue economy as a key pillar of its Vision 2030 development agenda. A total of 1,139 square kilometers of Kenya's coastal and marine ecosystem are designated as Marine Protected Areas (MPAs). These play an important role in the management of Kenya's coast and marine ecosystems. They also provide valuable income and livelihood opportunities to the coastal and marine areas, generating annual revenues in excess of US$1.5 million.[33]

Waste management

Managing solid, liquid, and electronic waste (e-waste) is one of the greatest ecological challenges facing county and national governments. Lack of effective waste management systems and increasing urbanization results in ever increasing volumes of waste and complicates the flows of waste through to disposal. The disposing of solid waste by uncontrolled burning is an increasing problem. In particular, the burning of plastic waste produces highly toxic emissions.

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24 This refers to the average annual replenishment of both surface and groundwater resources.

25 Mogaka et al. 2006. *Climate Variability and Water Resource Degradation in Kenya: Improving Water Resources Development and Management.*

26 The Water Project. 2019. *Water in Crisis—Kenya.*

27 MEWNR. 2013. *The Project on the Development of the National Water Master Plan 2030.*

28 Strukova. 2017. *Cost of Environmental Degradation in Kenya.*

29 The two main policy initiatives are the *Masterplan for the Conservation and Sustainable Management of Water Catchment Areas in Kenya* and the *National Water Master Plan 2030.*

30 USAID. 2018. *Climate Risk in Kenya: Country Risk Profile.*

31 Note: The World Bank includes sustainable resource use in its definition of the Blue Economy. Sometimes the term is used by others to simply refer to maritime economic activities, whether they are sustainable or not.

32 Muigua. 2016. *Utilizing Kenya's Marine Resources for National Development.*

33 Kenya Wildlife Service (unpublished report). Cited in: Tuda and Omar. 2012. *Protection of Marine Areas in Kenya.*

Although policies, laws, and regulations that guide waste management exist, weak implementation and poor practices have led to towns and cities overwhelmed with waste, endangering both public health and the environment.

Managing human waste, including open defecation and untreated municipal sewage, presents a particular challenge. Open defecation is the only option for around 5.6 million Kenyans, while access to improved sanitation increased by only 5 percent between 1990 and 2015.[34] Children and women suffer most from poor sanitation and a lack of access to clean water. This is a major cause of diarrhea—a leading cause of child mortality and morbidity.[35]

Electronic waste is becoming one of Kenya's fastest growing waste components. When e-waste is burnt, toxic substances are emitted. Informal e-waste recycling is causing serious environmental and public health hazards in rural and urban areas. Illegal imports of e-waste or used electronics from all over the world add to Kenya's e-waste management challenge.

Wildlife and nature-based tourism

Kenya's rich and diversified biodiversity and the tourist industry are two sectors that co-exist, yet in a contested way. The tourist industry needs thriving and diverse wildlife, yet too much nature-based tourism puts pressure on the environment and threatens Kenya's biodiversity. In the past decade, Kenya has significantly improved the management of its natural ecosystems, and there is recognition that current approaches to managing nature-based tourism may be contributing to an irreversible deterioration in the very assets it needs to exist.

Wildlife and biodiversity are in decline, and the drivers of this decline are complex and interrelated. Kenya has lost at least 68 percent of its wildlife over the last 40 years and is ranked the fifth worst country in Africa for numbers of threatened species. The design of the national parks is one part of the problem. How the land around parks is managed is another. Population increase and the resulting expansion of agriculture and demand for improved infrastructure add to these pressures. An expanding tourism industry has resulted in more roads and infrastructure development—all of which negatively impact on Kenya's wildlife and biodiversity.

OPPORTUNITIES FOR CHANGE

The analysis provided in this report shows that Kenya's environmental challenges have a strong potential to undermine the path of economic growth the country seeks. Environmental policies are receiving increasing attention from Kenyan policy and decision makers and the public, recognizing: (1) the future of economic growth lies in fostering sustainable development that incorporates environmental policies and considerations; and (2) mitigating environmental health impacts can strengthen development.

Consensus exists at both the national level and across counties that environmental issues are still not given the necessary attention. The devolving of multiple government functions and responsibilities to the counties provides an opportunity to transform environmental management, promote innovation, provide a strong focus on sustainable infrastructure investments, and strengthen renewable natural resources assets.

The CEA recommendations provide a range of interlinked actions that can be incorporated into development investments. Development investments can be either large-scale, at the national level or subnational level, or small-scale at the county level. The actions recommended below are part of the design and implementation of sectoral (or multi-sectoral) initiatives. If implemented, they will provide the opportunities and mechanisms to embed improved environmental management into everyday practice. A summary of the six strategic recommendations that will have a transformative impact are presented below. A range of sector-level interventions are provided at the end of each chapter and in consolidated form in Annex 1.

34 Njuguna and Muruka. 2017. *Open defecation in newly created Kenyan Counties: A situational Analysis.*

35 See WHO fact sheet on diarrhoeal disease: https://www.who.int/news-room/fact-sheets/detail/diarrhoeal-disease

Recommendation 1: Strengthen environmental governance and support institutional capacity at all levels

Enforce existing environmental laws and regulations. To achieve this, it will be necessary to strengthen the mandate of County Environment Committees (CECs), and support counties to formulate their own subsidiary environmental laws and policies, in line with the revised National Environmental Management and Coordination Act (EMCA) 2015. Initial priorities should be the key drivers of degradation: producing and transporting charcoal, illegal logging, farmers and settlers encroaching onto forest and wetlands, overgrazing of grasslands, and poor water retention and soil management in agriculture areas.

Improve the quality of County Environment Action Plans (CEAPs). These often lack operational clarity, deadlines, budgetary details, and funding. Effective planning will require better inter- and intra-agency communication for effective collaboration, as well as increased community participation in active environmental management. Existing citizens groups such as Water Resource User Associations (WRUAs), Community Forest Associations (CFAs), Community Wildlife Conservancies (CWCs) and its umbrella body, the Kenya Wildlife Conservancies Association (KCWCA), and Charcoal Producer Associations (CPAs), etc., are entry points for greater community participation. Public participation is more likely if Environmental and Social Management Plans (ESMPs), Environmental and Social Impact Assessments (ESIAs) and similar reports contain summaries in local languages and residents are encouraged to read and comment on them.

Recommendation 2: Enhance compliance with environmental policies to reduce pollution and improve environmental health

Strengthen environmental accountability mechanisms for industry (especially the manufacturing sector). This will require an investment in staffing and training to ensure that suitably trained government staff dedicated to compliance are available to provide oversight on projects regardless of the source of funding.

Better utilization of environmental risk management tools such as Strategic Environmental and Social Assessments (SESAs), and cumulative impact assessments (CIAs). By law, at the project level, an ESMP must be conducted and a report submitted to the National Environment Management Authority (NEMA) for review and approval. However, the quality and implementation of these assessments is frequently not prioritized.

Raise public awareness of the importance of environmental health so that there is a demand for better accountability. The public can and should be custodians of their environment and demand a healthy environment and a reduction in pollution. Campaigns to facilitate culture change and nationwide appreciation of the environmental policies provide one route to raising awareness. The education system is the other key entry point, where there is scope to include a focus on environmental sustainability in curricula of subjects such as engineering, agriculture, energy, and transport.

Recommendation 3: Integrate data and indicators for natural capital and environmental sustainability into economic planning

Develop natural capital accounts for water, wildlife, fisheries, and forest resources. The crucial role of natural capital in the Kenyan economy is well recognized by GoK. For example, the Ministry of Environment and Forestry (MoEF) released a Biodiversity Atlas in 2015, which explicitly recognizes the importance of natural capital to the national economy. The government needs to continue developing natural capital accounts for key natural assets such as water, wildlife, fisheries, and forest resources in order to identify cross-sector linkages and improve available data to guide economic planning by the National Treasury.

Utilize the state of environment report (SoER) to support environmental planning and management. The SoER is a tool that could provide a comprehensive overview of the natural capital accounts. This report was last published in 2010. Between 2016 and 2018, a new report was drafted. However, it has not been finalized or publicly shared. This report should be updated and published on a regular basis and used as the basis for environmental planning and management. It is important to finalize the latest, updated edition as its focus is on devolved functions of the government and the environmental ranking of the counties. It establishes a national data baseline and highlights the gaps and opportunities for strengthening planning and management of environment and natural resources.

Recommendation 4: Increase budgetary allocations and streamline releases to support ENR management

Increase budgetary allocations to environment and natural resources (ENR) institutions. Budget allocations need to match strategic plans. To date, both national and county level ENR ministries and other institutions have experienced inadequate allocations and untimely releases of budget, exacerbated by the low absorption capacity of allocated funds. In addition, the money allocated to ENR institutions has gone down rather than up. The average annual allocation of financial resources to MoEF against the national budget was only around 1 percent, while income from natural resources was 2.5 percent of GDP in 2017.[36] In the final three years before devolution, the ministry's budgetary allocation was higher in comparison to the first three years under devolution.[37] A dedicated Public Expenditure Review (PER) focusing on environment and natural resources would serve as a guide for determining the levels of financial allocations for ENR sectors at national and sub-national levels.

Strong and sustainable financial support for ENR management. In order to attain the goals set out in Vision 2030, and enhance a low-carbon, resource efficient economic transformation, the relevant public sector institutions working on ENR sectors will need to rely on the strong and sustainable financial support from the National Treasury.

Recommendation 5: Expand sustainable land management interventions, with a focus on diversifying livelihoods, particularly in the NNE and coastal counties

Invest in sustainable land management (SLM) interventions. Such investments will reduce the impacts of pressures on water and land and contribute to improving food security, which is one the priorities under the Big 4 Agenda. Three main investments are needed:

- **Provide incentives to land users to invest in SLM approaches.** Subsidies for fertilizer could be redirected to provide financial incentives to small farmers to invest in SLM practices. Existing subsidies have been criticized for encouraging agricultural expansion onto marginal agricultural land (such as forests, slopes, and wetlands). They also mainly benefit larger farmers.
- **Create an institutional environment and rural services that will support the investments.**
- **Focus particularly on reducing the high risks for arid and semi-arid land (ASAL) production systems.**

In parallel, focus on environmental strategies to improve land management at county levels. Discussion and decision making on the scope, nature, and implementation mechanisms of environmental strategies need to take place in the county assemblies, county cabinet committees, and the Council of Governors' Environment Committee. These are the decision-making assemblies that have the mandate to help to increase and prioritize appropriate funding to address land degradation in Kenya.

Recommendation 6: Build resilience and enhance long–term planning for disaster risk preparedness and management

Mainstream climate change risks and opportunities. Make sure climate change risks and opportunities are a top priority for government departments and stakeholders working with major vulnerable sectors. This can be done by incorporating climate change awareness in the educational system and encouraging the implementation of policies such as the National Disaster Management Response Plan.

Focus on disaster risk management (DRM) solutions in ASALs. These include developing disaster-proof infrastructure such as climate-proofing road design and construction, investing in sustainable livelihoods adaptive to climate change (for example, ensuring knowledge of and access to drought-resistant crop varieties, dryland forestry, and community-based livestock systems), and implementing public awareness programs. Possible support could be given by providing index-based weather insurance schemes.

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36 Based on the indicator for total natural resources rents (revenues above the cost of extracting the resources) are the sum of oil rents, natural gas rents, coal rents, mineral rents, and forest rents.—World Bank, 2018. *Changing Wealth of Nations 2018: Building a Sustainable Future.*

37 GoK. 2019. *Estimates of Development Expenditure of the Government of Kenya for the year ending 30th June 2020.*

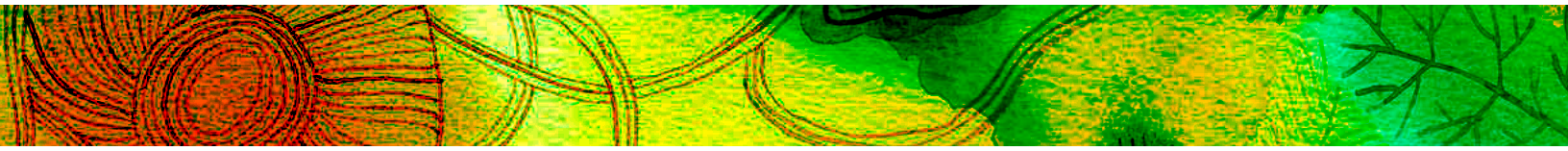
Rehabilitating the main watersheds to expand the water retention areas and decreasing the variability of discharges in the rivers will reduce risk and build resilience to weather shocks. Sustainable water and land management naturally decreases the overall impact of extreme events such as floods and droughts. One of Kenya's Vision 2030 goals is increasing the country's tree cover to 10 percent of the land mass. This has the potential to greatly strengthen sustainable land and water management and decrease the expected impact of natural disasters, erosion, and flood risk, provided that tree planting programs utilize suitable tree species in suitable environments.

Target vulnerable communities for local-level disaster preparedness. Improving emergency and disaster responses requires better preparation in vulnerable communities, ensuring they are aware of early warning systems and know how to respond if an emergency warning is triggered. Disaster risks can often be reduced through the diversification of rural livelihoods and teaching practical coping mechanisms.

Strengthen information linkages between the Kenya Meteorological Service and local communities. Modernizing meteorological systems should include strengthening links between national-level information and local-level stakeholders to ensure timely information for targeted responses to emerging weather-related disaster risks. This should include a focus on 'last mile' early warnings and improving county-level response planning for droughts and floods.

Training county-level officials on both disaster risk reduction and disaster management. Ensuring adequate skills are in place at county levels for effective disaster risk reduction planning will help local authorities mitigate impacts of future disasters. Training county-level disaster management officers for each county will help to ensure more timely and effective responses to disasters.

Address the problem of water scarcity. The current and projected levels of water scarcity need to be urgently addressed, including by implementing the Water Sector Investment Plan for 2008–2030 and the Water Catchment Management Initiative.



Introduction

PURPOSE

The Country Environmental Analysis (CEA) is one of the World Bank's country-level diagnostic tools. It is designed to close the gap in a country between environmental sustainability and economic development. It is a tool that can be used to manage natural resources to deliver improvements for livelihoods, reducing poverty and building climate change resilience.

The analysis and policy recommendations in this report will help the government prioritize and address the country's most critical environmental management challenges. It will also help define the scope and direction of donor support to strengthen environmental management and inform and coordinate the activities of civil society and other development partners.

Overall, this CEA provides a critical review of the natural resource challenges at national and county levels. It assesses and identifies the institutional capacity gaps for environmental and natural resource management (ENRM), and it explores the costs of environmental degradation providing the basis for a policy dialogue on the economic and social costs of non-action. Importantly, it offers potential solutions to address these natural resource challenges.

CEA METHODOLOGY

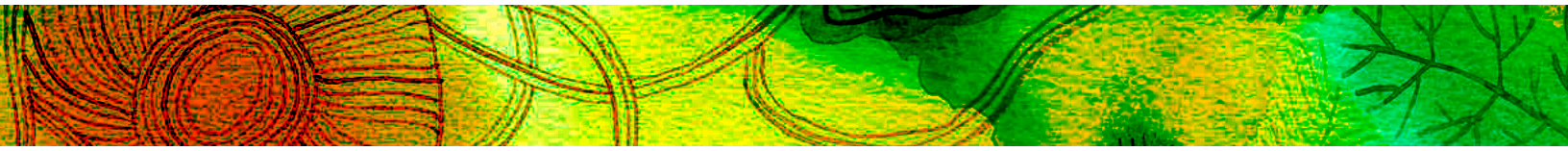
The information in this CEA is based on a review of recent literature on the country's environment problems, stakeholder interviews, and data collection. Preparation for the CEA began in 2015, and in 2016 some findings and recommendations were presented at a national stakeholders' forum organized by the World Bank. In 2018, the data compiled during this time was then reviewed and repurposed and the document was revised using more recent information and data.

In May 2019, a stakeholder validation workshop was held which included national- and county-level government officials and nongovernmental organizations (NGOs). The feedback from this workshop contributed to the finalization of this report, particularly the recommendations and way forward.

STRUCTURE OF THE ASSESSMENT

There are five main sections in this report.

1. **Introduction**—The purpose of the document, who the audience is, and the methodologies used in the analysis.
2. **Executive summary**—A summary of the discussion and the way forward.
3. **Context**—The chapters on the important contextual issues that impact on the environment.
4. **Environmental sectors**—The chapters that discuss Kenya's important environmental sectors.
5. **Opportunities for change**—A summary of the recommended solutions to Kenya's environmental challenges.



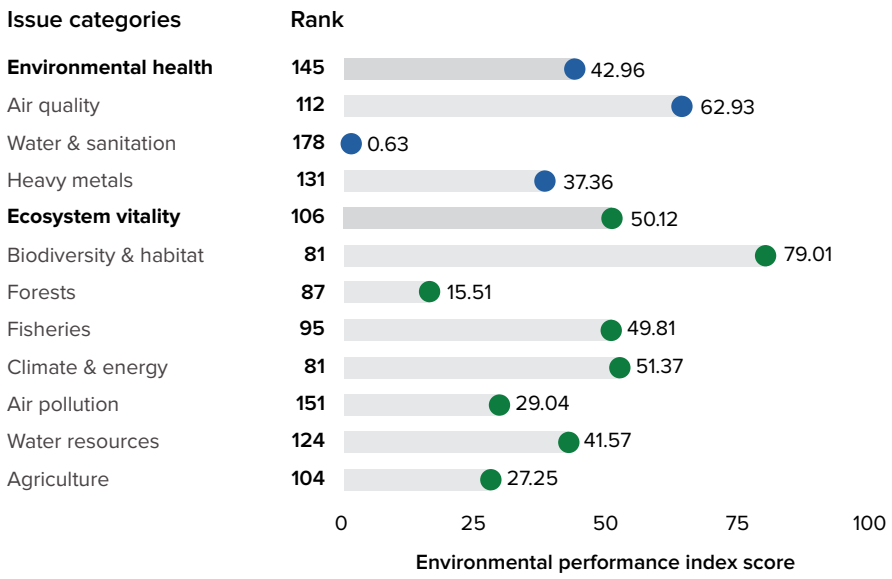
Context

Environmental performance

In the 2018 Environmental Performance Index (EPI),[38] Kenya is ranked 130 out of 180 countries. The EPI, developed by Yale Center for Environmental Law and Policy, scores 180 countries on 24 performance indicators across ten issue categories covering environmental health and ecosystem vitality.[39]

Environmental health indicators for Kenya are particularly low (145th place out of 180). Figure 2 shows Kenya's EPI scorecard with rankings and scores. Water and sanitation are ranked as one of the lowest in the world with a score of 0.63 out of 100. Ecosystem vitality indicators are ranked at 106 out of 180. The highest ranking is assigned to the biodiversity and habitat score which is 79.01 out of 100. This is attributed to the Species Protection Index (SPI) that accounts for legal protection status for the areas with greatest biodiversity.

FIGURE 2. Kenya EPI scorecard



Source: EPI. 2018.

These metrics provide an opportunity to compare countries based on established environmental policy goals. However, these indicators and corresponding scores do not reflect on the country's geographical diversity and political context, which are major factors in decision making for environment and natural resource management issues in Kenya.

38 EPI. 2018. *Environmental Performance Index.*

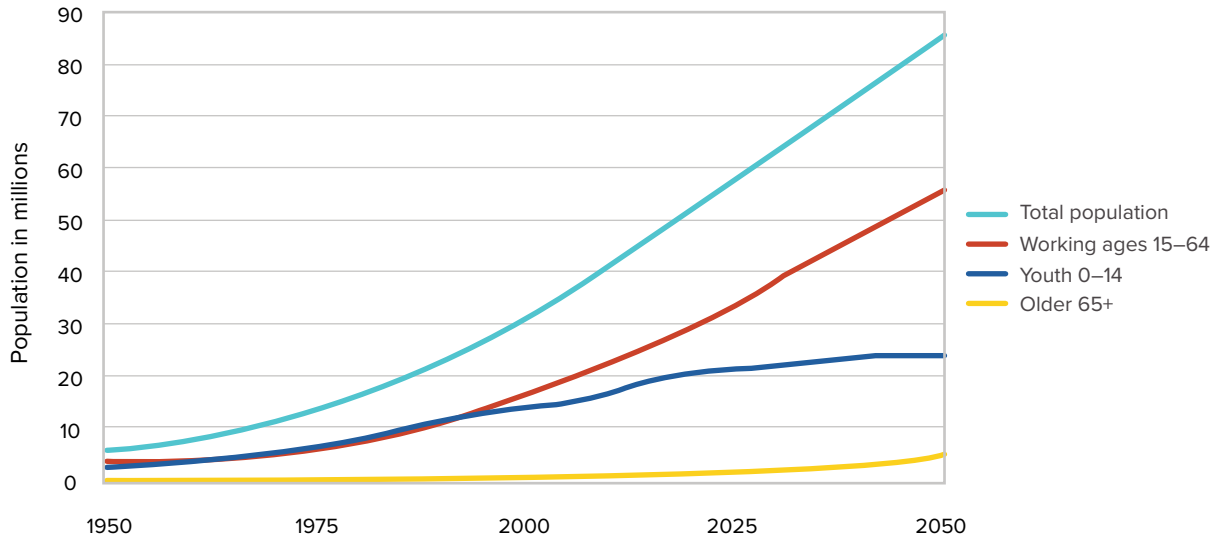
39 Environmental Health aggregates air quality, water and sanitation, heavy metals while Ecosystem Vitality aggregates water resources, agriculture, forests, water resources, biodiversity, climate, and energy.

Population and livelihoods

POPULATION

Kenya's population is currently around 52 million and growing rapidly, with both high birth and infant mortality rates (Figure 3). This pattern of population growth is similar to many other African countries.[40] Life expectancy has improved in recent years. In 2006, the average life expectancy was 48.9 years. By 2016 it had risen to around 59 years and increased further to 64 years in 2018. The population is young with a current median age of 19.7 years.[41]

FIGURE 3. Kenya's demographic trends, 1950–2050



Source: World Bank. 2019.[42]

The growing population increases environmental pressures and stress on the country's natural resource base. Forests, wetlands, and hillsides are converted into agricultural land and, because this land is often unsuitable for cropping, greater soil erosion occurs, and water courses are silted up.

In pastoral areas, the increase in human populations restricts historic movement patterns, resulting in pastures and rangelands deteriorating due to overgrazing. Wildlife habitats and forests are lost or become more vulnerable to degradation. Farm plots are split across generations and become unprofitable and unsustainable, causing increased poverty and reduced livelihood security.

URBANIZATION

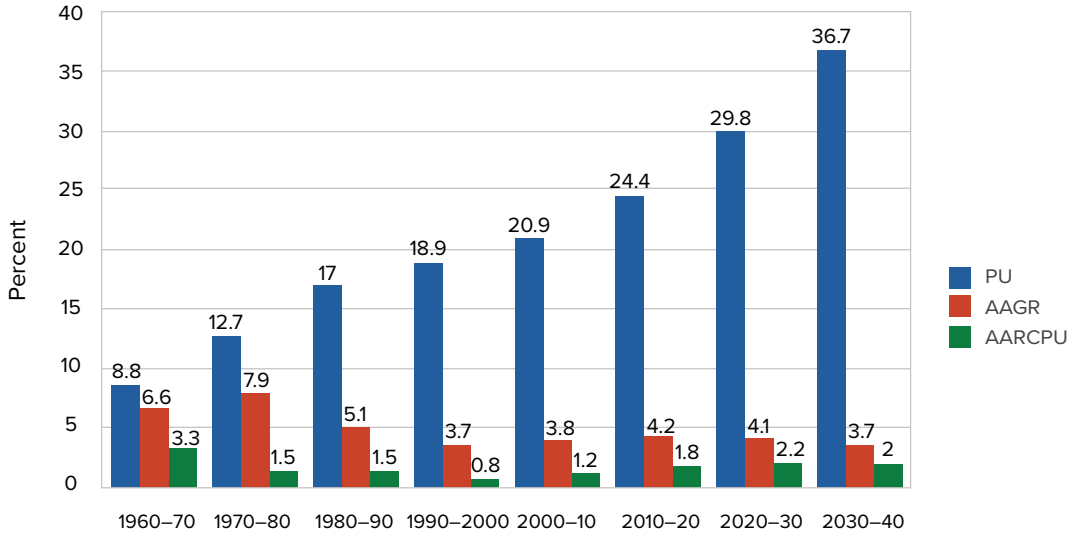
Kenya is characterized by rapid urbanization and urban growth. Kenya's urban population, as a proportion of the total population, increased from 8.8 percent in 1960–1970 to 20.9 percent in 2000–2010 and is projected to exceed 36 percent by 2030–2040 (see Figure 4). Currently, one in five Kenyans live in urban areas, compared to one in twelve in the 1960s.[43]

40 UN-DESA. 2019. *World Population Prospects 2017*.
41 See World Population Review website: http://worldpopulationreview.com/countries/kenya-population/
42 See Kenya's Demographic Trends: https://databank.worldbank.org/data/
43 Hope. 2012. *Urbanisation in Kenya.*



Kenya's urban centers are expanding rapidly.

FIGURE 4. Urban population trends, 1960–2030



Note: PU = proportion of total population that is urban; AAGR = average annual growth rate of urban population; AARCPU = average annual rate of change of proportion urban.
Source: Hope. 2015.[44]

While the number of urban dwellers is increasing rapidly, the population in rural areas is also rising. This is due to an overall growth in the population. As a result, urbanization is not diminishing the environmental pressures caused by an increasing population.

44 Hope. 2012. *Urbanisation in Kenya.*



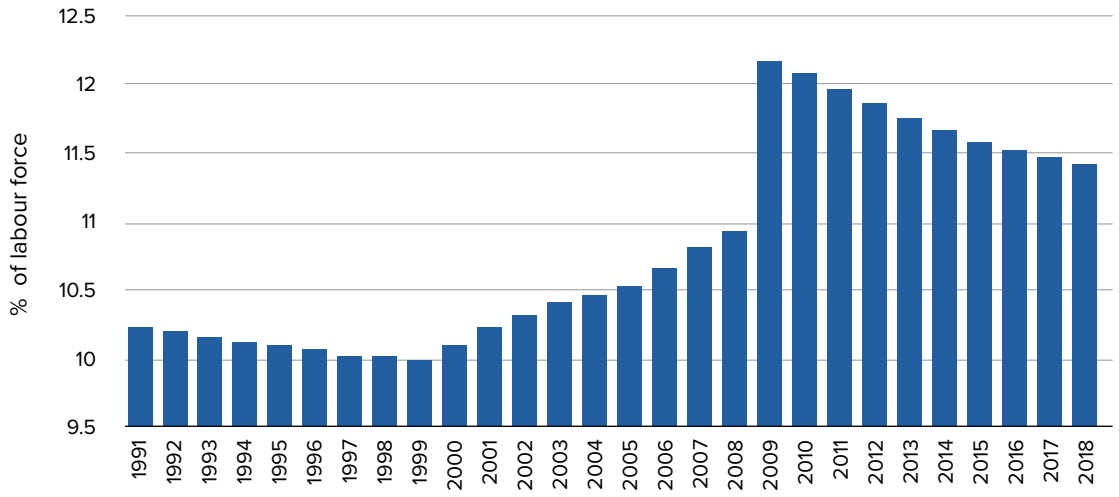
Kibera—a large Nairobi slum.

LIVELIHOODS

Despite rapid urbanization, agriculture remains an important part of Kenya's economy. The sector directly accounts for more than one quarter of the gross domestic product (GDP), 70 percent of rural jobs, 65 percent of exports, and 60 percent of foreign exchange earnings.[45]

Unemployment rose rapidly following the 2008/09 global recession but has been slowly dropping since then. The current unemployment rate is 11.43 percent. This figure does not include people who are not looking for work, such as children, women taking care of others at home, students, the sick, and the retired (Figure 5).

FIGURE 5. Kenya's unemployment rate, 1991–2018



Source: World Bank. 2019.[46]

Despite strong economic growth, consistently above 5 percent in recent years, employment opportunities have not kept pace with population growth. Services now make up around 55 percent of GDP.[47] However, most service sector jobs

45 D'Alessandro et al. 2015. *Kenya Agricultural Risk Assessment*.

46 Word Bank Data portal, accessed 23–04–2019. https://data.worldbank.org/indicator/SL.UEM.TOTL.ZS?end=2018&locations=KE&start=1991&view=chart

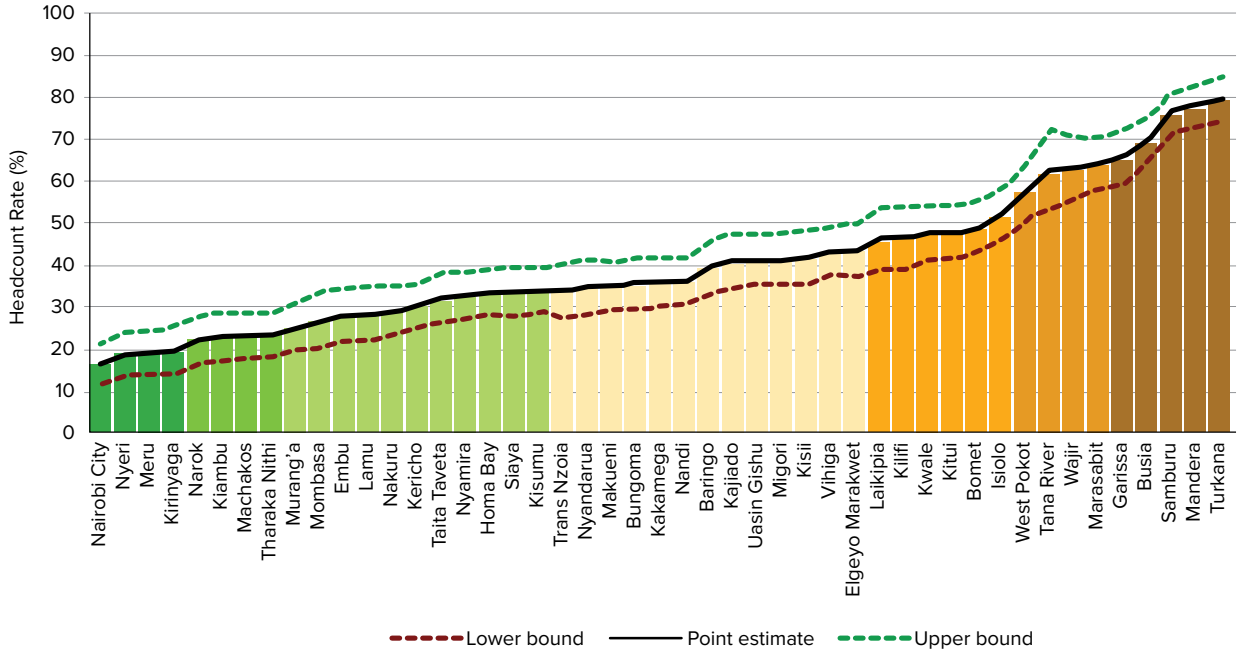
47 World Bank. 2013. *Technical Assessment of the Kenya National Safety Net Program for Results.*

are low-productivity ones in the informal sector, with agriculture and manufacturing stagnating.[48] As a result, although unemployment rates are falling, they have not returned to the lower levels of the late 1990s (Figure 5).

POVERTY

Official figures put Kenya's poverty incidence at 36.1 percent with 8.6 percent in extreme poverty.[49] Although high, the proportion of people living below the poverty line has declined by around 10 percent over the last 10 years, and extreme poverty declined by around 11 percent in the same period. Overall poverty rates are lower in urban areas (29.4 percent in core urban areas) and higher in rural areas (40.1 percent). The highest poverty rates are in arid and semi-arid areas (ASALs) with Turkana county's poverty rate the highest in the country at 78 percent.

FIGURE 6. Incidence of overall poverty by county (2015/16 household survey)



Source: KNBS. 2018.[50]

It should be noted that for many households, poverty is transitional rather than permanent.[51] Non-poor households fall into poverty following a shock and poor households 'escape' from poverty. Some then fall back into poverty again (a 'transitory escape' from poverty) while others succeed in improving their well-being permanently (a 'sustainable escape' form poverty). Livelihood diversification is an extremely common strategy to cope with livelihood insecurity and can provide a means of escape from poverty. However, it is not guaranteed to succeed. (See Annex 4 for detail on the findings of a recent study on poverty escapes in rural Kenya).

Unchecked environmental and natural resource degradation will have an adverse impact on longer-term poverty trends. Kenya has very high natural resource dependency levels. If natural resources continue degrading, there is a serious risk that poverty will begin to increase in the future. Degradation of natural resources will also reduce resilience to weather shocks such as droughts and floods, and heat stress.

48 World Bank. 2016a. *Kenya—Country Economic Memorandum: From Economic Growth to Jobs and Shared Prosperity.*
49 KNBS. 2018. *Highlights of the 015/16 Kenya Integrated Household Budget Survey (KIHBS) Reports.*
50 KNBS. 2018. *Highlights of the 015/16 Kenya Integrated Household Budget Survey (KIHBS) Reports.*
51 Scott et al. 2018. *Resilience and Sustainable Poverty Escapes in Rural Kenya.*

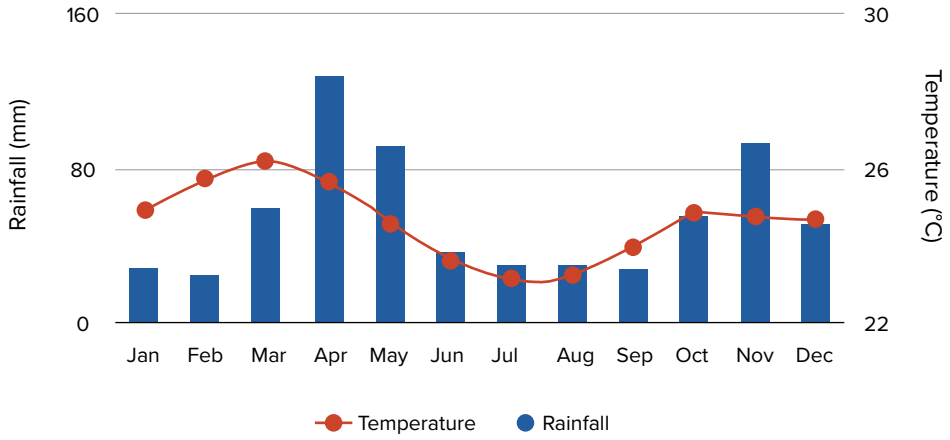
Climate change and natural disasters

- Kenya's climate is already changing, with a marked warming trend.
- Losses attributable to shifting weather patterns already cost Kenya around 2 percent of gross domestic product (GDP) each year and this is likely to increase.
- The gap between weather-induced food emergencies has already reduced significantly.
- More frequent and extreme droughts, floods, and heatwaves will disrupt agricultural production, and risk the sustainability of pastoral production systems.
- Mitigation, adaptation, and disaster management policies exist, but implementation is hampered by poor coordination.

KENYA'S CLIMATE

Kenya is an equatorial African country with a climate that varies considerably among regions. The coastal region is tropical, the central and western regions temperate, the sparsely populated North and North-Eastern (NNE) regions are arid, and the southern rift valley is semi-arid. Kenya's dryland areas, also known as arid and semi-arid lands (ASAL), make up almost 80 percent of Kenya's land area. However, the majority of Kenyans live in the rain-fed areas of the western, central, and coastal regions, which are also home to most of Kenya's agricultural production. See Figure 7 for mean temperatures and rainfall patterns across the country.

FIGURE 7. Mean historical monthly temperature and rainfall for Kenya, 1901–2015



Source: World Bank. 2019.[52]

The average annual rainfall in Kenya is 630 mm, although the amounts vary vastly from region to region. The ASAL regions have low rates of precipitation. Annual averages are generally below 500 mm, and in some places below 200 mm. As Kenya lies within the Intertropical Convergence Zone, it experiences two rainy seasons each year. Most precipitation in Kenya falls from March and April to May and June (the 'long rains') with additional rainfall during October, November, and December (the 'short rains').

52 World Bank. 2019a. *Climate Change Knowledge Portal—Kenya.*

Average temperatures also vary across the region. The ASAL regions have high temperatures, with averages between 24°C–35°C. Coastal temperatures remain in a narrow band of 27°C–31°C throughout the year, while the highlands of the central region have moderate temperatures ranging between highs of 29°C and lows of 7°C.

CLIMATE CHANGE

Observed trends

Over the past 50 years, weather patterns have changed, and widespread warming has been observed. However, the data on precipitation is less clear.[53] In addition, limited long-term weather data makes it difficult to identify trends with confidence. The most reliable recent data runs from 1960. While country-level downscaled modelling for Kenya has not yet been done, global circulation models are reasonably confident that the climate is changing regionally—so it can be assumed the same is happening in Kenya.

A general increase in rainfall events from September to February has been observed. The data indicates a tendency of the 'short rains' (October to December) to extend into January and February, which are normally hot and dry. Although, confusingly, there is also some limited evidence that precipitation decreased between 1960 and 2003. The glaciers on Mount Kenya in the country's mountainous region are shrinking and are expected to disappear completely in the next 30 years.[54] This affects water resources in both the surrounding area and areas downstream and has an adverse knock-on effect on biodiversity.

Since 1960, average temperatures across the country have increased by a range of between 0.02°C and 0.25°C per decade. The average number of hot days per year went up by approximately 15.6 percent between 1960 and 2003 (rate of increase being highest in March to May).[55] Nighttime temperatures (daily minimal) show a widespread decrease in cool nights and an increase in warm nights.

Droughts and extreme weather events in Kenya are often linked to El Niño and La Niña events. The El Niño Southern Oscillation (ENSO) has always had an impact on Kenya's weather patterns, with droughts often coinciding with El Niño activity. However, more recent experiences suggest these droughts are becoming more severe. For example, the 2015/16 El Niño event resulted in a major drought across the country, leaving around 3.4 million without enough to eat and an estimated 500,000 people without access to water.[56] The mechanisms that drive the ENSO phenomenon are complex and not fully understood. Yet, the most recent research suggests that increases in global temperature will intensify ENSO impacts on wind patterns, cloud cover, atmospheric temperature, and precipitation.[57]

Changes in weather patterns threaten livelihoods in northern Kenya and other areas. In the recent past, the magnitude and severity of drought has increased, particularly in the ASALs, which comprise almost 90 percent of Kenya's total land mass. The changes in temperature and rainfall also have a negative impact on the integrity of natural ecosystems, a situation made worse by human factors, such as changes in land use, overgrazing, and a rising population. As a result of these changes the rate of biodiversity loss is high with some species threatened with extinction.

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53 The data in this section, unless referenced otherwise, is drawn from: DECC. 2016. *Climate: Observations, Projections and Impacts—Kenya.*

54 Prinz et al. 2018. *Mapping the Loss of Mt. Kenya's Glaciers: An Example of the Challenges of Satellite Monitoring of Very Small Glaciers.*

55 McSweeny et al. 2010. *UNDP Climate Change Country Profile—Kenya.*

56 NDMA. 2017. *Long rains assessment report.*

57 Fasullo et al. 2018. *ENSO's Changing Influence on Temperature, Precipitation, and Wildfire in a Warming Climate.*



Severe droughts are becoming more frequent.

A majority of Kenya's public who have heard of climate change consider it to be a real problem that is already affecting their lives. A 2019 Afrobarometer survey found that 65 percent of Kenyans are aware of climate change.[58] More than half of these believe that agriculture is suffering because of climate change and that the changing climate is already having an impact on how they live today (Box 1.)

BOX 1. Public perceptions of climate change in Kenya

People in Kenya who have heard of climate change believe:

- Climate change will affect the weather negatively, and that it is caused by human activity.
- Climate change is affecting their lives already, and some say it is affecting them "a lot."
- They can do something about it.

Source: Selormy et al. 2019.

Climate projections

Climate change projections[59] suggest both temperatures and precipitation will increase by 2100. Projections indicate temperature increases across Kenya of around 1°C by the 2020s and up to 3°C by 2100.[60] However, under some high emission scenarios these projections go even higher (see Figure 8). These temperature increases will be accompanied by a rise in the number of heat waves (see Figure 9). Precipitation is projected to increase by over 20 percent by the end of the century, and this is likely to be accompanied by an increased flood risk[61] (see Figure 10) with a 10 percent increase in 1:10 year floods.[62] There is good agreement across various climate models for these precipitation projections.

58 Selormy et al. 2019. *Climate Ahead—Experience and Awareness of Climate Change in Africa.*

59 Assessed against the IPCC's A1B scenario: assumes an integrated political world combined with economic growth, global population peaking mid-century, the introduction of new and more efficient technologies, and a balance between fossil and non-fossil fuels.

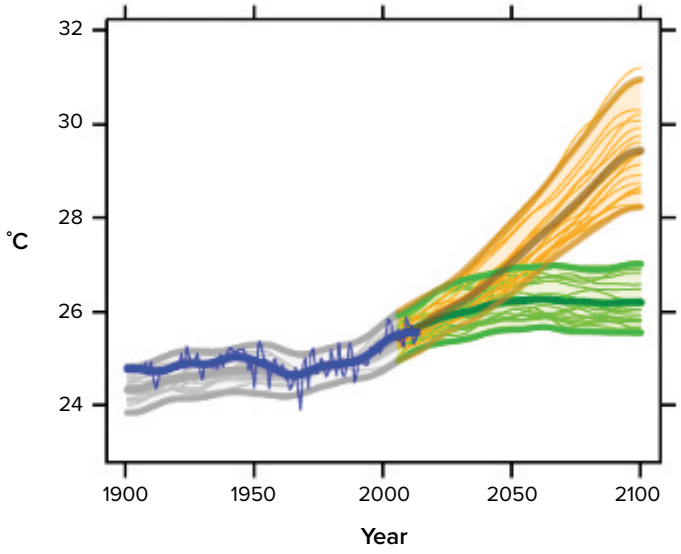
60 World Bank. 2019a. *Climate Change Knowledge Portal—Kenya*.

61 Parry et al. 2012. *Climate Risks, Vulnerability and Governance in Kenya: A review.*

62 NEMA. 2015. *Second National Communication to the United Nations Framework Convention on Climate Change.*

Climate projections also suggest a gradual decline in crop yields. Several regional and national studies suggest climate change will lead to declining yields across east Africa, especially for important staples such as maize and beans.[63] Currently, Kenya has moderately high levels of undernourishment. The implication of these studies is that the country could face increasingly serious food security challenges over the next 40 years.

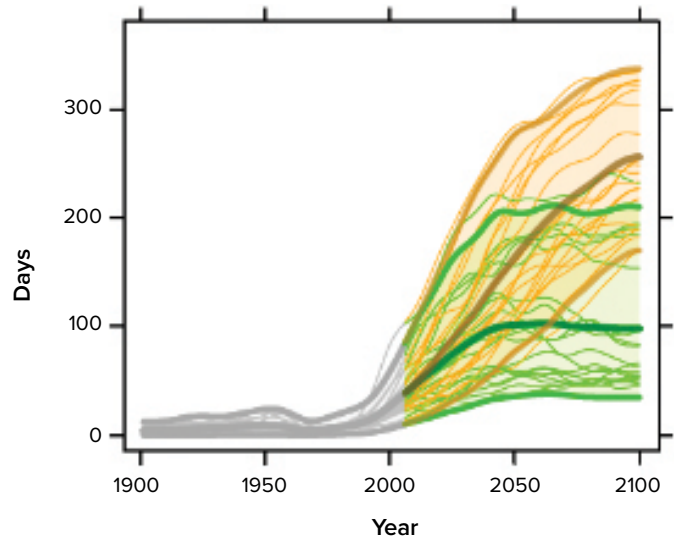
FIGURE 8. Mean annual temperature



Under a high emissions scenario (**brown**) mean annual temperature is projected to rise by 4.5°C from 1990 to 2100. If global emissions decrease rapidly (**green**), the temperature rise is limited to about 1.2°C. (**Blue** shows the actual temperatures to 2016).

Source: WHO. 2016a.[64]

FIGURE 9. Days with hot spells (heat waves)



Under a high emissions scenario (brown), warm spells are projected to increase from about 10 days in 1990 to about 250 days in 2100. If emissions decrease rapidly (**green**), the days of warm spell are limited to about 95.

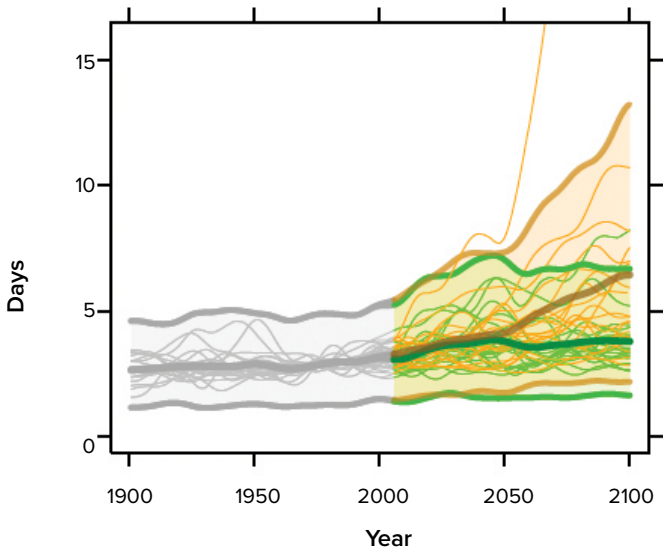
Source: WHO. 2016a.

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63 For example: Arnell et al. 2010. *Simulation of avoided impacts on crop productivity and food security;* Fischer. 2009. *World Food and Agriculture to 2030/50: How do climate change and bioenergy alter the long-term outlook for food, agriculture and resource availability?;* Lobell et al. 2008. *Prioritizing climate change adaptation needs for food security in 2030.*

64 WHO. 2016a. *Climate and Health Country Profile—2015: Kenya.* Using analysis by the Climatic Research Unit and Tyndall Centre for Climate Change Research, University of East Anglia. Model projections are from CMIP5 for RCP8.5 (high emissions) and RCP2.6 (low emissions). Model anomalies are added to the historical mean and smoothed.

FIGURE 10. Days with extreme rainfall (flood risk)



Under a high emissions scenario (**brown**), days with very heavy rainfall (20 mm or more) could double (an increase of around 3 days) from 1990 to 2100, increasing the risk of floods. Some models imply an even greater risk. If emissions decrease rapidly (**green**), the increased risk is much reduced.

Source: WHO. 2016a.[65]



Maize is a staple food for most Kenyans.

65 WHO. 2016a. *Climate and Health Country Profile—2015: Kenya.*

It is important to increase water storage infrastructure to help manage the impact of future climate change on the country's crops, and to protect food security. Although Kenya already carries a high level of water risk across all parts of the country, it is unclear whether this will become worse over the next decades, and large uncertainties remain in projections of future water stress and drought.[66] However, limited water storage infrastructure is already a limiting factor on crop production. As a result, this is a vital investment needed to address the adverse impacts of climate change over the coming decades.

Climate change is also reducing agricultural production and food insecurity is on the rise. Erratic rainfall, reduced soil productivity through erosion and the prevalence of pests and diseases have already created a much shorter food insecurity cycle. Kenya's drought and food insecurity cycle shrank rapidly from every 20 years in the 1980s to now being almost an annual event. The latest drought started in 2016 and is still ongoing in 2019. In 2017, the Government of Kenya (GoK) declared the drought a national disaster, and there are currently an estimated 3.5 million people in need of "acute" emergency food relief.[67]

What the future may hold

It is difficult to provide exact forecasts for the economic impacts of climate change because of the levels of uncertainty associated with all projections. However, some recent studies have suggested that the annual GDP losses linked to adverse weather are already high and will be even higher in the future. A 2009 study estimated that Kenya was losing approximately 2 percent of GDP every year due to weather-related events.[68] By 2030, it is suggested that the impacts of climate change will cost the equivalent of 2.6 percent of Kenya's annual GDP, with severe consequences for both the environment and the wider economy.[69]

Climate change also leads to a rise in global sea levels and ocean temperatures, with implications for the increased frequency of coastal flooding and the intensity of storms. By 2030, coastal flooding associated with rising sea levels is projected to affect 10,000–86,000 Kenyans. In addition, sea-level rise is expected to contribute to the loss of coastal wetlands and coastal erosion. By 2030, the annual economic cost of sea-level rise is projected at US$7 million–US$58 million. By 2050 it is projected to be closer to US$31 million–US$313 million per year.[70]

The increased risk of drought and persistent vulnerability of the poor are also likely to have serious impacts on development. During drought, common mobility and migration strain both the environment and its services to the communities. Increased risk of drought also negatively affects Kenya's wildlife, which in turn hinders tourism. Drought also reduces water supply and hydroelectric power generation.

Over the medium- to longer-term, climate change will also result in slow onset changes that threaten both agricultural and pastoralist production systems. In higher potential agricultural areas, changes in cropping patterns and land husbandry practices will be required to adjust to changes in weather conditions. In ASAL areas, which present challenging environments under current weather patterns, the impacts will be more severe. An increase in the frequency and severity of drought periods will reduce the quality of pastures and the availability of both fodder and surface water sources. This will threaten the sustainability of pastoralism, the current mainstay livelihood of a large proportion of the ASAL population.

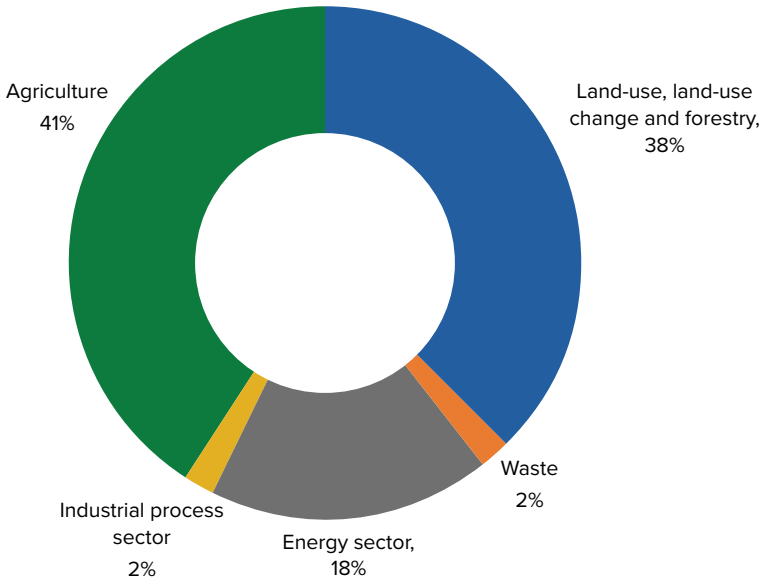
66 DECC. 2016. *Climate: Observations, Projections and Impacts—Kenya.;* Arnell et al. 2010. *Simulation of avoided impacts on crop productivity and food security.*
67 IFRC. 2019. *Emergency Plan of Action Final Report—Kenya: Drought Appeal.*
68 SEI. 2009. *The Economics of Climate Change in Kenya: Final Report.*
69 Parry et al. 2012. *Climate Risks, Vulnerability and Governance in Kenya: A review.*
70 SEI. 2009. *The Economics of Climate Change in Kenya: Final Report.*

GREENHOUSE GAS (GHG) EMISSIONS

Kenya's total GHG emissions in 2013 was a relatively low 60.2 MtCO2e,[71] roughly 0.13 percent of the world's total, with agriculture the country's biggest emission source. The World Resources Institute's Climate Analysis Indicators Tool (WRI CAIT), a widely used measure, and GoK's figures in the 2nd National Communication to the United Nations Framework Convention on Climate Change (UNFCCC)[72] disagree on the amount that land use change and forestry (LUCF) contributes to carbon sequestration (the process of absorbing carbon dioxide emissions).

WRI CAIT suggests that LUCF activities are a sink, removing nearly half of Kenya's emissions in 2013. However, GoK's inventory for 1995–2010 figures show LUCF as a source of emissions. One of the complications is the role that forests have in absorbing carbon versus the role that agriculture has as a large source of GHG emissions (see Figure 11). GoK's figures also tally with Kenya's loss of forest cover during the same period.[73] These differences mainly reflect different assumptions underlying the methodologies used and both WRI CAIT and GoK figures agree that agriculture is the largest source of GHG emissions.

FIGURE 11. Relative distribution of major emissions by sector in 2000



Source: NEMA. 2015.[74]

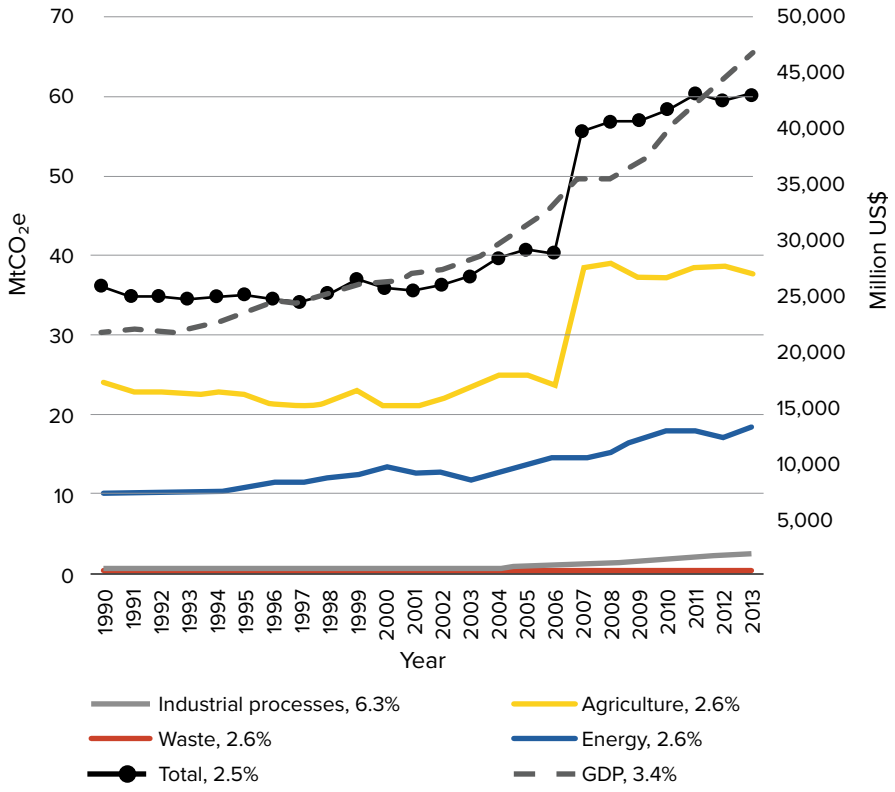
Kenya's Nationally Determined Contribution (NDC) commits to keeping GHG emissions to 30 percent below 'business-as-usual' by 2030. (See chapter on Policies, laws and institutions for more detail on Kenya's NDC). Population growth and economic development are projected to lead to emissions rising to 140 MtCO2e in 2030 under business as usual.[75] Plans to mitigate this include a major push to installing geothermal electricity generation, supported by private sector investment. However, this target has been superseded by a more ambitious National Energy Policy (NEP).[76] While it does include the construction of coal-fired power stations,[77] it also aims to reduce emissions through a combination of energy efficiency gains, adopting clean coal technology and building carbon credits from expanding renewable energy sources, traded through the clean development mechanism.

Further investments in low emission projects, capacity building, and appropriate mitigation technologies are needed to meet Kenya's 30 percent emission reduction target by 2030. Currently, Kenya's GHG emissions track GDP (see

71 See CAIT—WRI's Climate Data Explorer: https://www.wri.org/resources/websites/cait
72 NEMA. 2015. *Second National Communication to the United Nations Framework Convention on Climate Change.*
73 See CAIT—WRI's Climate Data Explorer: https://www.wri.org/resources/websites/cait
74 NEMA. 2015. *Second National Communication to the United Nations Framework Convention on Climate Change.*
75 NEMA. 2015. *Second National Communication to the United Nations Framework Convention on Climate Change.*
76 GoK. 2015a. *National Energy and Petroleum Policy, Final Draft.*
77 With a capacity of nearly 2 GW in the near future and up to 4 GW coal-fired capacity by 2030.

Figure 12). This implies that proposed mitigation actions are likely to be inadequate to meet the ambitious emissions target because anticipated economic growth will add further emissions, especially from the transport and energy sectors.[78]

FIGURE 12. Trends in GHG emissions



Source: USAID, 2017, based on WRI. 2017. CAIT 2.0.[79]

KENYA'S NATIONAL DISASTERS RISK

Most natural disasters in Kenya result from extreme climatic events, primarily droughts and floods. Droughts typically affect all of Kenya—floods are usually more localized but often have higher fatalities.[80] Landslides can also have significant social and economic impacts causing loss of life, destruction of agricultural land and crops, and damage to infrastructure. Figure 13 shows how drought has impacted more people than floods and how the numbers have risen substantially over the last 20 years or so.

Climate change exacerbates an existing combination of hazards faced by Kenya's communities. These hazards include poverty, aridity, settlement in areas prone to perennial flooding, settlement in areas with poor housing (with or without poor infrastructure), and poor services. Combined with the effects of a changing climate, these existing vulnerabilities increase the impacts of natural disasters.

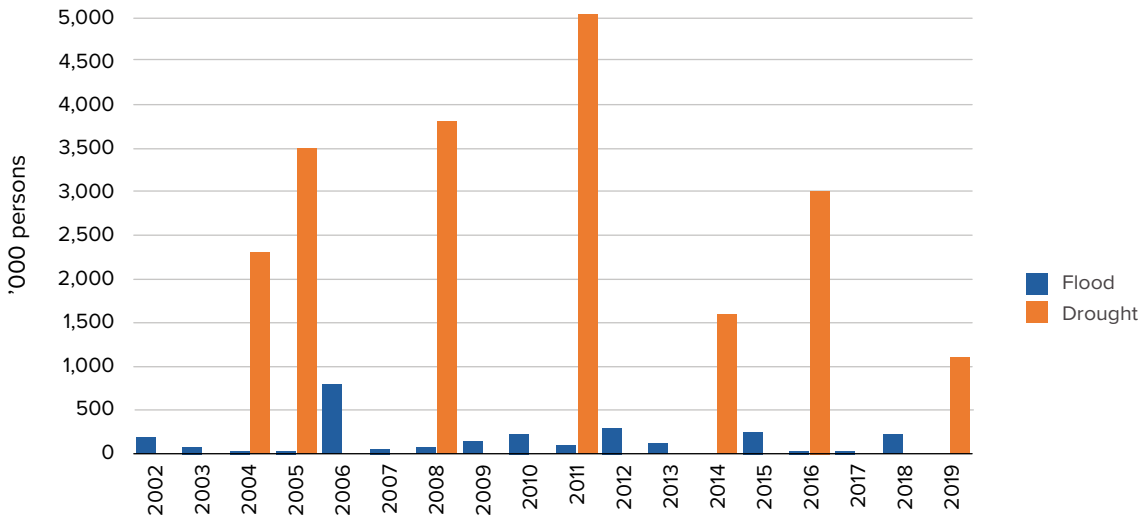
The pressure of an increasing human population further intensifies the impacts of floods, droughts, and landslides. People are often forced to settle in areas that have been designated as flood prone, or on steep slopes where cultivation tends to increase the community's vulnerability to landslides.

78 Suswatch. 2017. *Promoting the Implementation of the Paris Agreement in East Africa, with a Focus on Pro-Poor Low Emissions Development—Kenya National Baseline Study.*

79 USAID. 2017. *Greenhouse Gas Emissions in Kenya;* CAIT: https://www.wri.org/resources/websites/cait

80 See *EM-DAT: The International Disaster Database:* http://www.emdat.be/

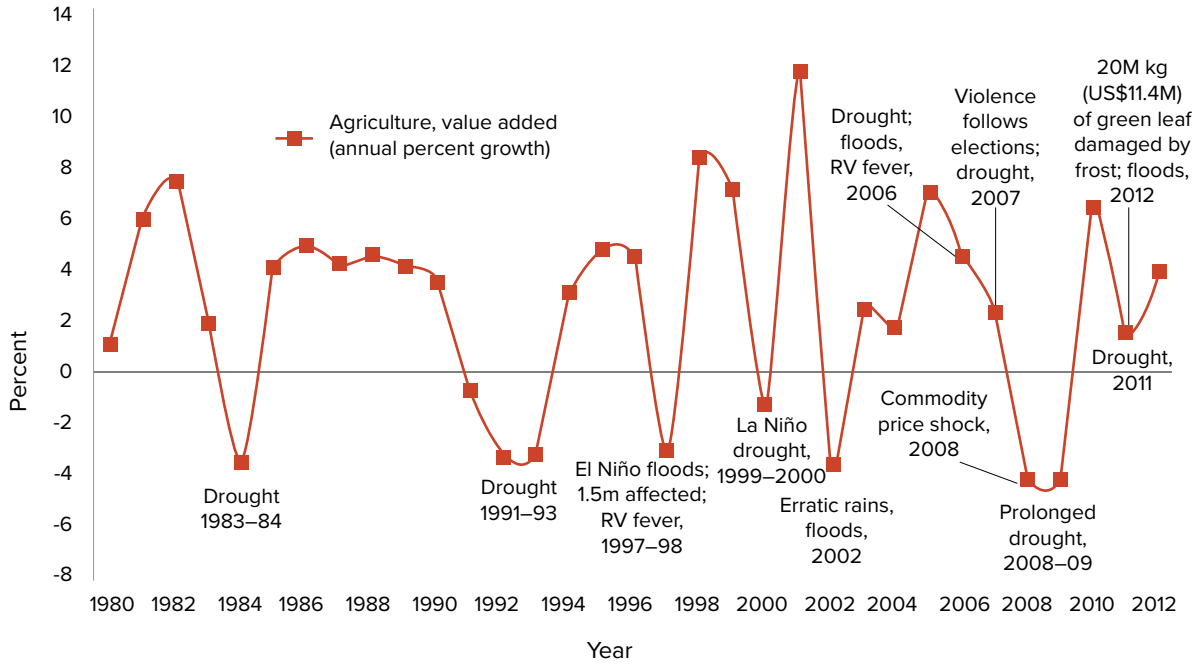
FIGURE 13. People affected by floods and droughts in Kenya, 1971–2016



Source: CRED. 2019.[81]

In the last decade, regular droughts, floods, and landslides have been a recurring theme in Kenya's agricultural market. The large agriculture sector and small average farm size increase the risks from such meteorological and hydrological events. Figure 14 illustrates how weather-related shocks have impacted agricultural production since 1980. The increased risk limits the expansion of the sector and sustainable growth over time. The implications of future climate-related natural disasters are expected to increase in severity and cost. The continuing expansion of irrigation practices and additional flood control measures could mitigate these costs. Figure 15 shows the areas that are most at risk of droughts and floods.

FIGURE 14. Historical timeline of major agricultural production shocks in Kenya, 1980–2012

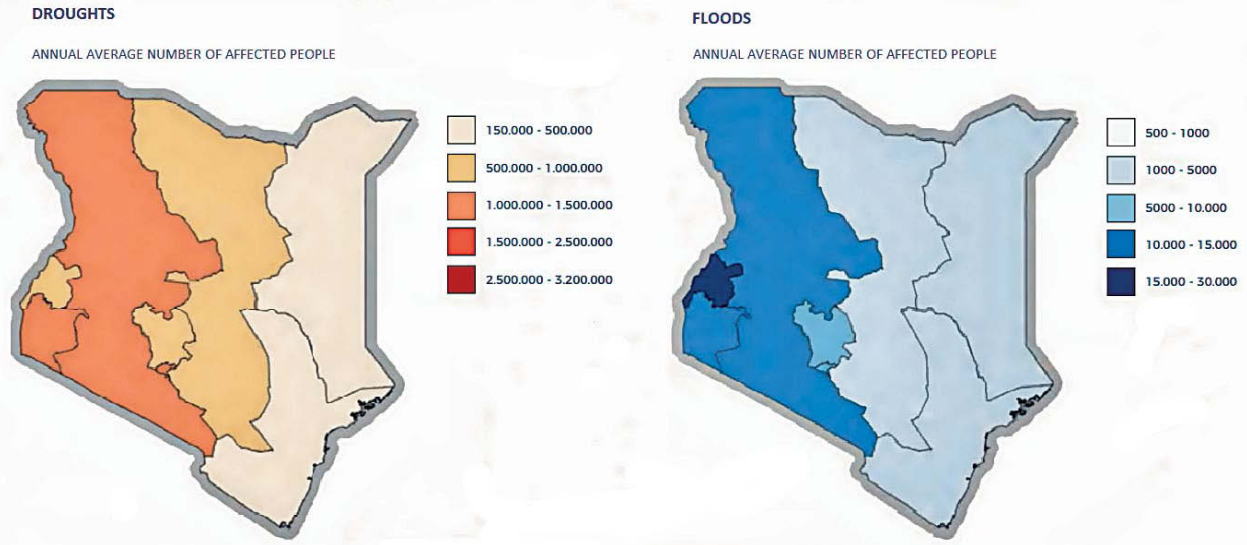


Source: D'Alessandro et al. 2015.[82]

81 See *EM-DAT: The International Disaster Database:* http://www.emdat.be/

82 D'Alessandro et al. 2015. *Kenya Agricultural Risk Assessment.*

FIGURE 15. Geographic distribution of droughts and floods on Kenyan population



Source: UNISDR and CIMA. 2018.[83]

The National Climate Change Action Plan (NCCAP) notes that climate change has already increased the incidences of droughts and floods.[84] Climate change is expected to increase the frequency, intensity, and magnitude of extreme weather events. Impacts of these changes in weather patterns, including the increased incidence of malaria and other disease epidemics, are already evident. An increasing frequency of weather-related disasters will result in increased numbers of lives lost and disrupted livelihoods—with the poor bearing the brunt of these impacts. Table 1 shows the climate risks and the resulting vulnerabilities.

TABLE 1. Climate risks and sources of vulnerability

Climate Risks	Sources of Vulnerability
● Rising temperatures. ● Uncertain changes in rainfall patterns. ● Rising sea levels and stronger storm surges. ● Greater risk of extreme weather events (droughts, floods, and landslides). ● Melting glaciers. ● Ocean acidification.	● High levels of multi-dimensional poverty, particularly in the ASALs. ● Gender inequality. ● Environmental degradation, including loss of forest cover. ● High reliance of the national economy and local livelihoods on rain-fed agriculture. ● High level of water scarcity and mismanagement of water resources. ● Insecure land tenure and land fragmentation. ● Population growth and migration to urban areas. ● Heavy disease burden and limited access to quality health care, particularly in rural and remote areas.

Source: GoK. 2018a.[85]

83 UNISDR and CIMA. 2018. *Kenya Disaster Risk Profile.*
84 GoK. 2018a. *National Climate Change Action Plan 2018–2022.*
85 GoK. 2018a. *National Climate Change Action Plan 2018–2022.*

Droughts

Drought periods are becoming more frequent. Historically, in Kenya, major droughts have occurred approximately every 10 years and moderate droughts or floods occur every 3 to 4 years.[86] Over the last two decades (1990–2010), droughts and floods have been more frequent and are more intense (Figure 14).

The combination of an increased risk of drought and the persistent vulnerability of the poor is likely to have serious impacts on development. During drought, crop and livestock losses reduce food and livelihood security, and normal mobility patterns and distress migration strain both the environment and its services to communities. Increasing frequency and intensity of droughts also have a negative effect on Kenya's wildlife, which in turn harms tourism. Finally, drought reduces water supply and hydroelectric power generation.

BOX 2. The human and financial costs of droughts

Kenya has already suffered huge economic and human losses as a result of natural disasters. For example, during a La Niña event in 1998–2000, a drought considered the worst in 40 years harmed large numbers of people in the Central, Rift Valley, Coast, and NNE provinces.[87] The resulting reduction of industrial production, reduced hydropower generation, and lost crops and livestock cost approximately US$2.8 billion.[88]

Poor rains in 2006 caused the loss of approximately 70 percent of livestock in the NNE counties and led to nearly 3.5 million people requiring food aid and other humanitarian assistance.[89] Between 2008–11, another major drought affected 3.7 million people with total losses of approximately US$12 billion.[90] Most of the economic burden fell on the livestock sector, which carried 72 percent of the total impact of the drought (Figure 16).

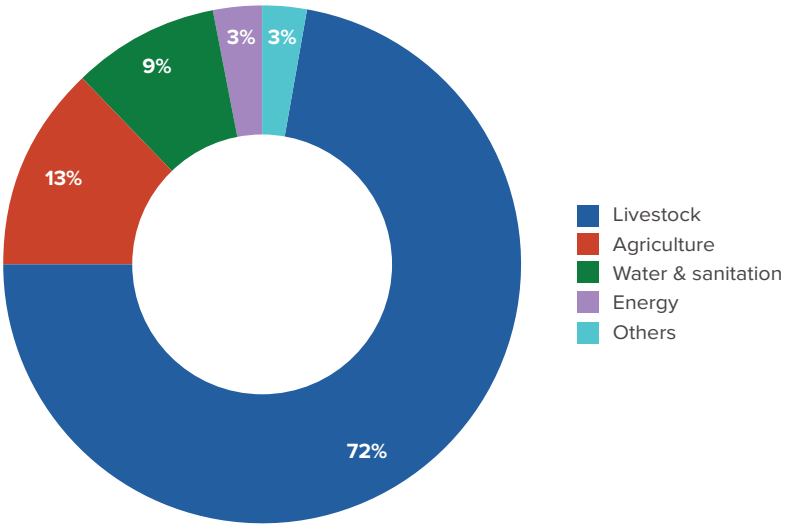
In 2016, a severe drought hit Kenya's ASAL counties, again attributable to a La Niña event. This recent drought left 2.7 million people (including 1.1 million children) food insecure and 2.6 million people in need of WASH assistance.[91]

ASALs are particularly hard hit by drought because droughts reduce the availability of forage, increase disease incidences, and break down marketing infrastructure. Droughts are a common experience for ASAL areas, and local pastoralist communities have developed various strategies for managing their livestock through droughts and restocking once a drought has ended. The Turkana tribe, who live in the north-west of Kenya, even give droughts a name by the impact they cause. For example, the 1960 drought was called 'Namator'. This means 'bones exposed' in English and referred to the high number of animals who died.[92]

However, the increasing frequency with which droughts are now occurring undermine these traditional coping strategies. For example, in the last decade alone the Turkana have suffered four serious droughts causing significant livestock losses and forcing many families into poverty.

86 Parry et al. 2012. *Climate Risks, Vulnerability and Governance in Kenya: A Review.*
87 SEI. 2009. *The Economics of Climate Change in Kenya: Final Report.*
88 Mogaka et al. 2006. *Climate Variability and Water Resource Degradation in Kenya: Improving Water Resources Development;* SEI. 2009. *The Economics of Climate Change in Kenya: Final Report.*
89 Parry et al. 2012. *Climate Risks, Vulnerability and Governance in Kenya: A Review.*
90 ACP-EU. 2017. *Kenya: Post Disaster Needs Assessment.*
91 UNICEF. 2017. *2017 Drought in Kenya.*
92 See: http://old.worldagroforestry.org/downloads/Publications/PDFS/NL06291.pdf

FIGURE 16. Cost of 2008–2011 drought to Kenya—by sector



Source: PDNA. 2012.

The social consequences of drought can be substantial. In pastoralist communities, these consequences include undermining the social position of households, breaking up families, damaging social safety nets, and increasing vulnerability to future food insecurity, as well as increasing the likelihood of conflict. In addition, the projected increasing severity and frequency of droughts will only aggravate this situation.

Floods

Extreme rainfall events can often lead to water pollution, soil erosion, dams bursting, outbreaks of waterborne disease, crop losses, and food insecurity. They cause environmental degradation; destroy homesteads; and disturb normal economic production, distribution of goods, and food harvests. In its most immediate form, flooding can inundate farms and villages and disrupt transportation networks, ultimately wreaking havoc on food security and market distribution systems.



Flooding disrupts transport networks.

Floods also contribute to the health burden on the population. Stagnant floodwater causes both bacterial and vector-borne diseases, which result in high incidence of morbidity with consequent loss of alternative employment opportunities. Flooding is associated with diseases such as malaria, typhoid, and bilharzia (*schistosomiasis).*

Flooding is worse in the narrow tropical belt along the Indian Ocean, as seen in the natural hazard map of Kenya (Figure 15). However, in addition to the coastal counties, floods also seasonally affect parts of western counties, especially around the Lake Victoria basin, as well as the Tana River basin in the east.[93]

BOX 3. The human and economic impact of floods

The 1997–98 floods during an El Niño event affected approximately 1 million people and resulted in an economic loss of US$0.8 billion–1.2 billion in damaged infrastructure, public health impacts, and crop losses.[94] Only around 13 percent (US$100 million) of the damaged infrastructure has been replaced, illustrating floods' long-term negative impact on Kenya's development.[95] Changes in natural flood protection, such as deforestation and floodplain alterations, have made these extreme events worse and exacerbate the resulting economic losses.

Floods severely hamper development, increasing the vulnerability of rural societies. Due to poverty, lack of education, and poor rural infrastructure, rural populations are the most vulnerable to floods and post-flood consequences. In 2018, Kenya experienced an extreme rainfall event that killed at least 186 people, affected 40 out of 47 counties, displaced at least 300,000 people and had an impact on at least 800,000 people.[96]

Landslides

Landslides are a significant hazard in Kenya. A combination of population pressures and poverty has resulted in significant numbers of people living and cultivating on steep slopes. Living and working in these vulnerable locations puts them at greater risk of death and injury. Unfortunately, weak institutional capacity limits the authorities' ability to enforce the regulations to stop people settling in flood- and landslide-prone areas. Landslides also destroy wildlife habitats, and this leads to loss of biodiversity. This loss of habitat extends not only to land-based species but also to fish dependent on stream access and water quality for breeding and as a food source.

Landslides happen most during heavy rains in densely populated regions, such as the Central Highlands. Landslides are triggered by rapid saturation of the soil, which in turn reduces cohesion, surface tension, and friction. During the El Niño rains in the first quarter of 2016, major landslides and loss of life were reported in Central and Western Kenya.

DISASTER RESPONSE AND RISK MANAGEMENT

Effective emergency and disaster response and preparedness are important for achieving the goals of Vision 2030 and the Sustainable Development Goals. Kenya's 2009 National Policy for Disaster Management[97] (NPDM) states that the country's disaster profile is dominated by droughts, fires, floods, terrorism, technological accidents, diseases, and epidemics. These disasters disrupt people's livelihoods, destroy infrastructure, divert planned use of resources, interrupt economic activities, and retard development.

93 Parry et al. 2012. *Climate Risks, Vulnerability and Governance in Kenya: A Review.*

94 SEI. 2009. *The Economics of Climate Change in Kenya: Final Report.*

95 Mogaka et al. 2006. *Climate Variability and Water Resource Degradation in Kenya: Improving Water Resources Development.*

96 Kilavi et al. 2018. *Extreme Rainfall and Flooding over Central Kenya Including Nairobi City during the Long-Rains Season 2018: Causes, Predictability, and Potential for Early Warning and Actions.*

97 GoK. 2009. *Draft National Policy for Disaster Management in Kenya.*

In recent years, GoK has made technological advances in predicting drought and in developing early warning systems. It has recognized the growing threat of climate-related risks, and in response, has improved its capacity to prevent, manage, and recover from disasters. The impacts of the 2014–16 El Niño event, one of the three strongest since 1950, were not as profound as in 1997/98 due to improved early warning systems which triggered advance planning.

Even though positive steps have been taken, the challenge of providing an effective response is becoming more urgent. The limited technological resources and the low-income nature of the affected populations leave many highly exposed and vulnerable to natural disasters. In addition, this is made worse by the increasing intensity of the seasonal rains due to climate change. Most recently, in 2018, the March to May rain season was the heaviest for 55 years and caused significant flash floods, and riverine and coastal flooding. In many previously drought-affected areas, the compacted soil was unable to absorb the rain. This flooding resulted in significant soil erosion and nutrient leaching of cropland.

There is evidence too that Kenya's disaster risk management is ineffective in practice.[98] A recent political economy study of Kenya's preparedness identified a range of factors that frustrate Kenya's attempts to deal with disaster risk management. These include a lack of political will, limited stakeholder engagement, too many demands from other priorities, and no political championship. See Box 4.

BOX 4. The governance and legal frameworks guiding disaster preparedness

'Ad hoc and knee-jerk system (reactive) not proactive; on paper we look like we are doing something but in practice this is not true.' (International nongovernmental organization (NGO))

'We are averagely prepared. We don't have a body coordinating. We are fragmented, we need one disaster institution. We don't have a policy.' (United Nations Agency)

'Attempts to make preparation plans are conceptual and theoretical. But in practice this is not in place.' (National government ministry).

Source: Development Initiatives. 2017.

To anticipate floods and mitigate their impacts on the population, the national and county governments require comprehensive up-to-date information describing hydrologic conditions. The Kenya Meteorological Department considers the available ground-based measurements of stream flow and rainfall inadequate to provide the basis for a comprehensive hydrological monitoring strategy. In addition, further potential solutions include developing disaster-proof infrastructure development in the ASALs, investing in sustainable livelihoods adaptive to climate change (such as crop farming with drought-resistant seeds, dryland forestry, and community-based livestock systems), and implementing public awareness programs.

CLIMATE CHANGE POLICIES AND INSTITUTIONS

GoK has a range of policies, strategies, plans, and financing mechanisms that integrate climate change into wider government programs. The Ministry of Environment and Forestry (MoEF) leads GoK's climate change policies and implementation. The National Climate Change Response Strategy (NCCRS) was launched in 2010.[99] This was followed by the National Climate Change Action Plan (NCCAP), 2013–2017[100] (revised and updated as NCCAP II, 2018–2022),[101]

98 Development Initiatives. 2017. *Assessment of Kenya's Preparedness to Disasters caused by Natural Hazards.*
99 GoK. 2010. *National Climate Change Response Strategy.*
100 GoK. 2013a. *National Climate Change Action Plan 2013–2017.*
101 Most recent drafts of NCCAP II can be downloaded from: the Kenya Climate Change Portal: http://www.kcckp.go.ke/nccap-ii-2018-2022-2/

which is aimed at implementing the NCCRS and sets out a range of low-carbon and resilient development pathways for the country. Further policies that directly address climate adaptation and mitigation actions are the Climate Change Act, 2016[102] and the Green Economy Strategy and Implementation Plan 2016–2030.[103] More localized detail is provided in the Kenya National Adaptation Plan (NAP) 2015–2030.[104] Access to climate finance is covered in the National Climate Finance Policy.[105] All these documents are derived from Kenya Vision 2030, the country's long-term development blueprint.

There is a strong analysis of Kenya's climate change challenges and responses presented in Kenya's Second National Communication (SNC)[106] and Nationally Determined Contribution (NDC).[107] Both of these important documents were submitted to the United Nations Framework Convention on Climate Change (UNFCCC) in 2015. The SNC summarizes the main climate challenges Kenya faces, while the NDC sets out actions to address mitigation and adaptation, along with ways of mainstreaming climate change into future medium-term plans.



Solar power helps reduce emissions and low-cost, household level options are available.

102 GoK. 2016a. *Climate Change Act.*
103 GoK. 2016b. *Green Economy Strategy and Implementation Plan 2016–2030.*
104 MENR. 2016a. *Kenya National Adaptation Plan.*
105 GoK. 2018b. *National Climate Finance Policy.*
106 NEMA. 2015. *Second National Communication to the United Nations Framework Convention on Climate Change (UNFCCC).*
107 MENR. 2015. *Kenya's Intended Nationally Determined Contribution (INDC).*

Kenya established a National Climate Fund in 2016 as the key mechanism for raising and allocating finance for climate change activities from development partners (and potentially domestic bodies). The fund is managed by the National Climate Change Council. The National Environment Management Authority (NEMA) also administers the UNFCCC's Adaptation Fund and Green Climate Fund. In addition, a range of initiatives financed by international sources (such as the Global Environmental Facility (GEF), the Adaption Fund and the World Bank are now in place.[108] See Annex 2.

Disaster response management is guided by the recently approved National Disaster Risk Management Policy.[109] This policy was approved in 2018. The policy is benchmarked against global best practices in disaster risk management. It lays down strategies for ensuring GoK commits itself to enhancing research on disasters and formulating risk reduction strategies.

Disaster risk management and response is led by the National Disaster Management Unit (NDMU) formed in 2013. The NDMU has established Standard Operating Procedures based on best practices and formulated the National Emergency Disaster Plan (2014). Overall, disaster risk management falls under the mandate of the Directorate of Special Programmes under the Ministry of Devolution and Planning, with some disaster response functions under the Ministry of Interior and Coordination of National Government.[110]

WAY FORWARD

1. **Invest in Kenya's weather and climate services capacity to improve flood and weather forecasting and develop more effective early-warning systems for disaster management.** Responses to extreme weather events and efforts to build longer-term adaptation approaches are hampered by the limited quality of climate information.
2. **Establish fully-fledged disaster management operation centers at county level.** Effective early warnings and disaster management require full-functioning local-level coordination.
3. **Continue to provide finance and technical support for climate smart agriculture (CSA).** A major adaptation imperative is to transform agricultural practices toward 'climate smart' approaches that address both the challenges of adapting agriculture to changing weather patterns and also reduce emissions from agriculture where possible. Current initiatives supporting CSA should be sustained and increased. It is imperative that Kenya maintains and increases food production levels in the face of climate change. For some farm households, the changing climate will reduce the biophysical and financial viability of farming. Supporting a shift to CSA must include supporting some farm households to move out of farming into other means of livelihood.
4. **Improve the planning and design of buildings, roads, and bridges to take account of climate impacts.** Appropriate design standards can protect against the damage caused by extreme weather. 'Climate proofing' is not yet included in building regulations or other infrastructure design regulations for public buildings and other economically important infrastructure.
5. **Improve the design and planning of investments in the transport and energy sectors to prioritize incorporating technologies and approaches that mitigate GHG emissions.** Increases in vehicle numbers caused by economic growth and the planned expansion of coal for energy generation will make it extremely hard for Kenya to achieve its emissions reduction targets. Emission mitigation must become an explicit aspect of national transport and energy sector development.

108 MFA. 2018. *Climate Change Profile—Kenya.*

109 GoK. 2018c. *National Disaster Risk Management Policy.*

110 UNDP website: http://www.ke.undp.org/content/kenya/en/home/operations/projects/DisasterRiskReduction/governance-for-drr-in-kenya-.html

Wealth and natural capital[111]

- Kenya has achieved lower-middle-income status, but wealth per capita has declined by around 10 percent in the last 25 years.
- Natural capital (mainly pasture and cropland) remains an important contributor to Kenya's overall national wealth, providing around 35 percent of wealth per capita.
- The decrease in wealth per capita is mainly due to a slow rate of overall wealth creation combined with rapid population growth.
- Kenya risks developing an unbalanced wealth portfolio, as natural capital's contribution will be constrained without increased investment in produced capital, particularly infrastructure.
- The current methods of calculating Kenya's total wealth are almost certainly an overestimate, because they do not take account of natural capital losses.
- Including assessment of natural capital in national accounts would help identify opportunities for growth through better management of natural capital.

This section explains the methodology used in defining how we measure wealth and what this means in the context of Kenya.

WHY WE MEASURE WEALTH

Current assessments of Kenya's economic performance do not adequately integrate changes in natural capital into political priorities and economic policies and plans. Kenya's economic performance is generally assessed using conventional measures such as the growth of gross national product (GDP). However, this approach does not adequately assess the value of the country's natural capital assets. It also fails to take account of how changes in these assets over time will impact the country's likely economic trajectory. Natural capital constitutes over a third of Kenya's capital asset. For this reason, it is important that economic and political decision making adequately incorporates an assessment of how growth and development trajectories are impacting on, and impacted by, natural capital, both now and in the future.

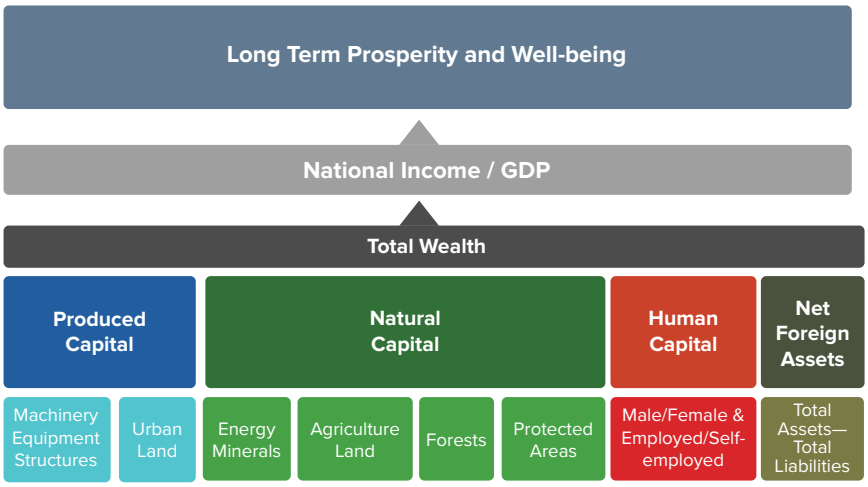
Gross national product (GDP) measures current national income—wealth measures the prospects for generating that income into the future. These are complementary indicators, and both should be measured to provide a more complete picture of national economic health and sustainability. If we want to maintain GDP in the future, we need to maintain the assets that produce it. It is for this reason that we measure wealth—it is a better indicator of sustainability. Figure 17 illustrates how these assets and types of capital come together to form a measurement of total wealth that supports national income and the potential future prosperity and well-being of a country.[112]

National income and well-being are underpinned by a country's assets or wealth—measured comprehensively to include produced capital, natural capital, human capital, and net foreign assets. Viewed through the lens of wealth, development is a process of building and managing a broad portfolio of assets. Although a macroeconomic indicator such as GDP provides an important measure of economic progress, it measures only income and production and does not reflect changes in the underlying asset base. Used alone, GDP may provide misleading signals about the health of an economy over the long term. It does not reflect depreciation and depletion of assets, whether investment and accumulation of wealth are keeping pace with population growth, or whether the mix of assets is consistent with a country's development goals.

111 Most of the content in this section originates from Lange et al. 2018. *The Changing Wealth of Nations 2018: Building a Sustainable Future.*

112 Measuring national wealth and changes in wealth is part of an ongoing effort by the World Bank to monitor the long-term economic well-being of nations. 'The Changing Wealth of Nations 2018' builds on two previous World Bank reports and provides wealth accounts for 141 countries for the period 1995 to 2014. All data are estimated from globally available data sets, such as those provided by the Food and Agriculture Organization of the United Nations (FAO) or the Penn World Tables. They may be less accurate than more detailed information available within a particular country.

FIGURE 17. The assets and capitals that drive wealth and development



Wealth accounts include the following asset categories, all measured in market prices and converted to 2014 U.S. dollars using market exchange rates:

- **Natural capital:**
  - Nonrenewable resources: 14 types of minerals and fossil fuels.
  - Renewable resources: cropland, pastureland, forest timber, forest services (an estimate of non-timber forest products), watershed services, recreation values, protected areas (value estimated as the opportunity cost of converting to agriculture).
- **Produced capital and urban land:** infrastructure, machinery, buildings, equipment, and urban land.[113]
- **Human capital:** measured as the discounted value of earnings over a person's lifetime.
- **Net foreign assets:** the sum of a country's external assets and liabilities.

NATURAL CAPITAL AND DEVELOPMENT

Natural capital is the most important asset for low-income countries, averaging 47 percent of wealth in 2014, and a major part of wealth in lower-middle-income countries too (27 percent). As a 'gift from nature', natural capital has been the most abundant asset available to all countries at one point in their development. At low incomes, economies are largely built around this relatively abundant asset, mainly renewables, forests, and agricultural land. They can only move beyond subsistence production of food and shelter to manufacturing and services with the addition of scarce capital—human capital, infrastructure, and other produced capital.

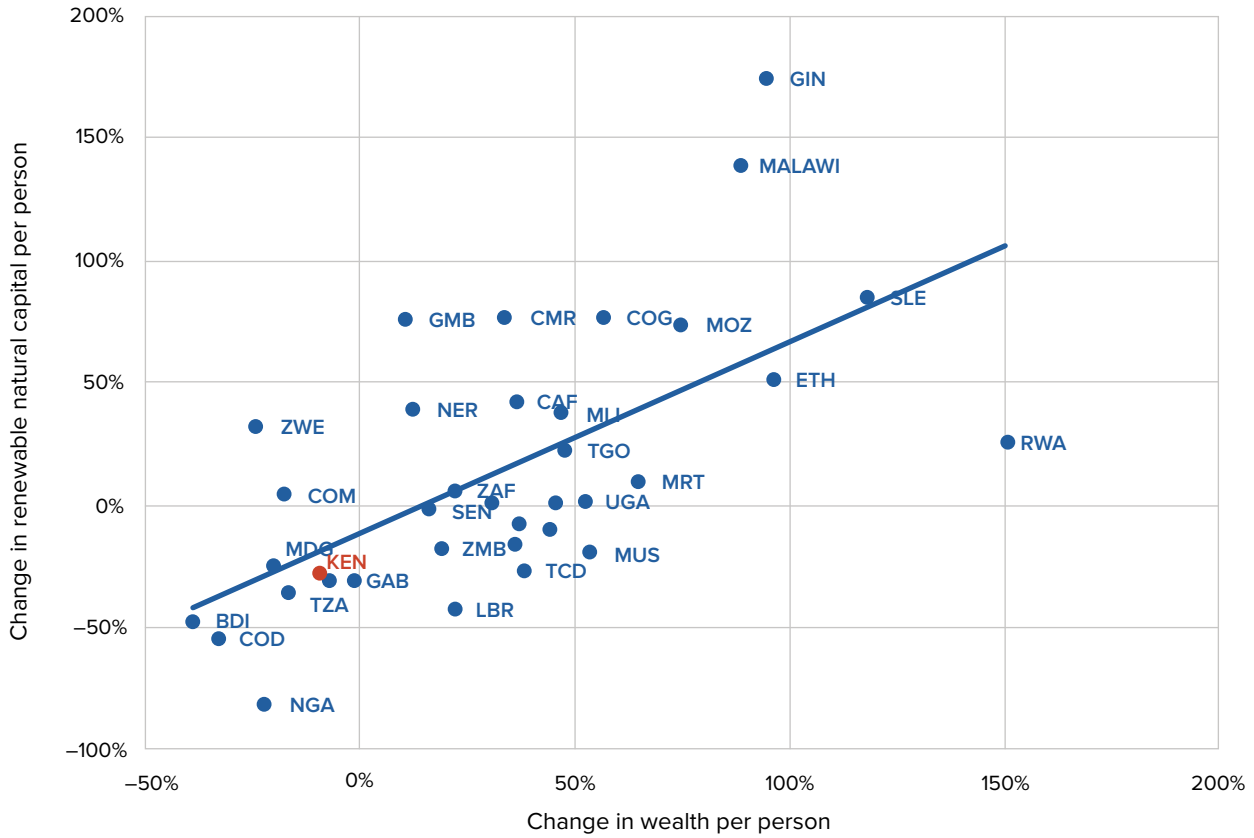
Development is about using natural capital and other assets more efficiently and making sure the management of renewable natural capital is sustainable. It is not about liquidating natural capital to purchase other assets. The value of renewable resources can increase by bringing more land into productive use or by using the resource more productively. Examples of this include improving crop yields and developing nature-based tourism on forest land. Figure 18 shows that on a per capita basis, as renewable natural capital grows, so does the growth of total wealth. Ethiopia, Rwanda, and Mozambique all show this growth of both total wealth and renewables per person. In contrast, Kenya, Burundi, Madagascar, and Tanzania show that total wealth and renewable natural capital both declined. A small number of countries,

113 For brevity, we use the abbreviated term 'produced capital' to include both.



Livestock are a tangible example of how natural capital translates into wealth.

FIGURE 18. Change in wealth vs. renewable natural capital per person in Africa, 1995–2014 (percent)



Source: Calculated from the database from Lange et al. 2018. *The Changing Wealth of Nations 2018: Building a Sustainable Future.*

including Chad and Liberia, achieved growth while depleting renewables. However, the latter two are typically resource-rich countries that depend heavily on nonrenewables and mineral resources for their economic growth.

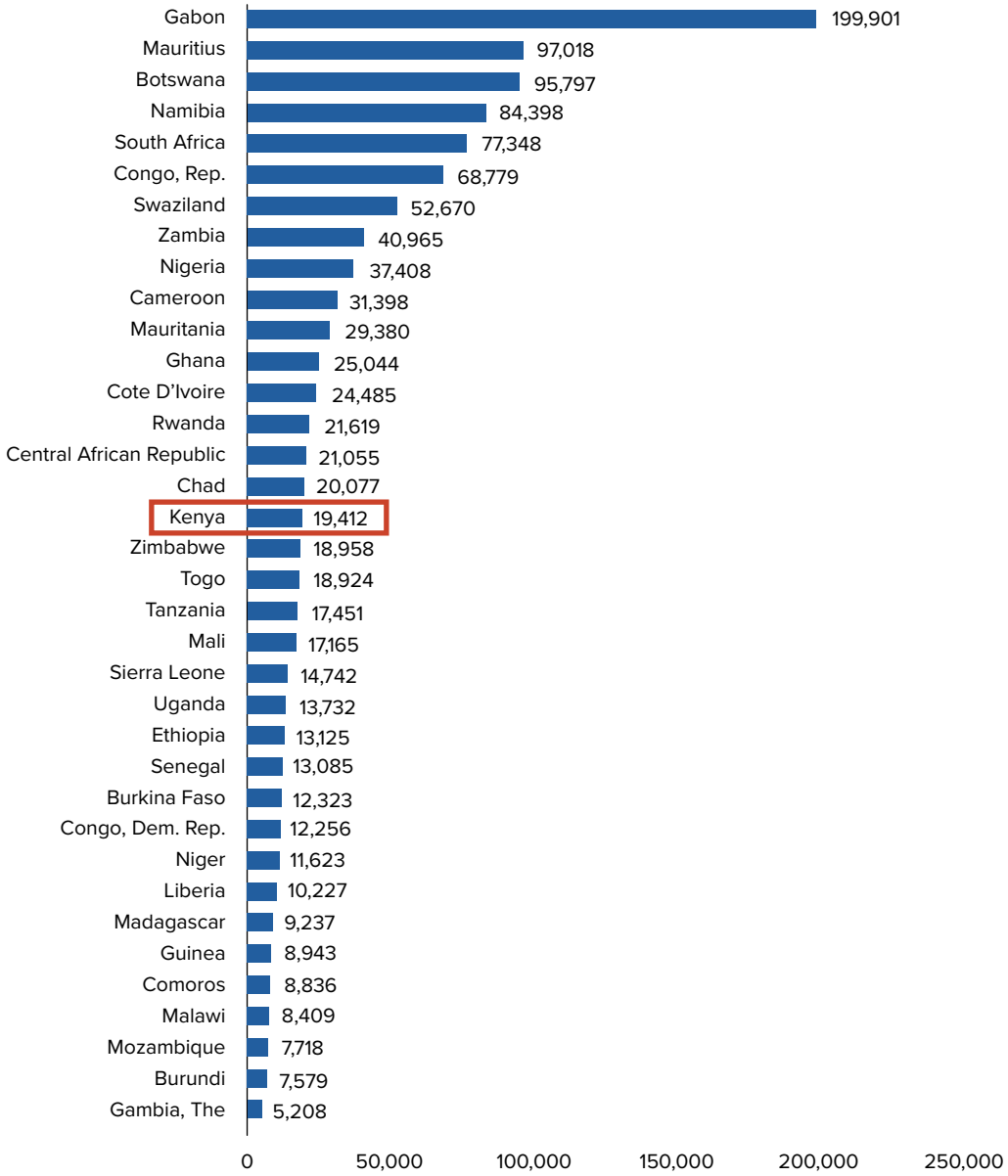
Having defined the lens through which we will make the analysis, we will now look at Kenya's national wealth. This analysis includes an explanation of what this means in terms of the country's growth trajectory. This analysis uses the best available data from global data sources, but it should be interpreted in light of other more detailed country contextual information provided in this Country Environmental Analysis (CEA).

KENYA'S NATIONAL WEALTH

Kenya is one of Africa's weak performers in terms of per capita wealth accumulation, based on national wealth accounting. From 1995 to 2014, Kenya's per capita wealth declined 10 percent, and the country's economy performed worse than most other African middle-income countries. Kenya is not investing enough to maintain per capita wealth and reap the country's demographic dividend because it is not building wealth rapidly enough to match its population growth rate.

Kenya's wealth per capita—US$19,412 in 2014—is just above the median for Sub-Saharan Africa as a whole (US$18,958) (Figure 19 and Table 2). Kenya belongs to the group of 28 countries that were low income in 1995 but grew to lower-middle income by 2014. However, Kenya's wealth per capita is only 75 percent of the average for lower-middle-income countries.

FIGURE 19. Africa—Wealth per capita, 2014



Source: Calculated from the database from Lange et al. 2018. *The Changing Wealth of Nations 2018: Building a Sustainable Future.*

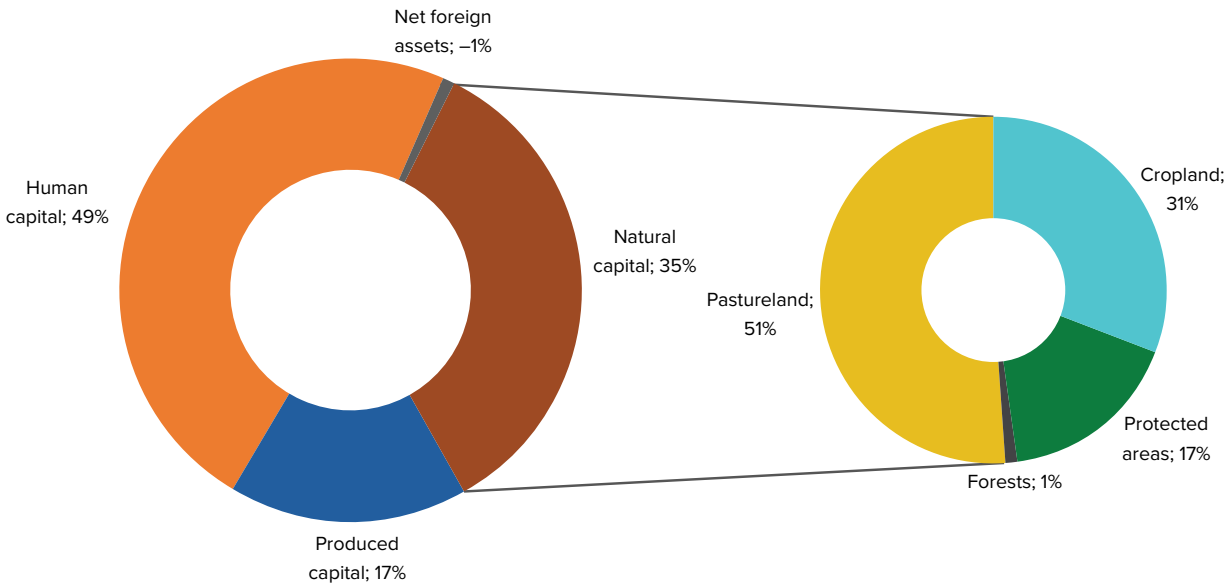
TABLE 2. Wealth per capita in Kenya, lower–middle–income countries, and Sub–Saharan Africa, 2014 (constant 2014 US$ per capita)

	Kenya	Lower-Middle Income Countries	Sub-Saharan Africa
Total wealth per person	US$19,412	US$25,948	US$25,562
Produced capital	3,356	6,531	4,017
Natural capital	6,771	6,949	9,225
Renewables	6,746	5,006	6,403
Non-renewables	25	1,944	2,822
Human capital	9,556	13,117	12,680
Net foreign assets	–271	–650	–360
Population (mil)	**44.9**	**2,725**	**867**

Source: Calculated from the database from Lange et al. 2018. *The Changing Wealth of Nations 2018: Building a Sustainable Future.*

Approximately 35 percent of Kenya's wealth is renewable natural capital.[114] This is mainly cropland, pastureland, and protected areas (which importantly support a large tourism industry). Forests constitute a very small share of Kenya's wealth (Figure 20). The value of Kenya's renewable assets is worth US$6,746 per person (See Table 2). This is higher than the average for lower-middle-income countries (US$5,006 per person), and higher than the average for Africa (US$6,403 per person) mainly because of the country's large pastureland wealth. The gap in per capita wealth between Kenya and lower-middle-income countries results from Kenya's relatively low levels of human capital and produced capital and infrastructure per person.

FIGURE 20. Where is the wealth in Kenya?



Source: Calculated from the database from Lange et al. 2018. *The Changing Wealth of Nations 2018: Building a Sustainable Future.*

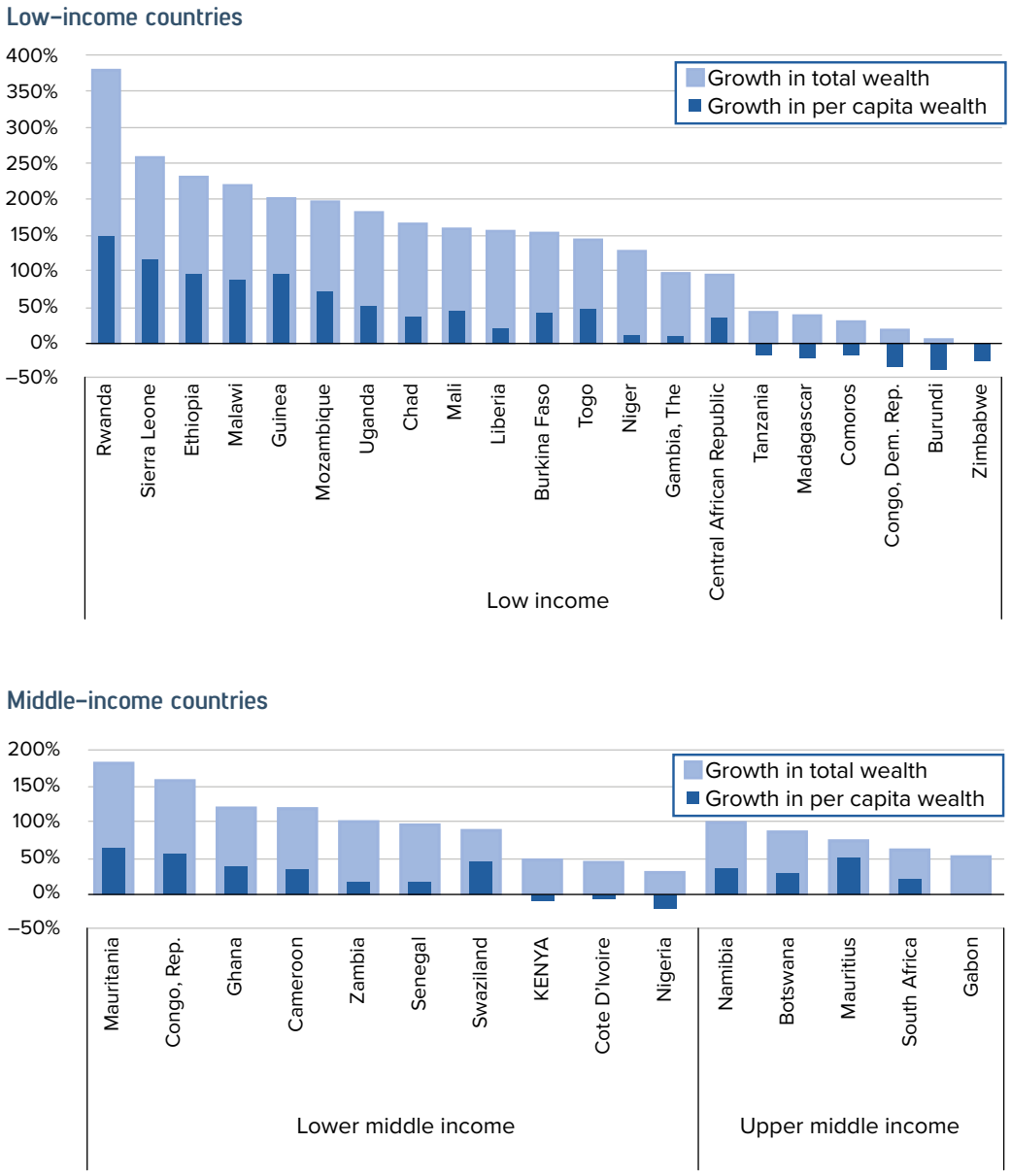
114 Currently, the wealth accounts do not include fisheries or water.

CHANGES IN KENYA'S WEALTH

Between 1995 and 2014, the growth of most African countries was close to the global average of between 60–66 percent. Although there was a great deal of variation among countries. During that period, Rwanda's total wealth more than tripled and, in contrast, Zimbabwe's total wealth declined. However, most African countries are low- or lower-middle income, so they need to invest faster than the global average to catch up.

Population growth is high in many low-income countries, including Kenya. High population growth dilutes wealth, which means that even countries with strong gains in wealth saw a much smaller increase in per capita wealth (Figure 21). Kenya is one of the countries with slow wealth growth (50 percent) and high population growth. As a result, between 1995 and 2014, its per capita wealth declined by 10 percent.

FIGURE 21. Growth in total and per capita wealth in low-income countries in Sub-Saharan Africa, 1995–2014 (percent)



Source: Calculated from the database from Lange et al. 2018. *The Changing Wealth of Nations 2018: Building a Sustainable Future.*

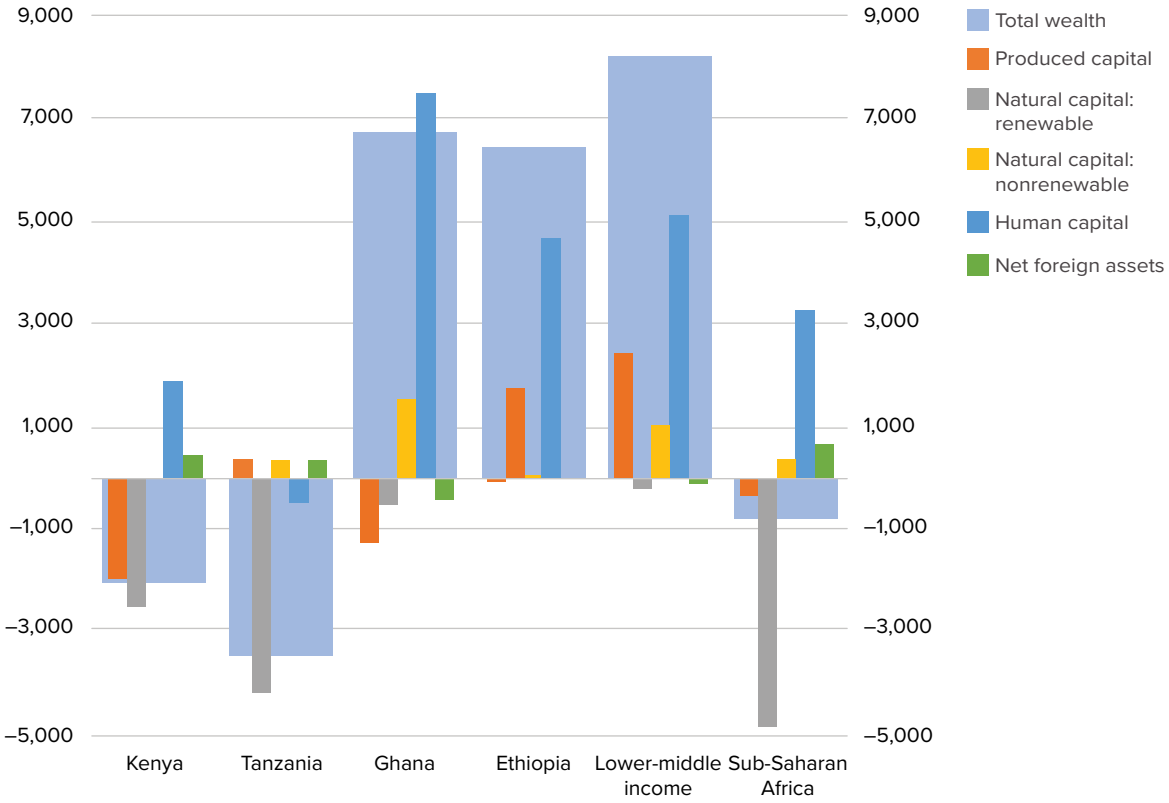
WEALTH CHANGES IN KENYA AND SEVERAL COMPARATOR COUNTRIES

Kenya belongs to the lower-middle-income group of countries with a higher than average dependence on natural capital (35 percent). The average for this group is 27 percent. However, Kenya's per capita wealth declined over the period due to a decrease in value in renewable natural capital and limited gains in human capital. In addition, not only did Kenya's natural capital decline, so did its produced capital, such as its infrastructure and buildings, which support development. Kenya made gains in human capital, but they were not sufficient enough to offset its losses in natural and produced capital.

Countries in this comparator group, such as Ghana, largely increased their per capita wealth through gains in human capital and nonrenewables. Like Kenya, they performed weakly regarding renewable natural capital but not as sharply (Figure 22). Kenya was outperformed by all African middle-income countries except Côte d'Ivoire (a fragility, conflict, and violence (FCV) country), and Nigeria, which also saw a decline in per capita wealth.

Low-income countries, such as Ethiopia and Tanzania, have very high levels of natural capital (47 percent). When the value of their renewable natural capital grew (as it did in Ethiopia), so did the value of their per capita wealth. In Tanzania, the value of their renewable natural capital declined (Tanzania), as did the value of their per capita wealth.

FIGURE 22. Change in wealth per capita in Kenya and selected other countries, 1995–2014 (US$ per person)



Source: Calculated from the database from Lange et al. 2018. *The Changing Wealth of Nations 2018: Building a Sustainable Future.*

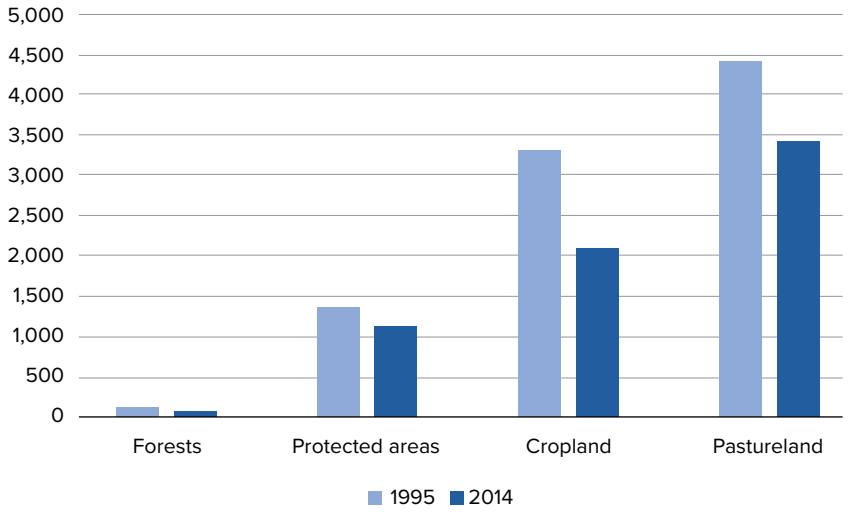
The decline of produced capital in lower-middle-income countries is likely an indication of unbalanced growth. All of these countries have huge infrastructure needs. These countries can achieve some economic gains by improving the productivity of agriculture and other natural capital, and by investing in human capital. However, over the longer term, the contributions to economic growth by natural and human capital will be constrained without complementary investments in produced capital, including roads and transport, water and energy supply, and communications.

KENYA'S RENEWABLE NATURAL CAPITAL

A closer look at Kenya's natural capital shows declines across all renewable assets between 1995 and 2014 (Figure 23). To understand this change in per capita asset during this period, we need to examine further the four renewable natural resources (forests, protected areas, pastureland, and cropland) through the three components of this change in asset value:

1. Change in land area utilized.
2. Change in land value per hectare (ha) (calculated as land area/land value).
3. Population growth (termed a 'population dilution effect').

FIGURE 23. Value of renewable natural capital per person, 1995 to 2014



Source: Calculated from the database from Lange et al. 2018. *The Changing Wealth of Nations 2018: Building a Sustainable Future.*

Kenya's budgetary allocations to the environment and natural resource (ENR) sectors is low by international standards. A public expenditure review, covering the period from 2013 to 2017, was recently completed.[115] This shows a slight increase in budgetary allocations to ENR—from 0.29 percent to 0.43 percent. Even with this increase, the allocation is very low. On average, countries allocate around 0.8 percent of their budgets to ENR[116]—twice the amount allocated by the Kenyan government in 2017. Adequate government funding for ENR sectors is crucial for the Kenyan economy, with its heavy reliance on natural resources.

Forests

Between 1995 to 2014, forest land value per capita declined 41 percent due to strong population growth (64 percent). This was despite a small increase in the extent of forest land (6 percent) and in the value per hectares of forest land (9 percent). Currently, the FAO forest data used to construct the forest asset account do not measure forest degradation, which deteriorates the ecosystem services provided by forests, including water supply, soil retention, and livestock grazing. Therefore, the forest value for Kenya may be overestimated.

Protected areas

Protected areas provide many economically valuable services to Kenya, but their value may be underestimated. Services include biodiversity and ecosystem services such as watershed protection (a critical service in such a water-scarce country). They also include tourism, which is a major industry in Kenya. Wealth accounts estimate the value of protected

115 National Treasury & Planning. 2017. *Comprehensive Public Expenditure Review: From Evidence to Policy.*
116 Eurostat. 2019. *Statistics explained: Government expenditure on environmental protection.*

areas as the 'opportunity cost' of agriculture, taking the lowest agricultural value per hectare. This is because keeping land under protected status means a country gives up the opportunity to use this land for agriculture. In Kenya, the value of agricultural land per hectare fell during the two decades studied (1995–2014), and this reduced the value of protected areas. Given the decreasing value of agricultural land and the increasing value of tourism over time, the use of the opportunity cost of agriculture production as a proxy for the value of protected areas may underestimate the full value of protected areas. Their value should be measured directly.

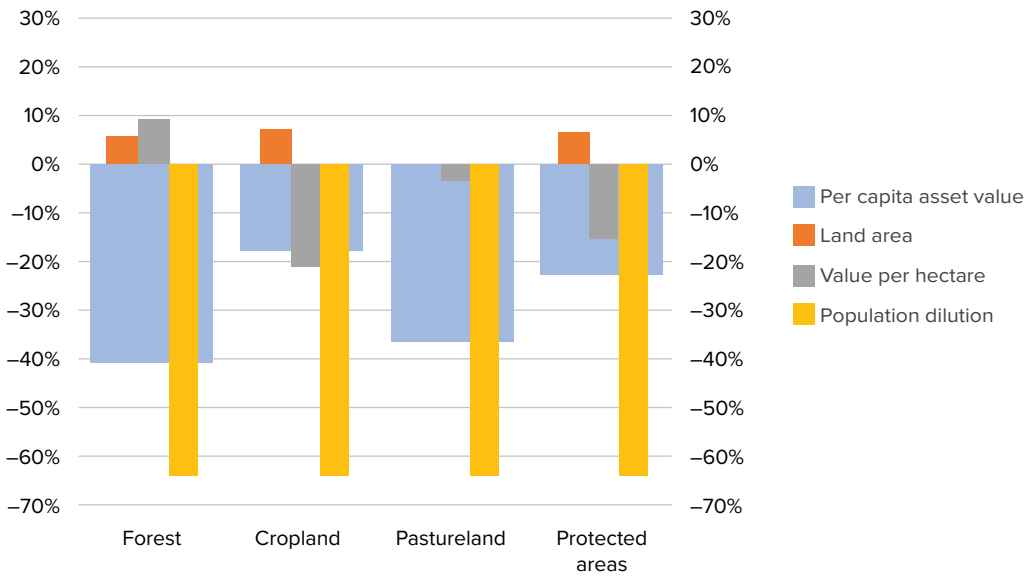
Cropland and pastureland

From 1995 to 2014, the value per hectare of Kenya's cropland declined by 21 percent, even though Kenya's area under crop cultivation expanded by 7 percent. For these 20 years, more than 50 percent of the value was accounted for by five crops: maize, tea, potatoes, fresh vegetables, and bananas. The price per ton declined for all these products except fresh vegetables. The value of pastureland also did not increase, and the per hectare value declined slightly.

Given the documented land degradation, together with the risks from climate change, it is prudent to assume that productivity, as well as the productive value of land, will decrease. The FAO data on which the wealth accounts are based do not include an estimate of land degradation, and yet there are serious concerns about land degradation and its impact on long-term productivity. The estimates also do not incorporate the potential impacts on agriculture of climate change, which could adversely affect productivity, pushing down the future value of agricultural land.

A simple scenario analysis was to test the sensitivity of the cropland value estimates to assumptions about productivity, that is, crop yields. The first scenario assumes no future gains in crop productivity after 2014.[117] Under this scenario, the value of cropland per capita in 2014 falls by nearly 50 percent, from US$2,109 to US$1,105. A more extreme scenario, which could occur as an effect of climate change, assumes a decline in productivity of 1 percent annually. This decline reduces the value of cropland by another nearly 60 percent to US$926 per person. Figure 24 presents the results for each asset: forests, protected areas, and cropland and pastureland.

FIGURE 24. Sources of change in natural capital per person in Kenya, 1995–2014 (percent change)



Source: Calculated from the database from Lange et al. 2018. *The Changing Wealth of Nations 2018: Building a Sustainable Future.*

Note: The broad blue bar represents percentage change in asset value while the thinner bars represent the components of change: change in land area, change in value/ha, and population dilution effect (population growth rate).

117 In calculating land value as the present value of future rents from production, the wealth accounts assume productivity growth of 1.94%. This scenario assumes zero growth, that is, crop yields continue at current levels.

SUMMING UP

Kenya is heavily dependent on its renewable natural capital (35 percent of total wealth), mostly cropland and pasture-land. Kenya's total wealth increased very little over the 20 years up to 2014 and declined per capita. The country's future growth will depend on the improved productivity and sustainable management of its natural capital.

Kenya's human capital has increased while its produced capital and infrastructure has declined. This suggests that Kenya may be building an unbalanced portfolio of assets that is less likely to support strong future economic growth. The typical asset portfolio trajectory of low- to lower-middle-income development is a declining share of natural capital with increasing shares of produced capital and human capital.

It is likely that the usual methods of calculating Kenya's total wealth may result in an overestimation because natural capital losses are not taken into account. Currently, agricultural and forest land degradation, including the loss of ecosystem services, are not captured in the wealth accounts. The potential impacts of climate change also are not factored into the valuation of natural capital. As an indication of the measuring system's sensitivity to agricultural land management, a simple scenario analysis for cropland was carried out. Under a scenario that assumed no future gains in crop productivity, the value of cropland per capita in 2014 fell by nearly 50 percent, from US$2,109 to US$1,105.

However, reassessing Kenya's wealth accounts to incorporate natural capital, allows us to identify opportunities for growth. Critical natural capital, such as fisheries and water, are not yet included in wealth accounts. Including these assets would increase the assessment of Kenya's natural wealth, and, more importantly, would help identify opportunities for growth through better management of its natural capital.

WAY FORWARD

Include the value of natural capital in economic planning.

Natural capital accounting provides a way to mainstream the value of natural resources into national economic policy planning, by including this information into national economic accounts and statistics. A starting point would be to focus initially on key sectors such as land, forests, and water and look at current budgeted public expenditures to these sectors. This information can then be compared with the contribution these natural assets make to the wider economy through the provision of ecosystem services, along with the economic losses associated with land and water degradation, and deforestation.

The National Treasury can use this information to generate an analysis on key policy questions, such as trade-offs between rapid economic development and the long-term sustainability of economic activities that directly depend on the environmental goods and services.

Build capacity in the Kenya National Bureau of Statistics (KNBS) to produce natural capital accounts.

The KNBS has never produced natural capital accounts and is unlikely to have the expertise or experience to manage this process. Support will be needed to ensure KNBS builds the capacity to produce these accounts in an accurate and reliable way.

Policies, laws, and institutions

- Kenya has a range of progressive policies and institutional arrangements to manage a wide range of environmental issues.
- Policy implementation is mainly devolved to county levels, but hampered by poor coordination, financial and technical capacity constraints, and a lack of clarity on roles and responsibilities.
- Budgetary allocations to environment and natural resources (ENR) are inadequate. Kenya allocates only around half as much budgetary expenditure to ENR as the international average.

Kenya has always been proactive and dedicated to supporting the environment. For decades it has developed a range of environmental policies and laws, and created the institutional frameworks needed to implement these policies and laws. This chapter provides an overview of Kenya's environmental policy and legal commitments and a discussion on the institutional structures in place to support them.

ENVIRONMENT IN THE KENYA CONSTITUTION 2010

The enactment of the 2010 Constitution of Kenya marked an important chapter in Kenya's environmental policy development. Hailed as a "Green" Constitution, it embodies provisions to secure future sustainable development, ranging from the environmental principles of Multilateral Environmental Agreements (MEAs) to the right to a clean and healthy environment, including water, food, and shelter.

Kenya's commitment to sustainable environment and environmental management is clearly expressed in its new 2010 Constitution. Article 42 in Chapter Four—The Bill of Rights states that *". . . every person has the right to a clean and healthy environment."*[118] Chapter Five addresses land and environment and Articles 66, 69, 70, 71, and 72 are dedicated to environmental and natural resource management (ENRM) issues. The chapter highlights the importance of sound conservation and protection of ecologically sensitive areas and the elimination of gender discrimination in land and environment management practices. In addition, Article 69 details the obligations on the state to implement the sustainable exploitation, utilization, management, and conservation of the environment and natural resources, and equitable sharing of benefits accruing from such.

VISION 2030

Vision 2030 provides Kenya with a development blueprint covering the period between years 2008 to 2030 and implemented in five-year medium-term plans. It aims to transform Kenya into a newly industrialized middle-income country in which citizens enjoy a high quality of life in a clean and secure environment. Vision 2030 recognizes that the environment and natural resources (ENR) are critical to achieve the socioeconomic and political development objectives that it sets out.

It consists of three pillars:[119]

The economic pillar—aimed at maintaining a sustainable economic growth of 10 percent per annum over the years covered in the blueprint.

The social pillar—aimed at ensuring a just and cohesive society that enjoys equitable social development in a clean and secure environment.

118 National Council for Law Reporting (Kenya Law). 2013. *Constitution of Kenya 2010.*

119 GoK. 2018d. *The Third Medium Term Plan (2018–2022) for Vision 2030.*

The political pillar—aimed at ensuring an issue-based, people-centered, and result-oriented democratic political environment.

Second Medium–Term Plan (MTP) 2013–2017

The environment section of Vision 2030's second five-year plan (MTP 2013–2017) was aimed at ensuring that Kenya has a clean, secure, and sustainable environment by 2030. Forest cover was to be increased from the current 3 percent up to about 4 percent, water sources conserved and new ways of harvesting and using rain and underground water were to be started. In addition, environment-related diseases were to be halved by promoting environmental conservation, improving pollution and waste management, and commissioning of private public partnerships in water and sanitation delivery, as well as enhancing disaster management.

Concrete plans included modernizing the meteorological services; rehabilitating and protecting water towers; promoting forestry research; wildlife conservation; and encouraging green energy, pollution management, and carbon trading. A land use and land cover (LULC) mapping exercise was initiated to comprehensively map the land use patterns for environmental conservation. Another initiative was the Master Plan for the Restoration, Conservation and Sustainable Management of Water Catchment Areas in Kenya.[120] See chapter on **Water** for more information. This targeted the rehabilitation of all Kenya's water catchment areas, including the five water catchment towers: Mt. Kenya, Mt. Elgon, the Aberdare range, the Cherengani Hills, and the Mau forest complex. Further policies are under development with the Kenya Water Towers Coordination and Conservation Policy, 2019 and related bill, currently at their second draft.[121] Another initiative was securing wildlife corridors and migratory routes.

Third MTP 2018–2022

Vision 2030 is now into its third MTP, which continues with the goals set out in the previous plan. In addition, it recognizes the additional challenges posed by the fragmented institutional framework that manages ENR in the devolved government structure.

The plan seeks to support the move to a high-growth economy with a 10 percent growth rate target by the end of the Plan period. It focuses on developing regulations and projects which work toward economic growth, support job creation, reduce poverty and inequality, take into account climate change impacts, and meet the 17 Sustainable Development Goals (SDGs) and the goals of African Union Agenda 2063. In particular, the Plan is aimed at implementing the structural changes needed toward increasing the shares of the manufacturing, industrial, and exporting sectors in the economy.

It also prioritizes the development of the country's oil and mineral resources sector. It will do this by fostering investment in upstream, midstream, and downstream infrastructure to facilitate the development of this crucial role player in the growth of Kenya's economy. Special attention will be paid to the maritime sector as a new frontier for social and economic growth (see **Blue Economy** section below).

Since the adoption of Vision 2030, Kenya's transition path toward sustainable development has become clearer, focusing on the efficient use of natural resources and environmental services with growth and development. The Ministry of Environment and Forestry (MoEF) is working together with the national and county government agencies on implementation of a Green Economy Strategy and Implementation Plan (GESIP)[122] in line with Vision 2030. The strategy provides a guide to ensure future investment and innovation contribute to sustainable growth and create new economic opportunities. It aims to embed green economy policies and initiatives in County Integrated Development Plans (CIDPs) as well as sector plans linked to the annual budget process. The national government's multiyear medium term expenditure framework (MTEF) provides the framework for linking the green economy strategy, planning, and policies, and the national budget process.

120 MEMR. 2012a. *Master Plan for the Restoration, Conservation and Sustainable Management of Water Catchment Areas in Kenya.*

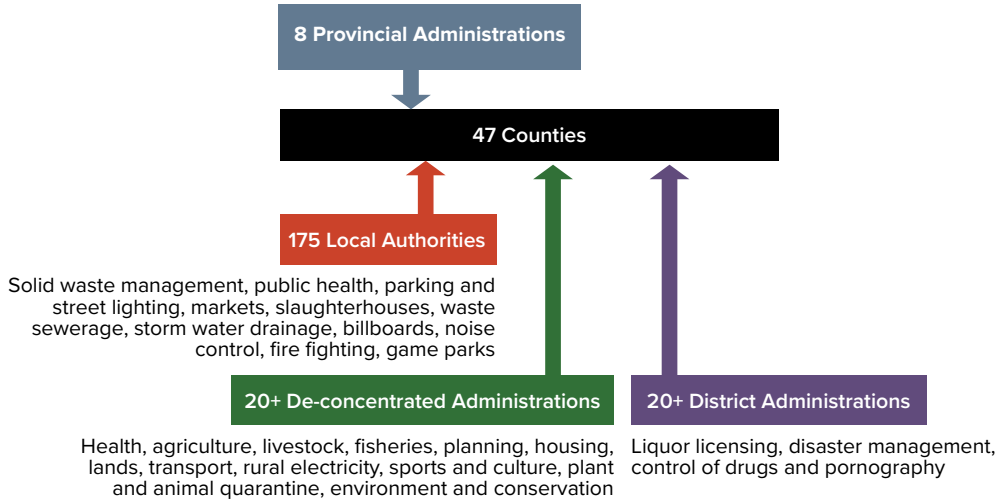
121 Current drafts of both documents can be found at: http://www.kwta.go.ke/second-draft-of-kenya-water-towers-coordination-and-conservation-policy-and-bill-2019/

122 GoK. 2016b. *Green Economy Strategy and Implementation Plan 2016–2030.*

DEVOLUTION

The process of devolution in Kenya began in 2010, under the new Constitution. Forty-seven county governments were formed followed by the subsequent transfer of resources and responsibilities from the national government to these county governments (see Figure 25). The new Constitution also specified the functions and powers of both the national and county governments in order to ensure the functioning of county governments was in line with the objectives and principles of devolution.

FIGURE 25. Kenya government post-devolution



Source: Parry et al. 2012.[123]

While devolution brings new opportunities, it also brings resource management challenges. The ten most populous counties, home to 40 percent of the country's population, occupy approximately 10 percent of Kenya's land mass. In contrast, 15 percent of the country's population occupy 75 percent of Kenya's land mass.[124] Inequality is the most pronounced in the North and North-Eastern (NNE) of the country, which have been historically underserved and currently performing below the national average on development indicators.

The Constitution was designed to address these unbalances by creating a two-tiered governing system. The national government provides a minimum of 15 percent of national revenues to counties to carry out their newly-added responsibilities. In addition, the starkly disparate geographic distribution of wealth and resources is a significant factor in strategic planning.

However, GoK has recognized the particular development needs of the arid and semi-arid counties in the NNE. As part of the latest reorganization of the government, GoK has created a dedicated function in the Ministry of Devolution in the arid and semi-arid lands (ASALs).

Mandates for implementing environmental and natural resource management (ENRM) policies are now devolved to county levels, but implementation capacity constraints remain. There has not been sufficient parallel support to build the required technical and managerial capacity at county levels. Responsibilities for a wide range of service provision has been shifted from the national level to counties fairly rapidly, without assessments of whether country administrations have the capacity to deliver, and often with a lack of clarity of roles and responsibilities.[125]

123 Parry et al. 2012. *Climate Risks, Vulnerability and Governance in Kenya: A Review.*

124 World Bank. 2012a. *Devolution without Disruption: Pathways to a Successful New Kenya*.

125 Cornella and D'Arcy. 2016. *Devolution, Democracy and Development in Kenya*; Mukorombindo, Y. 2018. *Budget and policy planning in devolved Kenya.*

NATIONAL ENVIRONMENT POLICY (2013)

The National Environment Policy, adopted in 2013, aims to enhance the ecological perspective and strengthen the connections between green policy and poverty reduction. The three main objectives of the policy are to:

1. Ensure sustainable management of Kenya's environment and natural resources.
2. Provide a framework for an integrated approach to planning and sustainable management of the environment and natural resources.
3. Strengthen the legal and institutional framework for good governance, and effective coordination and management of the environment and natural resources.

The National Environment Policy promotes and enhances cooperation, collaboration, synergy, partnerships, and participation in the protection, conservation, and sustainable management of the environment and natural resources. The policy informs the country's efforts to confront the following specific current and emerging environmental issues and challenges:

- Climate change.
- Environmental governance issues that significantly affect the environment: policies and laws concerning agriculture, land, water, forests, trade, and industry.
- Environmental protection, including conservation of biodiversity and protecting forests.
- Rehabilitation and restoration of environmentally degraded areas including wetlands, riverbanks, deforested zones, eroded shorelines, hilltops, and closed quarries and mines.
- Urbanization.
- Air quality.
- Waste management and industrial pollution.
- Chemicals management.
- Energy, security, and disaster management.
- Public participation and environmental education, and awareness data and information.
- Inadequate and disaggregated data that hinder integrated planning and management of the environment and undertaking total economic valuation.

OTHER NATIONAL ENVIRONMENT POLICIES[126]

Kenya has a range of national policies and legislation that cover specific environmental issues, such as forests, agriculture, water resources, wildlife, fisheries, and mining. A list of key sectoral policies and legislation is provided in Annex 2.

Ban on plastic

In 2017, GoK announced the ban of single use plastic bags and implemented the toughest laws in the world to enforce it. It is now illegal in Kenya to both manufacture and sell plastic bags, and offenders risk up to four years in prison and fines of nearly US$40,000.

This new approach to managing one of the world's major environmental challenges is groundbreaking. The National Environment Management Authority (NEMA) works closely with the police to enforce the ban, and in just one year there

126 Please note that these have been listed by date and not by importance.

have been over 100 convictions.[127] Two years on, the policy continues to be highly effective with the levels of plastic said to be much reduced. In addition, the government continues to adjust the policy to respond to new challenges resulting from the ban. One example of this was the increase in poor quality nonwoven polypropylene replacement bags which were becoming a new environmental threat. GoK immediately responded by initiating a ban on these from 31st March 2019.[128]

Clean land, water, and air

Policies and regulations relating to the management of land, water, and air do exist but are not enforced. There are limited facilities available to monitor air pollution, and those that exist do not yet cover even some of the major cities. A further complication is that devolution transferred the responsibility of monitoring air quality to the counties, thus complicating the broad picture.

Regulations covering the management of water include the Water Quality Act (2006) and the Environmental (Prevention of Pollution in Coastal Zone and other segments of the environment) regulations (2003).[129] However, monitoring and enforcement of water quality standards have not been developed. Similarly, approved standards for drinking water and effluent discharges exist, but are not enforced. Water pollution from urban and industrial wastes continues to degrade water quality. In addition, pesticides and fertilizers in agriculture deteriorate freshwater resources.

In 2009, Kenya became a signatory to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal (UNEP, 1989).[130] This followed up an earlier commitment made in 2001, when Kenya committed to limit the use and production of persistent organic pollutants by signing the Stockholm Convention on Persistent Organic Pollutants.

Arid lands

The National Policy for the Sustainable Development of Northern Kenya and Other Arid Lands (2012) focuses on climate resilience to manage drought and strengthen livelihoods in Kenya's arid and semi-arid land (ASAL). The goal of the policy is to close developmental gaps in Northern Kenya and other arid lands. Objectives are to:

1. Design a framework for ASAL development.
2. Mobilize resources, research, monitoring, and evaluation to strengthen the integration of ASALs with the rest of the country.
3. Craft strategies to develop sustainable agriculture, livestock husbandry, trade, and tourism.
4. Facilitate national economic development in the ASALs by, for example, drafting a policy framework for emergency response to drought.

This policy invests in foundations that will reduce poverty but also will build resilience and growth. Under this policy, the National Drought Management Authority (NDMA), National Disaster Contingency Fund (NDCF), and the Council for Pastoralists Education (CPE) have been established to support mechanisms to ensure that drought does not result in emergencies and that the impacts of climate change are sufficiently mitigated.

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127 Deutsche Welle. 2018. *Visiting Kenya a Year into Its Plastics Bag Ban.* https://www.dw.com/en/visiting-kenya-a-year-into-its-plastic-bag-ban/a-45254144

128 NEMA. 2019. *Ban on Manufacture Importation, Supply, Distribution and Use of Non-Woven Polypropylene Bags in Kenya.*

129 Revised in 2012.

130 UNEP. 1989. *Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal: Protocol on Liability and Compensation for Damage Resulting from Transboundary Movements of Hazardous Wastes and Their Disposal.*

FOCUS ON THE BLUE ECONOMY

In 2016,[131] GoK made a commitment toward a new approach in managing ocean resources. This approach, often linked to the term 'blue economy',[132] is aimed at sustainably using resources from the ocean to build livelihoods, grow the economy, and improve the health of the ocean ecosystem.[133] It is an integrated approach to the conflicting uses of marine resources, that takes account of living and nonliving (for example, shipping, fossil-fuel energy and mining), and renewable and exhaustive resources. In November 2018, GoK hosted the first global conference on the Blue Economy.

BOX 5. A statement of intent from the President of Republic of Kenya

"In taking the bold initiative to host the Conference, my government aims at providing a global forum for contributing to and advancing global conversation on the two important pillars of the Blue Economy. These are sustainability, climate change and controlling pollution on one hand and production, accelerated economic growth, jobs and poverty alleviation on the other."

Source: A special call to participate speech by Hon Uhuru Kenyatta, President of the Republic of Kenya[134] given during the Blue Economy Conference held in Nairobi, November 2018.

In recognition of the importance of this sector to fuel Kenya's economic growth, GoK took a number of specific actions. It created the State Department for Fisheries and the Blue Economy (SDF&BE) which is managed by the Ministry of Agriculture, Livestock, Fisheries and Irrigation. The Presidential Blue Economy Committee was established in September 2016. The Fisheries Management and Development Act (2016) was also enacted during the same month.

While recognizing the many sectors in the blue economy, the Act prioritizes fisheries and aquaculture, and maritime shipping and logistic services, as priority sectors that could deliver socioeconomic benefits to the communities in the coastal areas. It calls for enhanced revenues for fisheries governance to support the creation of employment. The Act also establishes institutions designed to strength the governance of fisheries and aquaculture industries in order to enable investments along the fishery value chains to maximize socioeconomic benefits. The institutions established under the Act include the Kenya Fisheries Service (KeFS), the Kenya Fish Marketing Authority, and the Fish Levy Trust Fund.

CLIMATE CHANGE

Kenya has been proactive internationally in the climate change debate. It has initiated climate conferences and developed and implemented regional legislation to mitigate climate change effects. However, as a low-middle-income country, Kenya's ability to slow the progress of climate change is limited. In response, the country addresses its challenges mainly through adaptation strategies.

The Vision 2030 framework aims to move the country toward a low-carbon and climate-resilient development pathway. It plans to use low-carbon development opportunities in energy, transport, industry, agriculture, forestry, and waste management combined with a climate fund, investment strategy, and carbon trading platform to mitigate the impacts of climate change. Under the plan, capacity building is a priority, enabling the monitoring, evaluation and verification, and reporting of mitigation and adaptation actions under the National Performance and Benefit Measurement (NPBM) component.

131 On May 2, 2016, and through the enactment of Executive Order No. 1/2016.

132 The 'blue economy' is a term widely used to describe economic activities linked to oceans, seas, and coasts.

133 Note: The World Bank includes sustainable resource use in its definition of the Blue Economy. Sometimes the term is used by others to simply refer to maritime economic activities, whether they are sustainable or not.

134 See conference website. http://www.blueeconomyconference.go.ke/

In 2012, GoK drew up its first National Climate Change Action Plan (NCCAP) that was largely informed by global and regional policies. These plans were supported by the launch of the 2010 National Climate Change Response Strategy (NCCRS) and the enactment of the 2016 Climate Change Act (No. 11). The NCCRS gives targeted recommendations on policies, institutional framework, awareness creation, and resource mobilization to curb climate change.

In addition, in 2012, Kenya established a Climate Innovation Center (KCIC),[135] which supports over 80 entrepreneurial firms in innovative climate technologies and businesses sectors. Kenya is one of the six pilot countries supported by the Scaling-up Renewable Energy in Low Income Countries Program (SREP).[136] Kenya will reduce its fossil fuel use by, among other things, investing in geothermal expansion, the Lake Turkana wind project, and bio-digesters in households in selected locations. Kenya has established several Emission Reduction Purchase Agreements (ERPAs).[137] ERPAs allow the trading of carbon credits under international market-based mechanisms, initially formally established as part of the Kyoto Protocol and strengthened by the 2016 Paris Agreement on climate change.

Kenya's Nationally Determined Contribution (NDC)

In 2015, Kenya submitted its (Intended) Nationally Determined Contribution ((I)NDC)[138] to the UNFCCC (United Nations Framework Convention on Climate Change). The (I)NDC document outlines, in broad terms, how Kenya intends to achieve a planned 30 percent emission reduction and accelerate adaptation to the impacts of climate change. The document indicates how it intends to reduce emissions and adapt to climate change and how they can be implemented as part of the country's wider sustainable development agenda. The (I)NDC identifies the National Climate Change Action Plan (initially the NCCAP 2013–2017, now superseded by the NCCAP 2018–2022) and National Adaptation Plan (NAP) as the main policy drivers to guide implementation of the (I)NDC. Table 3 and Table 4 provide a summary of the proposed mitigation and adaptation action plans.

TABLE 3. Mitigation actions proposed in Kenya's (I)NDC

Sector	Priority Actions
Energy	Expansion in geothermal, solar and wind energy production, other renewables, and clean energy options.
	Enhancement of energy and resource efficiency across the different sectors.
	Clean energy technologies to reduce overreliance on wood fuels.
Forestry and land use	Make progress toward achieving a tree cover of at least 10% of the land area of Kenya.
	Climate smart agriculture (CSA) in line with the National CSA Framework.
Transport	Low carbon and efficient transportation systems.
Waste management	Sustainable waste management systems.

Source: MENR. 2015.[139]

135 An initiative of World Bank's infoDev and supported by UKAid and Danida.

136 The Scaling Up Renewable Energy Program in Low Income Countries (SREP) is funded by the Strategic Climate Fund.

137 The World Bank is trustee of the most recent ERPA, signed in March 2019 between the Carbon Initiative for Development (Ci-Dev) trust fund and the Kenya Tea Development Agency Power Company Ltd.

138 MENR. 2015. *Kenya's Intended Nationally Determined Contribution (INDC).*

139 MENR. 2015. *Kenya's Intended Nationally Determined Contribution (INDC).*

TABLE 4. Adaptation actions proposed in Kenya's (I)NDC

Medium-Term Sector Plan	Priority Adaptation Actions
Energy	Increase the resilience of current and future energy systems.
Science, technology, and innovations	Support innovation and development of appropriate technologies that promote climate resilient development.
Public sector reforms	Integrate climate change adaptation into the public sector reforms.
Human resource development, labor, and employment	Enhance adaptive capacity and resilience of the informal private sector.
Infrastructure	Climate proofing of infrastructure (energy, transport, buildings, and ICT).
Land reforms	Mainstream climate change adaptation into land reforms.
Education and training	Enhance education, training, public awareness, public participation, public access to information on climate change adaptation across public and private sectors.
Health	Strengthen integration of climate change adaptation into the health sector.
Environment	Enhance climate information services.
	Enhance the resilience of ecosystems to climate variability and change.
Water and irrigation	Mainstream of climate change adaptation in the water sector by implementing the National Water Master Plan (2014).
Population, urbanization, and housing	Enhance the adaptive capacity of the population, urbanization, and housing sector.
Gender, vulnerable groups, and youth	Strengthen the adaptive capacity of the most vulnerable groups and communities through social safety nets and insurance schemes.
Tourism	Enhance the resilience of the tourism value chain.
Agriculture, livestock development, and fisheries	Enhance the resilience of the agriculture, livestock, and fisheries value chains by promoting climate smart agriculture and livestock development.
Private sector and trade, manufacturing, business process outsourcing, financial services	Create enabling environment for the resilience of private sector investment, demonstrate an operational business case.
Oil and mineral resources	Integrate climate change adaptation into the extractive sector.
Devolution	Mainstream climate change adaptation into county integrated development plans and implement the Ending Drought Emergencies Strategy.

Source: MOER, 2015.[140]

By 2030, Kenya aims to reduce greenhouse gas (GHG) emissions by 30 percent relative to 'business as usual' projections. Kenya's historical contribution to GHG emissions is relatively low at around 0.1 percent of the total global emissions. Under a 'business as usual' scenario, GHG emissions, which were around 80 MtCO2eq in 2015, are projected to reach 143 MtCO2eq in 2030 (see Figure 26).

The details and the costs of the mitigation and adaptation options identified in the (I)NDC have not been clarified. The actions identified in the (I)NDC have also not yet been prioritized or costed in detail. Although a 2016 World Bank assessment suggested that implementing the outlined adaptation and mitigation actions by 2030 would require US$40 billion.[141] The (I)NDC acknowledges that achieving this ambitious goal will require international support in the form of finance, investment, technology development and transfer, and capacity building.

National adaptation plan (NAP) 2015–2030

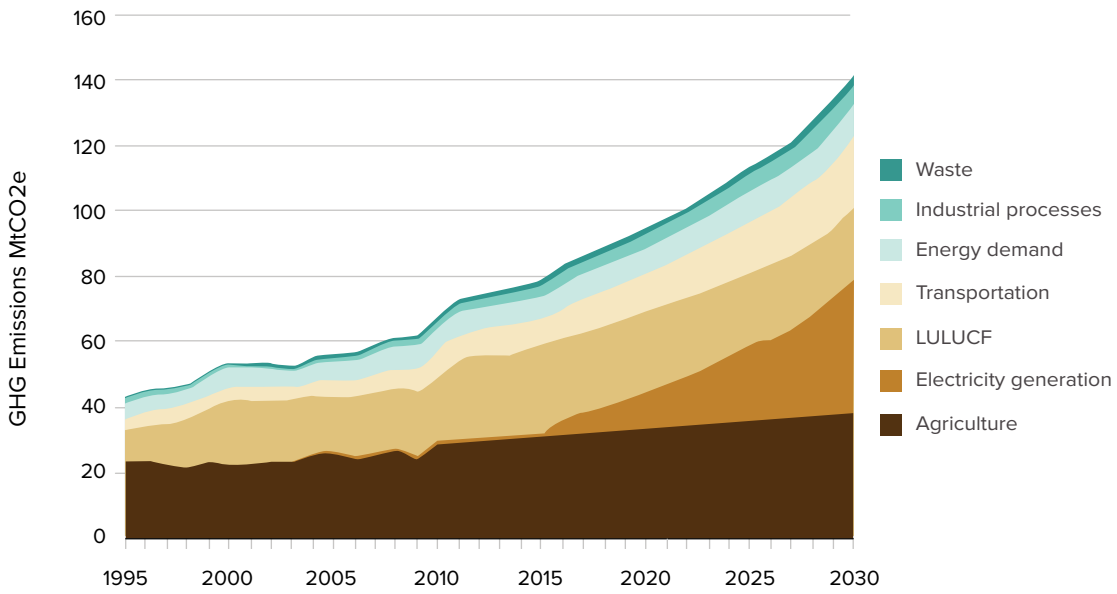
Kenya published its NAP in 2016.[142] NAPs are formulated under a process guided by the United Nations Framework Convention on Climate Change (UNFCCC) and created by the Conference of the Parties (COP 16) in 2010. NAPs are intended to identify medium- and long-term adaptation needs and develop and implement strategies and programs to address them. NAPs can also be iteratively updated over time. Kenya is one of the 13 countries that have submitted a NAP to the UNFCCC.

140 MENR. 2015. *Kenya's Intended Nationally Determined Contribution (INDC).*

141 World Bank. 2016b. *Kenya—(Intended) Nationally Determined Contribution.*

142 MENR. 2016a. *Kenya National Adaptation Plan: 2015–2030.*

FIGURE 26. Emission baseline projection for Kenya



Source: NEMA. 2015.[143]

TABLE 5. Objectives of Kenya's NAP

Kenya's NAP Aims to:
● Highlight the importance of adaptation and resilience building actions in development.
● Integrate climate change adaptation into national and county-level development planning and budgeting processes.
● Enhance the resilience of public and private sector investment in the national transformation, economic and social and pillars of Vision 2030 to climate shocks.
● Enhance synergies between adaptation and mitigation actions in order to attain a low carbon climate resilient economy.
● Enhance resilience of vulnerable populations to climate shocks through adaptation and disaster risk reduction strategies.

Source: MENR. 2016a.[144]

Unfortunately, at this point Kenya's NAP is not fully funded. GoK and development partners are already financing a number of adaptation interventions through the Adaptation Fund and the National Drought and Disaster Contingency Fund (NDDCF). The NAP will require further international finance from development partners, the Green Climate Fund (GCF), and other sources of climate finance. The NCCAP proposed establishing a domestic 'Kenya Climate Fund' managed by the National Treasury, but this has not yet happened. The NAP document estimates that total finance in excess of US$38 billion is required for full implementation up to 2030.

143 NEMA. 2015. *Second National Communication to the United Nations Framework Convention on Climate Change (UNFCCC).*
144 MENR. 2016a. *Kenya National Adaptation Plan: 2015–2030.*

INTERNATIONAL COMMITMENTS

Kenya has ratified various international conventions that deal with the protection of the environment (Table 6).

TABLE 6. International conventions ratified by Kenya

International Convention	Website	Date of Ratification
United Nations Framework Convention on Climate Change (UNFCCC)—Kyoto Agreement	https://unfccc.int/index.php/process-and-meetings/the-kyoto-protocol/what-is-the-kyoto-protocol/what-is-the-kyoto-protocol	2005
United Nations Framework Convention on Climate Change (UNFCCC)—Paris Agreement	https://unfccc.int/index.php/process-and-meetings/the-paris-agreement/the-paris-agreement	2016
International Convention on Biological Diversity (CBD)	https://www.cbd.int/	1992
World Heritage Convention (1972)	http://whc.unesco.org/	2003
Agreement of the Conservation of Eurasian Migratory Water Birds (2001)	https://www.unep-aewa.org/	2001
African Convention on the Conservation of Nature and Natural Resources	https://au.int/en/treaties/african-convention-conservation-nature-and-natural-resources-revised-version	2003
The Convention on International Trade in Endangered Species of Wildlife Fauna and Flora (CITES) 1973	https://www.cites.org/eng/disc/what.php	1979
East African Community Natural Resource Protocol	https://www.eac.int/environment/natural-resources-management/protocol-on-environment-and-natural-resource-management	2006

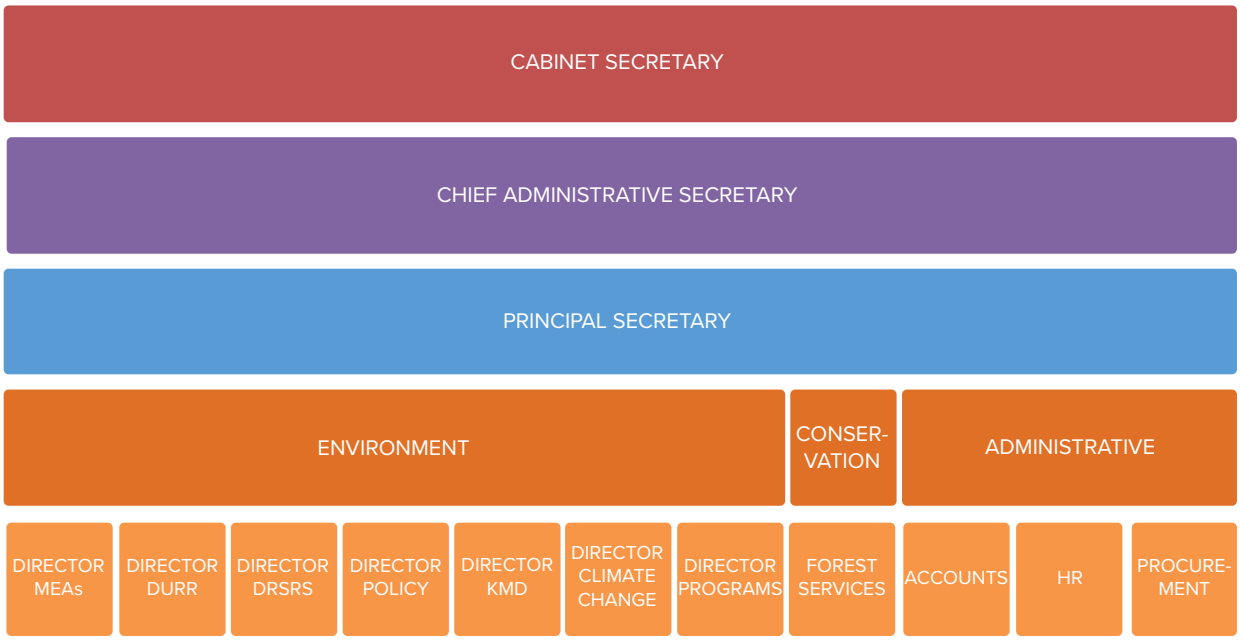
INSTITUTIONAL STRUCTURES

An environmental authority has long been part of GoK's structure and decision-making process at the policy level. The adoption of the 2010 Constitution, which mandated the devolution of government to the counties, changed the hierarchal structure of decision making and the adherence to national policies.

The Ministry of Environment and Forestry (MoEF) is charged with conserving and managing the environment and to be the primary environmental policy maker. MoEF consists of several departments and agencies, all involved in the direct or indirect management of the environment and natural resources (see Figure 27). The Directorate of Environment primarily conducts policy formulation and implementation, Multilateral Environmental Agreements, Urban Rivers Program development, and climate change strategy development. The Directorate of Natural Resources focuses on conserving and managing the natural resources, including water, forests, and wildlife, and developing and implementing conservation policies. These responsibilities are conducted primarily by the Kenya Forest Service (KFS) (established under the 2005 Forest Act), Kenya Forestry Research Institute (KFRI), Kenya Wildlife Service (KWS), and the Kenya Water Towers Agency (KWTA).

MoEF also includes the National Environment Management Authority (NEMA). This was founded under the Environmental Management and Coordination Act (EMCA) No. 8 of 1999. NEMA coordinates environmental policy development and is the principal instrument of government to implement all policies relating to the environment. NEMA ensures that measures to control or mitigate environmental degradation are not only implemented but also enforced, including calling for the preparation of Environmental Action Plans (EAPs) from the national to the county level and producing Environmental and Social Impact Assessments (ESIAs) prior to the approval of infrastructure investments. NEMA also produces a 'State of the Environment' (SoER) report. The last edition was published in 2010, although there is little evidence that it significantly influenced national budget allocations or local-level planning. An update of the SoER covering 2016–2018 is soon to be published, which has the potential to be used as a planning tool. NEMA also is an active and assertive monitoring institution. For example, the authority has queried and stopped several investment activities due to environmental concerns.

FIGURE 27. Structure of the Ministry of Environment and Forestry (MoEF)



Note: Multilateral Environmental Agreements (MEAs); Urban Rivers Program (DURR); RSRS—Programmes, Projects and Strategic Initiatives (RSRS); KMD—Meteorological Department.

Source: Ministry of Environment and Forestry.

However, EAP and ESIA processes are sometimes inadequate. These are caused by capacity constraints within NEMA. In addition, there are frequent claims of corruption and abuse of planning license approval processes,[145] although successful prosecutions are scarce.

Even though the EMCA is very clear on of the need for ESIAs, their importance is not always fully appreciated by political leaders, while public participation, which ideally would act as a check on any abuse of EIA processes, is very low in practice.[146] Although the law is very clear on public participation while conducting environmental impact assessments, ESIAs in Kenya are frequently conducted without thorough public participation, leading to controversial ESIAs that have not been validated by communities.[147] The process also frequently lacks culturally appropriate mechanisms, such as the use of local languages, or providing only written reports and so excluding a sizeable proportion of local populations who may not have a sufficient level literacy to fully understand them.

Although MoEF has a mandate to conserve and manage the environment and natural resources, multiple other ministries also have a pivotal role in support. Some of these ministries include the Ministry of Devolution and the ASALs, the National Treasury, the Ministry of Energy, the Ministry of Petroleum and Mining, the Ministry of Water and Irrigation, the Ministry of Tourism and Wildlife, and the Ministry of Land, Housing and Urban Development. The Ministry of Agriculture, Livestock, Fisheries and Irrigation has also been delegated with the responsibility of managing the protection of the Blue Economy through the newly established State Department for Fisheries, Aquaculture and the Blue Economy.[148]

145 See: Kakonge 2015; CGN. 2019; Connor.2017; Daily Nation. 2019; Reuters. 2019. https://af.reuters.com/article/topNews/idAFKCN1UH1J4-OZATP; Transparency International. 2017, https://tikenya.org/likelihood-and-impact-of-corruption-in-the-mining-sector-high/

146 Barczewski. 2013. *How well do environmental regulations work in Kenya? The case of the Thika Highway Improvement Project.*

147 For example, protests against construction of the Lamu Coal Plant: https://qz.com/africa/1301469/photos-kenya-environmentalists-protest-china-coal-plant-in-lamu/

148 For information on the role of the newly established State Department for Fisheries, Aquaculture and the Blue Economy, see: http://www.kilimo.go.ke/?page_id=376

In Kenya, the relationship between tourism and wildlife is closely connected, (see chapter on Wildlife and nature-based tourism). In recognition of this the former Ministry of Tourism was restructured in 2017 to absorb the Kenya Wildlife Service (KWS) (which was previously housed in the Ministry of Environment and Forestry). The ministry's aim is to ensure that the tourism industry benefits from the sustainable development and management of Kenya's wildlife.[149]

REGULATORY FRAMEWORKS

In 2012, the County Government Act was passed, which empowered county governments to take charge of nationwide environmental management issues. These new county governments were tasked with implementing specific national government policies on natural resources and environmental conservation, including soil and water conservation, forestry, and air pollution.

At the national level, GoK is responsible for protecting the environment and natural resources by establishing a sustainable system of development. At local levels, the county administrations create County Environment Committees (CECs). These committees are chaired by the county's chief officer for the environment and are made up of representatives from NEMA, KWS, KFS, the private sector, and communities.

The CEC is required to prepare a development plan and a County Integrated Development Plan (CIDP), which form the basis for the allocation of public funds to their county. The CIDP focuses on:

1. economic, physical, social, environmental, and spatial planning.

2. analyzing infrastructure, land use, nonstate actors, crops, livestock, fishing, environment and climate change interventions, mining, tourism, and industrial development.

The majority of counties have developed initial CIDPs and have updated these plans to guide county-level development for the next five years.

PUBLIC EXPENDITURE REVIEW

A public expenditure review of the Kenyan public sector covering the period from 2013 to 2017 was recently completed. It shows a slight increase of budgetary allocations to environment and natural resources (ENR)—from 0.29 percent to 0.43 percent. This is very low, by comparison with Organisation for Economic Co-operation and Development (OECD) statistics for 2019. This shows that on average OECD countries spend around 0.8 percent—twice the share allocated by the Kenya government in 2017. This is despite the fact that Kenya is significantly more natural resource dependent than most OECD countries.

A dedicated environmental expenditure review could identify specific needs of the ENR sector. The importance of full funding to ENR sectors is crucial, especially for the Kenyan economy with its heavy reliance on natural resources.[150]

THE CHALLENGES

Kenya's environmental ambitions are without doubt frustrated by capacity constraints. Kenya is committed to combating climate change, reducing poverty, and working toward the sustainable use of the country's natural resources. However, the existing organizational structures and arrangements with overlapping and duplicating responsibilities and mandates do not yet support the national aspiration for sustainable green development through ensuring low emissions and high energy efficiency. Also, GoK's main challenge is the limited capacity to execute, monitor, and enforce existing

149 Visit the Ministry of Tourism's website here: http://www.tourism.go.ke/vision-mission-mandate/

150 See: https://ec.europa.eu/eurostat/statistics-explained/index.php/Government_expenditure_on_environmental_protection

environmental regulations. This is even more challenging now that many of these responsibilities are devolved to counties, where appropriate technical, financial, and managerial capacity is often limited.

Another issue is the failure of the annual environmental audits (EAs) to be implemented or enforced. Kenya's environmental laws require annual EAs to be prepared by all ministries at national and subnational levels, and the national government is expected to be enforcing them. However, in reality, capacity constraints at both national and county levels mean that compliance with the environmental provisions of these EAs is low and enforcement is weak.

At present, few counties comprehensively assess environmental impacts prior to developing their infrastructure. Strategic Environmental and Social Assessments (SESAs) are required for sectoral policies, plans, and programs but these are slowly being initiated. NEMA has established guidelines for development of SESAs (updated in 2011). The objectives of a SESA are to supply a high level of protection of the environment and to promote sustainable development by integrating environmental considerations in the preparation and adoption of specified plans and programs. In its Readiness Plan for Reducing Emissions from Deforestation and Forest Degradation (REDD+), Kenya has begun a SESA. However, on the ground SESAs are only slowly being initiated by counties.

Institutional strengthening and capacity building are priority issues for NEMA and other institutions responsible for environmental compliance. This deficit in capacity increases the challenges in handling a growing number of environmental management cases and also complaints. This situation is made worse by high staff turnover and the continuous requirement on training staff and hiring external legal experts in legal issues.

Citizens' role in protecting the environment is not adequately recognized by official policy and government agencies. Citizens can and do have an important role to play in protecting the environment and managing disaster and climate risk. Organized communities bring valuable expertise and knowledge, based on their lived experience, and can be engaged as active partners in improving environmental protection.

WAY FORWARD

1. **Embed capacity building and institutional strengthening in the design of all investments in environmental sectors.** Gaps in technical and managerial capacity and ineffective institutional coordination currently undermine policy making, project and program implementation, and enforcement of environmental regulations and legislation. Opportunities to strengthen coordination and capacities exist at both national and local levels. Devolution has magnified existing shortcomings in both capacity and coordination, and so environmental investments at county levels provide important opportunities to address gaps of this nature. Including these factors in the design of all environmental investments allows practical experience to form the basis of new or improved ways of working and build expertise.
2. **Generate environmental data in a systematic manner at both national and county levels.** Regular and continuous monitoring is important to provide the information to guide planning and monitor policy implementation. This will permit decision makers at both county and national levels to learn lessons in real-time that can feed into adjustments to both policy and implementation.
3. **Strengthen links between local authorities and community organizations to improve environmental protection.** The everyday experience of local communities can assist focus on local-level priorities for better environmental management. Local indigenous knowledge can enhance and broaden the understanding of the causes of environmental challenges and contribute to identifying practical options to tackle them. The energies and commitment of local communities can supplement and complement county governments' constrained resources for environmental protection.

Environmental pollution and human health

- Even though life expectancy is rising, environmental pollution still causes large numbers of deaths.
- The majority of these deaths and illnesses are linked to unsafe water and sanitation health (WASH) and household air pollution (HAP).
- These health impacts affect the young and the elderly the most and are most prevalent in the poor North and North-Eastern (NNE) counties.
- The annual economic cost of environmental pollution is between 4.4 and 8.5 percent of gross domestic product (GDP).
- Accelerating the current slow pace of improvement to WASH will have a decisive impact on reducing mortality and morbidity linked to environmental pollution.

Environmental pollution continues to be a major health issue for Kenya. Life expectancy in Kenya is on the rise. In 2017, women lived an average of 68.8 years and men an average of 63.2—a sharp increase on the rates in 2000 which were below 58 for women and around 55 for men.[151] This implies that Kenyans' health status is improving. However, every year, about 60,000 people die from causes attributed to environmental pollution. The majority of these deaths are due to unsafe WASH and illness and disease related to WASH.

In this section, we explore the drivers of environmental pollution and the impacts it has on the Kenyan population. We look at how these impacts vary at county levels, and we also compare Kenya's health burden against her neighboring countries.



Environmental pollution continues to cause too many hospital admissions.

151 See IHME website: http://www.healthdata.org/kenya

WASH AND HAP

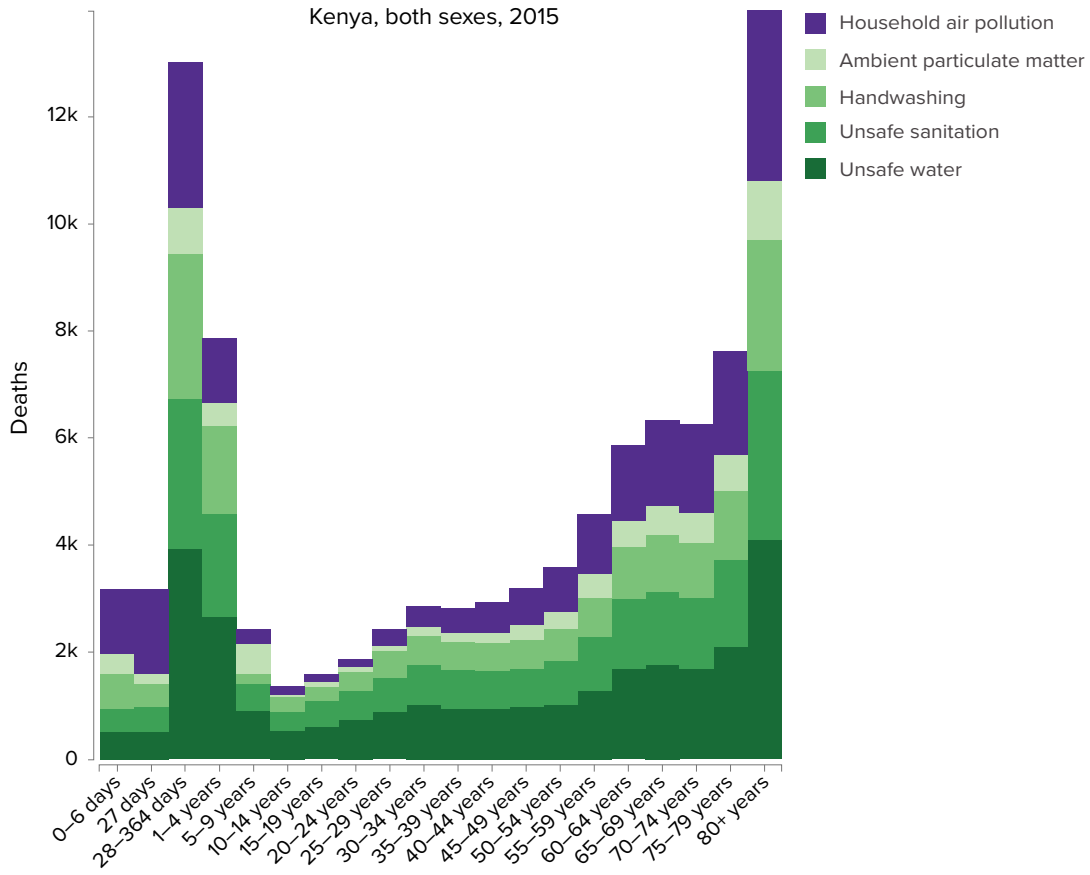
Every year, about 60,000 people die in Kenya from causes related to environmental pollution (ranging from about 52 thousand to 67 thousand). Unsafe WASH is linked to about 60 percent of the total estimated mortality (see Table 7 below) and HAP is the next largest factor. Children under five years and adults over 60 face the greatest risk. Figure 28 shows how environmental pollution causes greater mortality rates across different age groups.

TABLE 7. Annual mortality related to environmental pollution in Kenya

	Low	High	Mean
Unsafe WASH	32,513	36,790	34,374
Household air pollution from solid fuels	15,444	21,823	18,672
Ambient particulate matter pollution	4,614	8,665	6,371
Total	**52,570**	**67,278**	**59,418**

Source: IHME. 2016.[152]

FIGURE 28. Mortality related to environmental causes in Kenya by age group

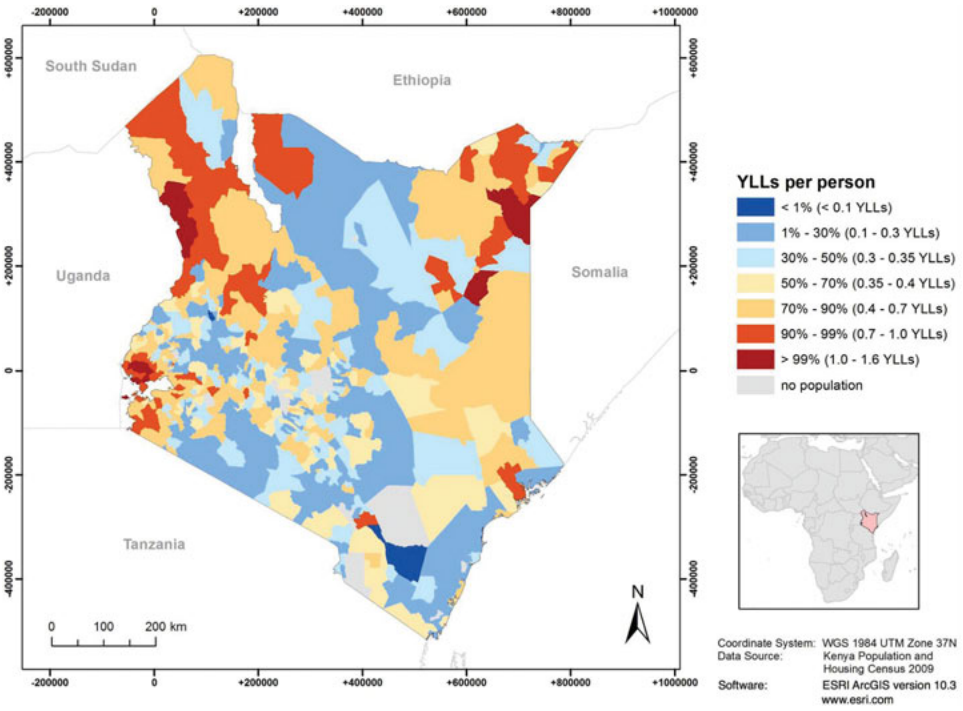


Source: IHME. 2016.[153]

Although coverage of water supply and sanitation is improving, disparities across different counties are high. Figure 29 shows the number of years of life lost (YLL) prematurely across Kenya. It shows the highest levels are situated in the NNE counties, north-west and parts of the western areas. Figure 30 shows how these YLL disparities correspond with the number of unimproved water sources by county.

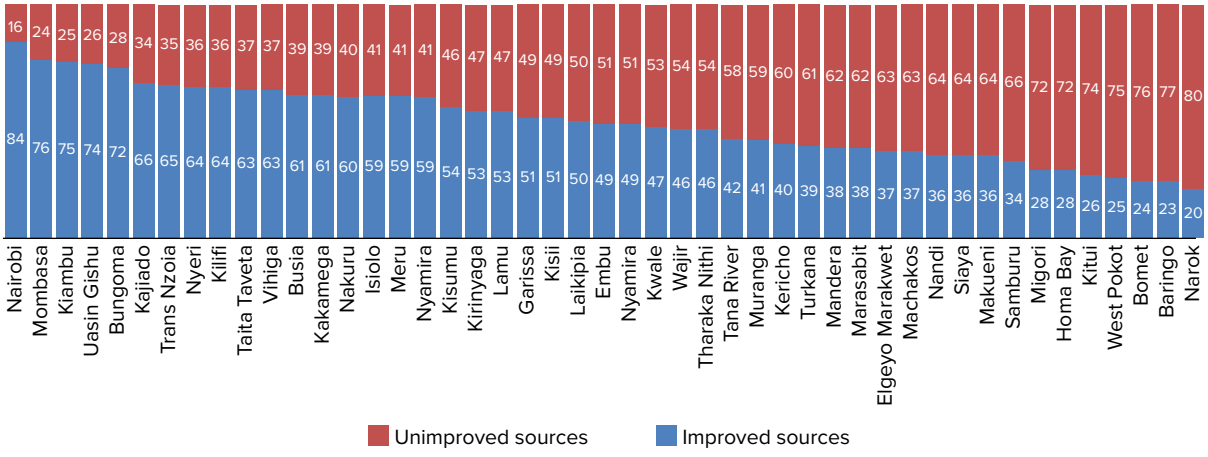
152 IHME. 2016. *Global Burden of Disease Study 2015 (GBD).*
153 IHME. 2016. *Global Burden of Disease Study 2015 (GBD).*

FIGURE 29. Years of life lost due to premature death in Kenya



Source: Frings et al. 2018.[154]

FIGURE 30. Improved and unimproved sources of water by county

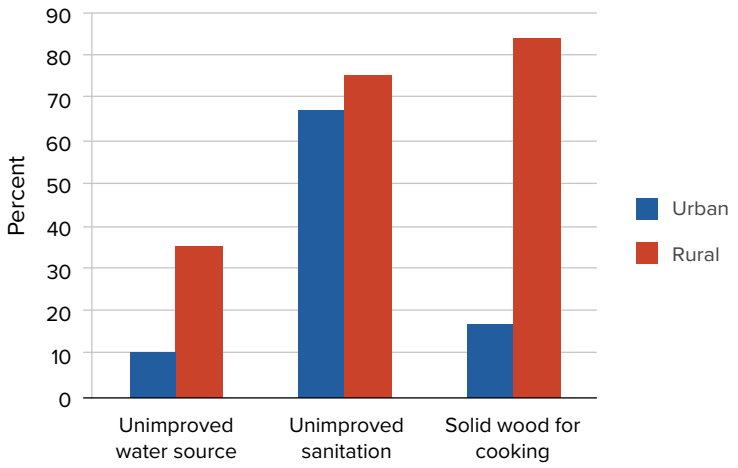


Source: SID. 2013.[155]

HAP is the greatest air pollution risk to the Kenyan population. Solid fuel is used for cooking by 82.6 percent of rural population (Figure 31 and Figure 32).[156] Using solid fuels for cooking is also more prevalent in rural counties—a pattern of usage that is similar to that for unimproved water sources, which is also far more common in rural areas (Figure 30).

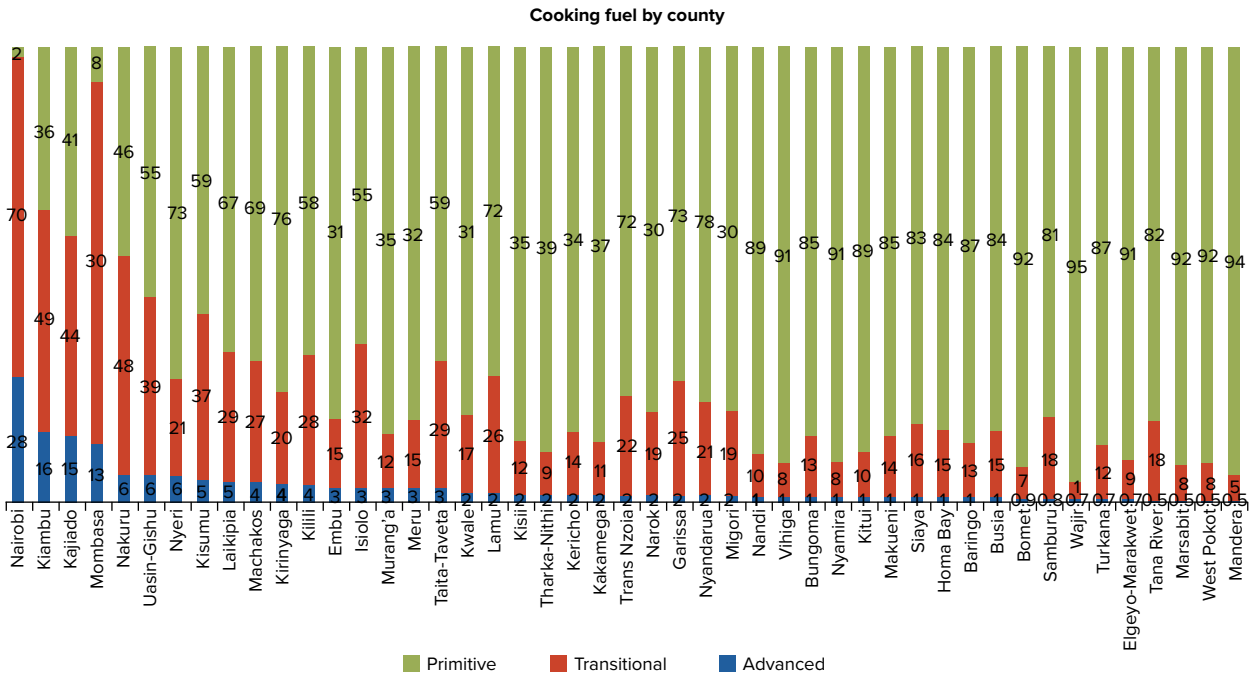
154 Frings et al. 2018. *Modeling and mapping the burden of disease in Kenya.*
155 SID. 2013. *Exploring Kenya's Inequality—Pulling apart and pooling together.*
156 GoK. 2015b. *Kenya Malaria Indicator Survey (MIS).*

FIGURE 31. WASH services in HH and solid fuel use for cooking in Kenya



Source: ICF International, 2015.[157]

FIGURE 32. Cooking fuel by county



Source: SID. 2013.[158]

The population using solid fuel for cooking is exposed to household air pollution levels averaging over 10–60 times the World Health Organization (WHO) guideline levels. Based on international studies, those who cook outside have 100–200 µg per cubic meters average annual concentration of $PM_{2.5}$[159] in the household. Those who cook inside with poor ventilation have 400–600 µg per cubic meters average annual concentration of $PM_{2.5}$ in their household.[160] Exposure to $PM_{2.5}$ concentrations above 100 µg per cubic meter is considered 'unhealthy' and above 300 µg per cubic meter 'hazardous'.

157 See ICF International STATcompiler website: http://www.statcompiler.com

158 SID. 2013. *Exploring Kenya's Inequality—Pulling apart and pooling together.*

159 $PM_{2.5}$ is particulate matter 2.5 micrometres or less in diameter. These particles have damaging effect on human lungs, triggering or worsening chronic respiratory problems and heart disease.

160 Pennise et al. 2009. *Indoor Air Quality Impacts of an Improved Wood Stove in Ghana and an Ethanol Stove in Ethiopia.*



Cooking with solid fuel is a major health hazard for many households.

In comparison, cities in Kenya have quite low levels of ambient air pollution compared with many developing countries. Recent global studies provide relatively low air pollution estimates for cities in Kenya.[161] This corresponds to the WHO air pollution database that reported 17 µg per cubic meter annual average $PM_{2.5}$ concentration in Nairobi in 2009.[162] However, this is still above the WHO guideline level of 10 µg per cubic meter concentration of $PM_{2.5}$.

COST OF ENVIRONMENTAL IMPACTS ON HEALTH

In 2015, environmental pollution in Kenya was estimated to cost the country at least 4.4 percent of its GDP, and maybe as much as 8.5 percent. Table 8 shows the estimated low, high, and mean costs in million US$s of unsafe WASH, and pollution caused by ambient particulate matter and HAP.

TABLE 8. Estimated annual cost of environmental health impacts in Kenya (million US$)

	Low	High	Mean
Unsafe WASH	1,708	4,393	3,051
Ambient particulate matter pollution	242	1,035	639
Household air pollution from solid fuels	812	2,606	1,709
Total	2,762	8,034	5,398
%GDP in 2015	4.4%	12.7%	8.5%

Source: Strukova. 2017.

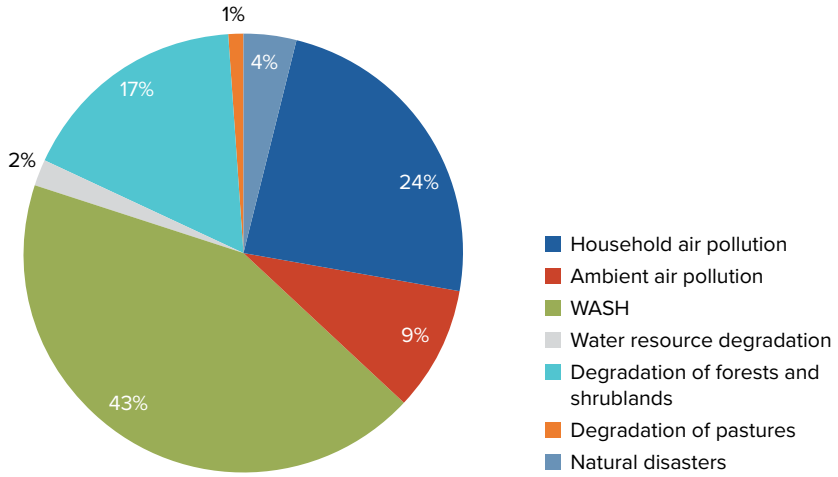
At a national level, around 67 percent of degradation costs are directly related to WASH and HAP. Inadequate WASH is responsible for 43 percent of Kenya's environmental damage, with HAP the cause of a further 24 percent[163] (Figure 33). Kenya's WASH status is only improving very slowly. Access to improved sanitation increased by only 5 percent between 1990 and 2015.[164]

161 Brauer et al. 2016. *Ambient Air Pollution Exposure Estimation for the Global Burden of Disease 2013.*
162 See WHO Global Annual Air Pollution Database: http://maps.who.int/airpollution/
163 Strukova. 2017. *Cost of Environmental Degradation in Kenya.*
164 Njuguna and Muruka. 2017. *Open defecation in newly created Kenyan Counties: A situational analysis.*



A man pulls a cart on a road flooded with raw sewage.

FIGURE 33. Share of costs of degradation by sector



Source: Strukova. 2017.

NNE AND COASTAL COUNTIES

Overall, environmental mortality is three times higher in the NNE than at the coast, and the annual cost of environmental health in the NNE counties alone is estimated to be around 8 percent of gross domestic product (GDP). In coastal counties, the annual cost is estimated to be at about 4 percent of GDP (Table 9). Poor infrastructure and high percentage of poor population, who use solid fuel for cooking, explains higher environmental health burden in NNE.

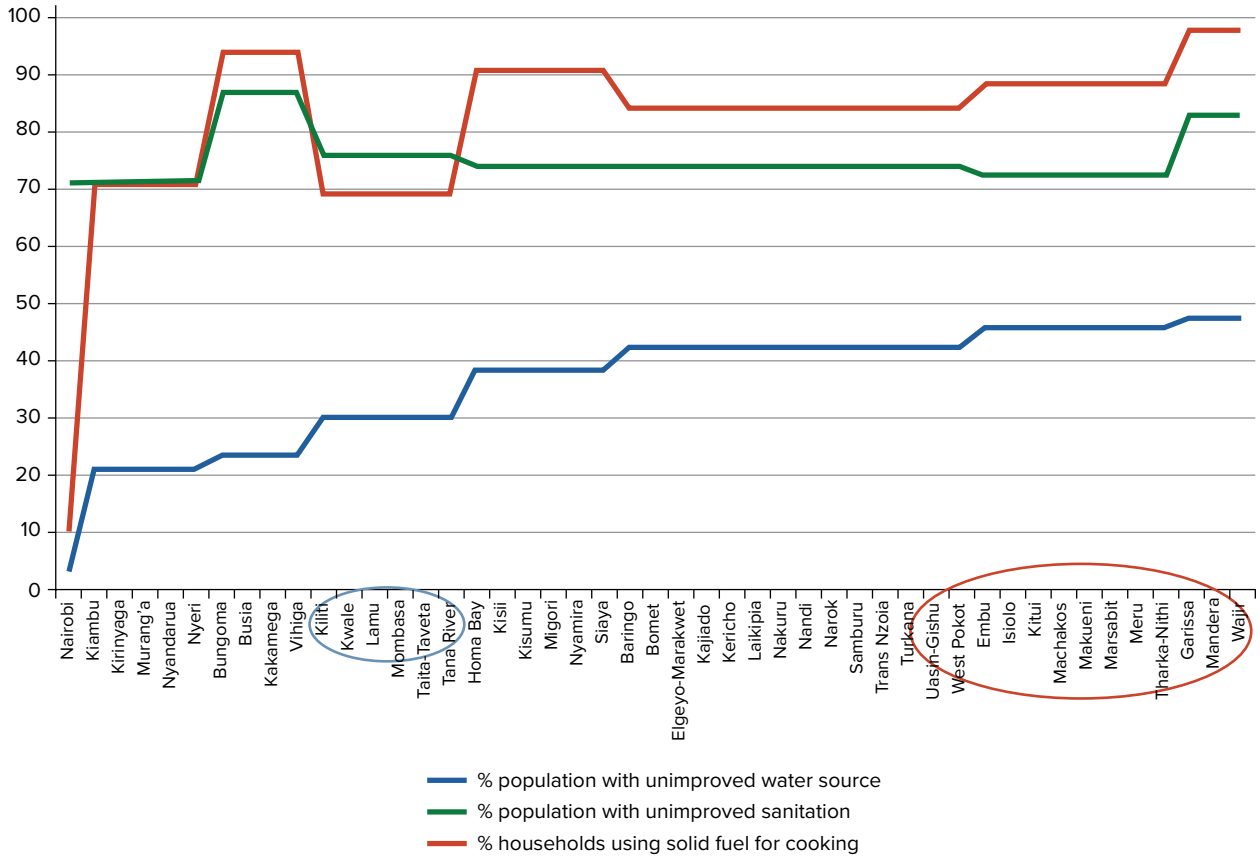
TABLE 9. Estimated annual health impact and cost in the selected counties

		WASH	AAP	HAP	Total	%GDP
Deaths	NNE	5,373	996	2,919	**9,288**	
	Coast	1,894	351	1,029	**3,274**	
		WASH	**AAP**	**HAP**	**Total**	
Cost, US$ million	NNE	106	20	58	**184**	8.3%
	Coast	116	22	63	**201**	4.4%

Source: Dogo et al. 2017.

A closer look at how different areas in Kenya experience this health burden highlights how the NNE counties suffer the most. Figure 34 shows the percentages of the population using solid fuel for cooking and improved and unimproved sanitation. The red circled counties are the NNE counties and the blue circles counties are on the coast. Over 95 percent of the population in NNE counties use solid fuel for cooking compared to only 70 percent at the coast. In addition, nearly 50 percent of those in NNE counties are still using unimproved sanitation compared to only 30 percent of those on the coast.

FIGURE 34. Infrastructure development and use of solid fuel for cooking by county (blue—coastal counties, red—NNE counties)



Source: World Bank. 2018.[165]

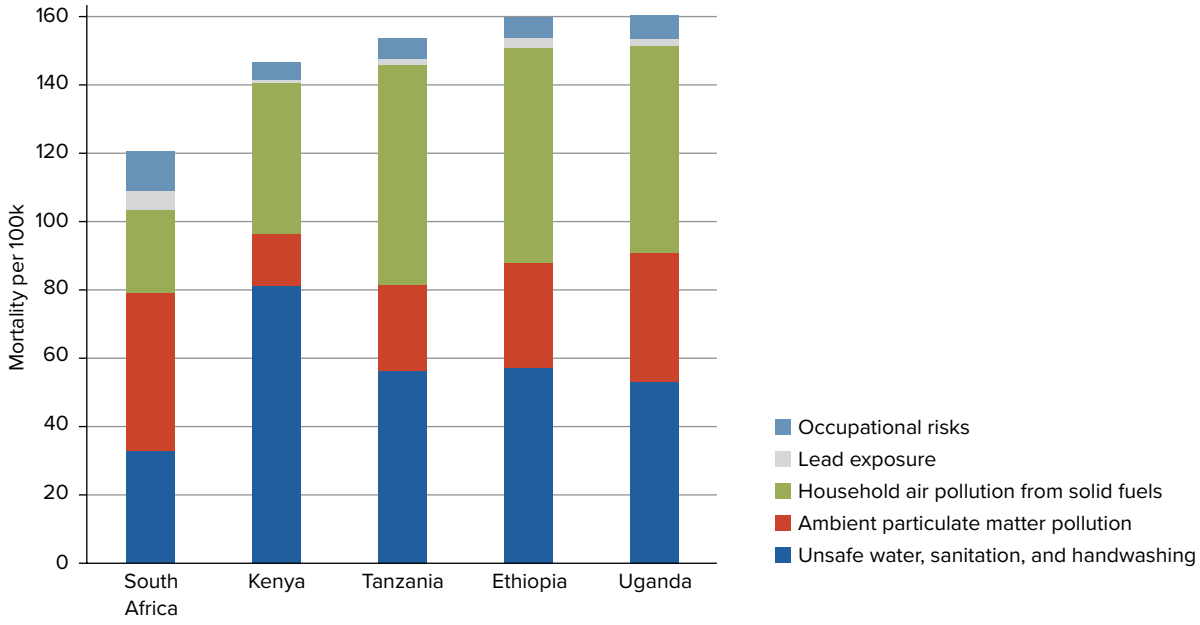
165 World Bank. 2018b. *Hidden Dimensions of Poverty: Economic Development and Sustainability [draft].*

COMPARISON WITH NEIGHBORING COUNTRIES

Kenya has a slightly lower rate of mortality attributed to environmental/occupational risks, compared to neighboring countries in Africa. It is estimated at about 146 deaths per 100,000, or about 60,000 cases annually (Figure 35). However, the burden attributed to inadequate WASH is about 40–50 percent higher in Kenya than in the neighboring countries. Poor water supply infrastructure in Kenya, especially in the most populated counties, is the reason for a high WASH health burden.

However, it is clear that across all five countries (including Kenya) the health effects from air pollution and inadequate WASH are severe, with mortality rates significantly exceeding those attributed to occupational risks and exposure to heavy metals, such as lead (see Figure 35).[166]

FIGURE 35. Comparison of mortality rate per 100,000 attributed to environmental pollution in the selected countries in Africa



Source: IHME. 2016.[167]

WAY FORWARD

1. **Accelerate and scale up the roll-up of WASH programs.** Kenya has significantly higher mortality rates due to unsafe water and sanitation than its neighbors. In addition, progress in providing more people access to improved sanitation has been extremely slow for many years. Urgent efforts should be made to remedy this situation.
2. **Immediate interventions should include education and public awareness strategies to make the severe health risks of HAP apparent.** Women, children, and the housebound elderly are at particular risk from HAP.
3. **Provide subsidies for more adoption of energy-efficient alternatives to wood fuel, especially at the household level.** These alternatives could include liquified petroleum gas, biogas energy from organic waste materials, uptake of efficient and improved cooking stoves, and improved ventilation of cooking and heating areas. HAP is the second highest cause of mortality attributed to environmental pollution in Kenya. Inefficient cookstoves and poor ventilation amplify HAP risks.

166 WHO defines 'occupational risks' as comprised of risks related to airborne particulates, injuries and carcinogens. https://www.who.int/quantifying_ehimpacts/global/occrf2004/en/

167 IHME. 2016. *Global Burden of Disease Study 2015 (GBD).*

Environmental impact of the Kakuma and Dadaab refugee camps

- Sizeable and wide-ranging adverse environmental impacts result from large numbers of refugees in two main camps that are situated in fragile arid ecosystems.
- Competition for access to local natural resources can lead to conflicts.
- The refugee camps are important local economic hubs.
- There are opportunities for environmental rehabilitation that also raise the incomes of both refugee and local host populations.

BACKGROUND

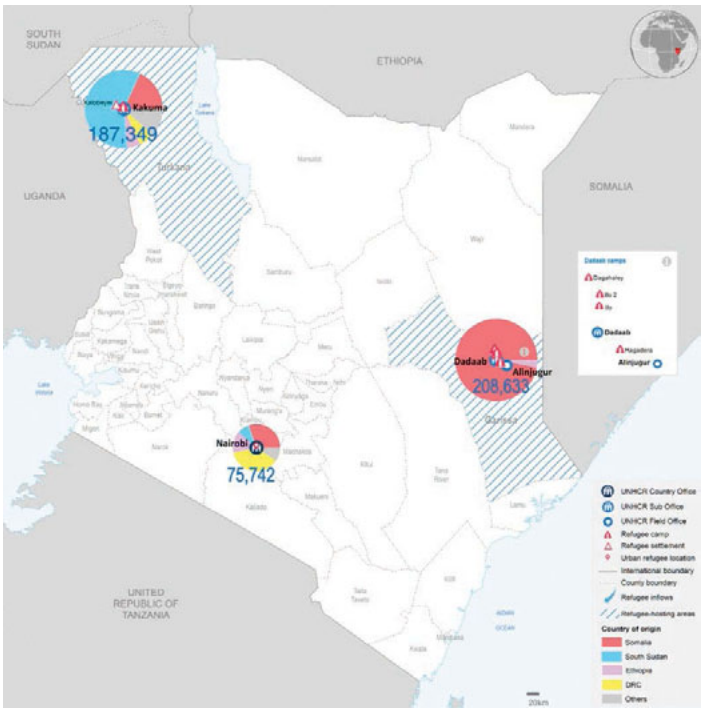
Kenya hosts 471,000 refugees, 88 percent of whom live in and around the Kakuma refugee camp in Turkana (over 187,000) and Dadaab refugee camps in Garissa (over 208,600).[168] Figure 36 shows the locations of these camps and a breakdown of which country the refugees came from. The refugees in Dadaab are mainly from Somalia with a small number from Ethiopia. A large proportion of the Kakuma refugees are from South Sudan although the camp also has a sizeable number from Somalia and from other countries. The Government of Kenya (GoK) has committed to closing Dadaab, in part due to security concerns, and overall refugee numbers in the country have reduced from a peak of over 474,000 in 2012[169] to 235,269 in early 2018. At present, there are no plans to close the Kakuma refugee camp.



The Dadaab refugee camps are home to over 200,000 people.

168 UNHCR. 2018. *Kenya: Registered refugees and asylum-seekers as of 31 December 2018.*
169 UNHCR. 2013. *Global Report, 2013: Kenya.*

FIGURE 36. Refugee locations and numbers, December 2018



The boundaries and names shown, and the designations used on this map do not imply official endorsement or acceptance by the World Bank or United Nations.

Source: UNHCR Kenya. Statistics based on UNHCR's Refugee Registration System, proGres.

The increased populations around Kakuma and Dadaab have put huge pressures on the natural environment. Both these locations are in fragile semi-arid environments. Historically, these locations sustained relatively small populations of pastoralists whose mobile livelihood strategies were geared to a sustainable use of the natural resource base. However, the increased population pressure resulting from the camps has upset this fragile balance between humans and the local natural environment.

Large refugee populations also give rise to occasional conflicts and social tensions with host populations. Host populations are generally sympathetic to the plight of refugees. However, from time to time conflicts arise between refugee and host communities, and one of the key triggers is access to grazing and water resources.[170]

It should be remembered that refugee camps are major trade hubs. For example, a study undertaken in 2010 estimated the turnover over in Dadaab camp shops to be as high as US$25 million per year.[171] The potential to grow the local economy is often overlooked as donor and support agencies' focus is on providing humanitarian relief.

ENVIRONMENTAL CHALLENGES

Natural resources

The large populations in the Kakuma and Dadaab camps have led to overexploitation of natural resources in the surrounding environment. For example, the Dadaab camp was originally built to host 90,000 people and yet, at its fullest,

170 Ali and Ocha. 2018. *East Africa Refugee Crisis: Causes of Tensions and Conflicts between the Local Community and Refugees in Kakuma Refugee Camp, Kenya.*

171 Enghoff et al. 2010. *In Search of Protection and Livelihoods: Socio-economic and Environmental Impacts of Dadaab Refugee Camps on Host Communities.*

ended up home to nearly five times that number. The demands of a heavy population combined with high levels of poverty result in major environmental pressures on the natural resources of the areas around the camps (see Box 6 below).

BOX 6. Environmental impacts of Kenya's large refugee camps[172]

Areas surrounding the large refugee camps are typified by an overexploitation of natural resources and other adverse environmental impacts. These include:

- Accelerated land degradation.
- Increased pressure on the available water resources and reduced water availability.
- Reduced wood used for wood fuel.
- Reduced pasture available for livestock and reduced livestock carrying capacity.
- Increased levels of soil erosion.
- Increased rate of loss of biodiversity.
- Reduced wildlife habitats and resources.
- Large increases in liquid and solid waste (including plastics).
- Increased unregulated and poorly managed mining and quarrying.

Trees and shrubs

Harvesting trees and shrubs for wood fuel and construction is an important driver of environmental degradation. Both refugee and host populations require wood fuel and charcoal for cooking and heating, consuming between 2 and 2.6 kilograms of wood fuel per household per day.[173] In addition, the consumption of these wood fuels is higher because inefficient three-stone fires are still commonplace. Wood is also used for constructing shelters in and around the camps.

Any increase in host or refugee populations leads to a parallel increase in the demand for wood fuel and construction material. The sale of wood fuel and charcoal, both locally and nationally, is an important livelihood option for many in both host and refugee communities. Wood fuel produced in Dadaab is also exported to Somalia and the Middle East.

Alien plants also take advantage of a degraded environment. Indigenous species are the favored choice for wood fuel. However, the continual cutting of indigenous trees and shrubs in a fragile environment leaves barren wastelands. The resulting gaps provide opportunities for regrowth, which is usually dominated by the alien invasive *Prosopis* species (see Box 8).

172 See for example: Braun et al. 2015. *Impact of Refugee Camps on Their Environment; A Case Study Using Multi-Temporal SAR Data.* And: Kamau and Fox. 2013. *The Dadaab Dilemma: A Study on Livelihood Activities and Opportunities for Dadaab Refugees.*

173 World Bank and FAO. 2018. *Rapid Assessment of Natural Resources Degradation in Areas Impacted by the Refugee Influx in Kakuma Camp, Kenya.*

BOX 7. Overexploitation of tree species around Kakuma camp

A survey of woodland degradation around the Kakuma camp[174] found that tree and shrub loss was so severe that it was necessary to travel around 32 kilometers from the camp before six separate tree and shrub species could be found growing near each other.

The most overexploited species are:

Species	Habit	Use
Acacia tortilis	Trees	Wood fuel, charcoal (most preferred fuelwood), construction, fruit, medicine and carving
Acacia eliator	Trees	Wood fuel, charcoal, medicine, carving (especially drinking vessels)
Acacia reficiens	Trees and shrubs	Wood fuel, charcoal, fodder, medicine, construction gum
Cordia sinensis	Trees and shrubs	Charcoal, wood fuel, and fruit
Salvadora persica	Trees and shrubs	Fence, construction, wood fuel, fruit, and carving
Acacia mellifera	Shrubs	Wood fuel, charcoal, construction, and gum
Ziziphus mauritiana	Trees	Fruit, fodder, medicine, construction, and carving

BOX 8. *Prosopis spp.*

Prosopis was originally introduced in East Africa to combat desertification.[175] It was also used as a way to rehabilitate quarries and was still being used to rehabilitate land during the 1990s.[176]

It is remarkedly drought tolerant and fast growing. However, it can invade valuable farm- and rangeland and sometimes forms extremely dense thickets. This competition with native vegetation can cause enormous ecological and economic damage.



Source: SciDevNet. 2019.[177]

174 Kariuki et al. 2008. *Baseline Survey of Woodland Utilization and Degradation Around Kakuma Refugee Camp.*
175 Geesing et al. 2004. *Management of introduced Prosopis* species: can economic exploitation control an invasive species?
176 Den Ouden. 2011. *Prosopis upsurge in Kenya: Cause and effects.*
177 https://www.scidev.net/sub-saharan-africa/biodiversity/news/tackle-invasive-species-degraded-landscapes.html



Boreholes provide the only source of water for many refugees.

Water

High populations add pressure on limited water resources. Inevitably, providing adequate safe drinking water becomes a major challenge when population densities are so high in a dryland region. With no permanent rivers near the camps, boreholes provide the only reliable sources of year-round water supplies. However, there is a limited knowledge of the quantities, quality, and recharge rates of the aquifers being tapped. In addition, the information that is available raises many concerns (Box 9).

BOX 9. Analysis of the impacts of abstracting water from the Merti aquifer

The Merti aquifer, Kenya's largest, is the source of Dadaab's water supplies.

It has a recharge estimate of 4.5 million cubic meters per year and had an estimated abstraction rate of 5.3 million cubic meters per year in 2010. There are also plans to supply Wajir town from this aquifer. Wajir is around 120 kilometers north of the camps and suffers from longstanding water shortages.

Although the peak abstraction rate has dropped due to the recent decline in camp numbers, the aquifer has been depleted and saline water underlies and surrounds the fresh water that has been extracted. Saline water can move upward as fresh water is abstracted from an aquifer—a process called 'upconing'.

The most detailed studies of the Merti aquifer that has been undertaken to date[178, 179] suggest that, while there is a low risk of boreholes running dry completely, monitoring of the impacts of abstraction is very weak. New boreholes should be restricted to the aquifer's 'high potential' zones and careful assessments are required before more boreholes are developed. Improving and developing surface runoff in dams and pans will not only add to local water availability, but also provide artificial recharge into the aquifer. There is a greater than 50 percent likelihood that, at current rates of abstraction, salinization could become a serious problem by 2050.

178 Oord et al. 2014. *Hydrogeological Assessment of the Merti Aquifer, Kenya.*
179 Earth Water. 2017. *Evaluation, Monitoring and Modelling of Merti Aquifer Final Report, Volume I, Main Report.*

These environmental challenges need to be set in the context of clear local economic gains from hosting large refugee populations. A recent study[180] shows that the inflow of refugees into Kakuma has resulted in increased economic activity in areas within a 10 kilometer distance of the camp. In addition, household consumption within these areas is 25 percent higher than in areas farther away, with marked improvements in food availability and nutritional status. These positive effects are a result of new employment opportunities (often linked to the presence of relief and development infrastructure),[181] along with price changes for agricultural and livestock products that benefit local producers.

It is important to establish the sustainable management of indigenous vegetation at the same time as controlling the alien *Prosopis spp.* A primary characteristic of the degraded natural resource base around the camps is the dominance of *Prosopis juliflora,* which spreads rapidly and overwhelms the regrowth of indigenous tree, shrub, and grass species. Past attempts to eradicate *P. juliflora* have not been successful.[182] However, renewed management efforts could focus on the benefits of using it for wood fuel and poles and include thinning and pruning *P. juliflora* thickets to make access for harvesting easier.

Competition for natural resources can often spill over into conflict, undermining rehabilitation efforts. Effective environmental rehabilitation and management can potentially benefit all communities. However, benefits are not necessarily shared equally for a multitude of reasons, and this can aggravate existing social tensions. Technical interventions that go hand in hand with peace-building processes mitigate this risk by bringing host and refugee communities together and these are more likely to succeed.[183]

BOX 10. Examples of potential environmental rehabilitation activities[184]

- Rehabilitate degraded land and indigenous vegetation.
  - Control and management of Prosopis spp. through utilization as an alternative to indigenous species, preferably with a goal to eradicate or control.
  - Provide 'green belts' in the areas close to the camps to provide a buffer between camps and surrounding bush, along with a genetic stock for future and ongoing regeneration.
- Work with pastoralists to adjust and improve grazing management and livestock development strategies.
  - Rangeland restoration and *community rangeland grazing management plans* based on traditional knowledge and social linkages.
  - Support natural regeneration: vegetation (grass and tree) reseeding, tree planting, reforestation/afforestation with appropriate species; rainwater harvesting.
  - Access to community-based animal health services.
  - Access to basic veterinary medicines.
  - Improved linkages with national livestock markets.
  - Capacity building (e.g., formation of community environmental management committees, community forest associations, and community wildlife associations).

180 Alix-Garcia et al. 2018. *Do refugee camps help or hurt hosts? The case of Kakuma, Kenya.*

181 Vemuru et al. 2016. *Refugee impacts on Turkana hosts: a social impact analysis for Kakuma town and refugee camp Turkana County, Kenya.*

182 World Bank and FAO. 2018. *Rapid Assessment of Natural Resources Degradation in Areas Impacted by the Refugee Influx in Kakuma Camp, Kenya.*

183 World Bank and FAO. 2018. *Rapid Assessment of Natural Resources Degradation in Areas Impacted by the Refugee Influx in Kakuma Camp, Kenya.*

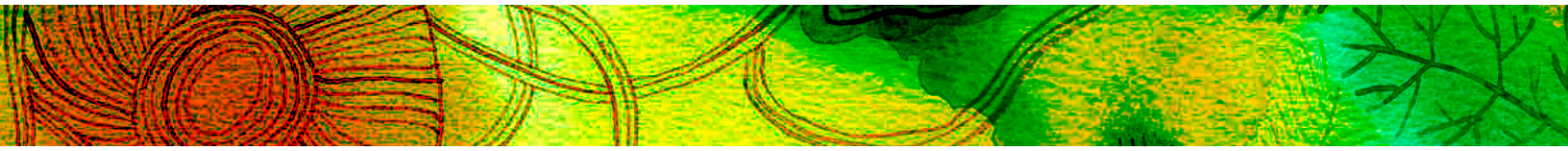
184 Based on: World Bank and FAO. 2018. *Rapid Assessment of Natural Resources Degradation in Areas Impacted by the Refugee Influx in Kakuma Camp, Kenya.*

- Develop sustainable natural resource-based livelihood opportunities, such as:
  - Beekeeping.
  - Horticulture.
  - Afforestation.
  - Nurseries.
  - Harvesting non-timber forest products (e.g., gum arabic, frankincense, dyes, aloe vera, medicinal plants).
  - Woodlots for wood fuel.
- Encourage crop production land management methods that assist saving and recharging water resources, such as:
  - Rainwater harvesting.
  - Drip irrigation.
  - Aquifer recharge.
- Provide alternative sources of energy, such as solar energy for lighting, along with cleaner stoves and improved charcoal production technologies. These can provide local business opportunities for sales, installation and maintenance.
- Map the areas around camps using geo-sensing and GIS data to provide real-time evidence to understand and develop rehabilitation efforts.

Environmental and natural resource management opportunities combined with training and awareness-raising can also improve incomes. It is important to provide increased opportunities for more secure livelihoods of both refugees and host communities. This can be done by making sure environmental management initiatives actively involve local communities. Supporting the establishment of local associations and cooperatives could be explored as a mechanism to link direct economic benefits with specific environmental and energy initiatives. Waste management (especially approaches to reduce, reuse, and recycle plastic waste) could be managed by local community environmental committees and offer employment opportunities, while helping provide a cleaner environment. In addition, providing training and awareness-raising opportunities (particularly for the large numbers of young people) will strengthen local community capacity and willingness to protect the environment, whilst at the same time offering more opportunities to provide more secure livelihoods.

WAY FORWARD

1. **Prioritize environmental rehabilitation activities that provide socioeconomic incentives for both refugees and host communities to tackle these large camps' environmental footprints.** This approach recognizes the potential to link positive environmental management initiatives with economic activity and capitalize on the camps' position as vibrant economic hubs. This has a far greater likelihood of uptake, than an approach that simply focuses on environmental improvements in isolation from immediate social and economic gains.
2. **Map the areas around camps using geo-sensing and GIS data to provide real-time evidence to understand and develop rehabilitation efforts.** Geo-sensing and GIS data provide readily available, cost-effective technologies for initial mapping and can also provide real-time updates on the impacts of rehabilitation efforts. This form of remote monitoring can be used to guide and adjust rehabilitation priorities.



Key Environmental Sectors

Land

- Nearly 90 percent of Kenya's land area is degraded.[185]
- Land degradation leads to loss of soil fertility, wind and water erosion, degrading rangelands, deforestation, and desertification.
- Climate change is likely to accelerate land degradation.
- Smallholder farming and pastoralism are particularly vulnerable to land degradation.
- Poor land management practices exacerbate land degradation.
- The annual economic loss from land degradation is close to 5 percent of gross domestic product (GDP). This includes production losses to farmers and pastoralists as well as the decrease in ecosystem services such as drought and flood protection.

Land degradation, made worse by poor land use practices, is a major challenge for Kenya. Soil erosion and soil nutrient depletion are major contributors to low agricultural productivity, and food crop production is failing to keep pace with population growth.[186] In addition, land is a vital resource to preserve biodiversity, and the loss of biodiversity that accompanies land degradation threatens the natural management of water systems and the store of carbon. The impacts of land degradation combine to result in impoverished community livelihoods, deteriorating health, a more fragile natural environment, and reduced economic growth.

Land degradation is defined here as "long-term loss of on-site and off-site terrestrial ecosystem goods and services, which humans derive from them."[187]

Source: Millennium Ecosystem Assessment. 2005. Global Assessment Reports.

Kenya's soils are also highly erodible. In the highlands, intensive crop production coupled with excessive rainfall and inadequate soil and water conservation are the main causes of soil erosion. In the drylands, wind and occasional floods are the main causes of soil erosion.

185 This land supports around 12 million people.

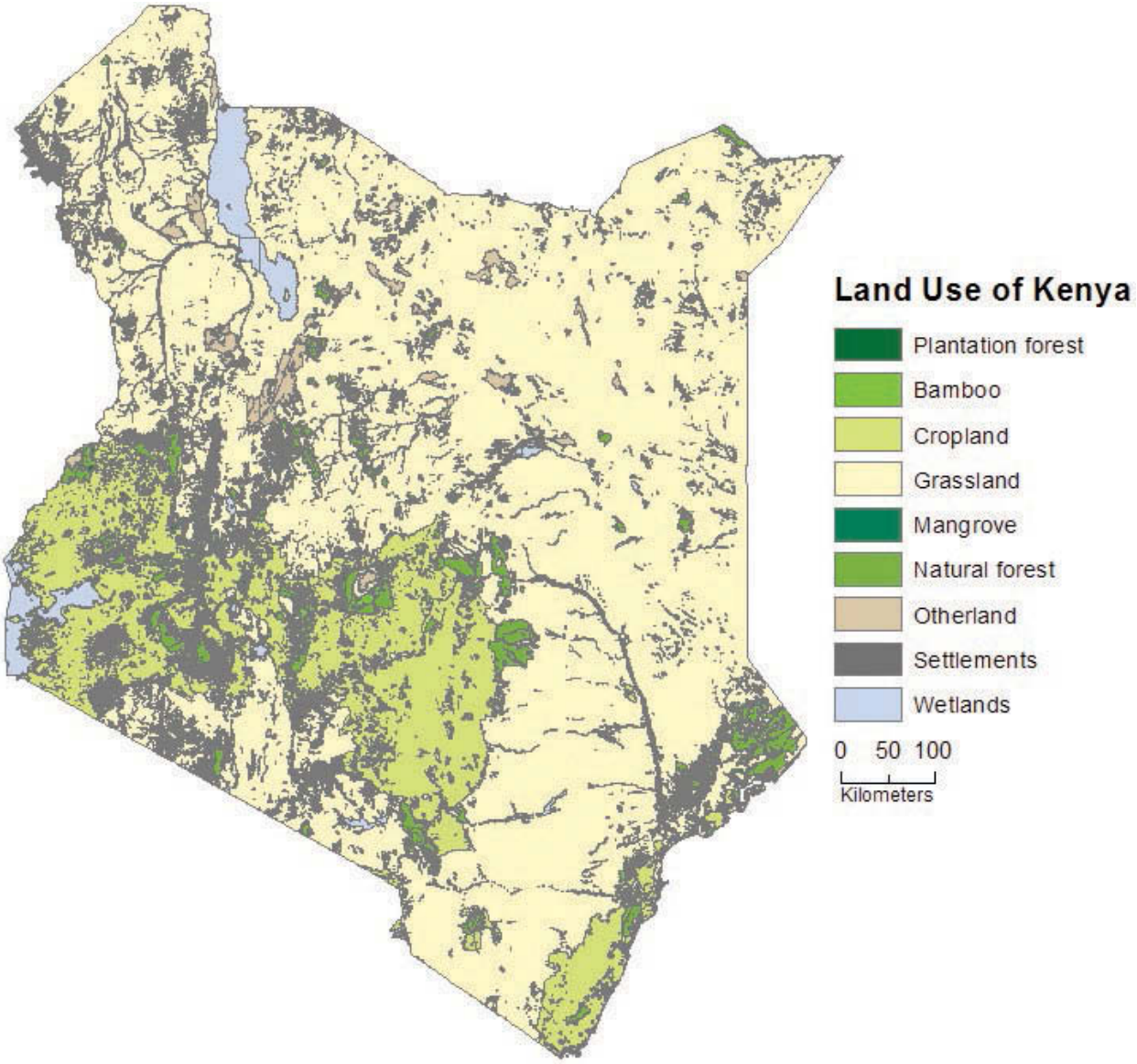
186 Mulinge et al. 2016. *Economics of Land Degradation and Improvement in Kenya. In Nkonya et al. 2016. Economics of Land Degradation and Improvement—A Global Assessment for Sustainable Development.*

187 Millenium Ecosystem Assessment. 2005. *Global Assessment Reports.*

A STORY OF DEGRADATION AND EROSION

Kenya has many landforms, while soil and climatic conditions also vary substantially across its regions. For example, the coastal region has a tropical climate, the central highlands are temperate and mainly arable, and the northern regions have an arid climate. The majority of Kenya's land is classified as arid and semi-arid. Typically, they have fragile ecosystems and land use is largely pastoral. In contrast, only approximately 11 percent of Kenya's land is classified as cropland.[188] Figure 37 shows the distribution of land cover in Kenya and the extent of grassland and shrubland.

FIGURE 37. Kenya land cover—2013



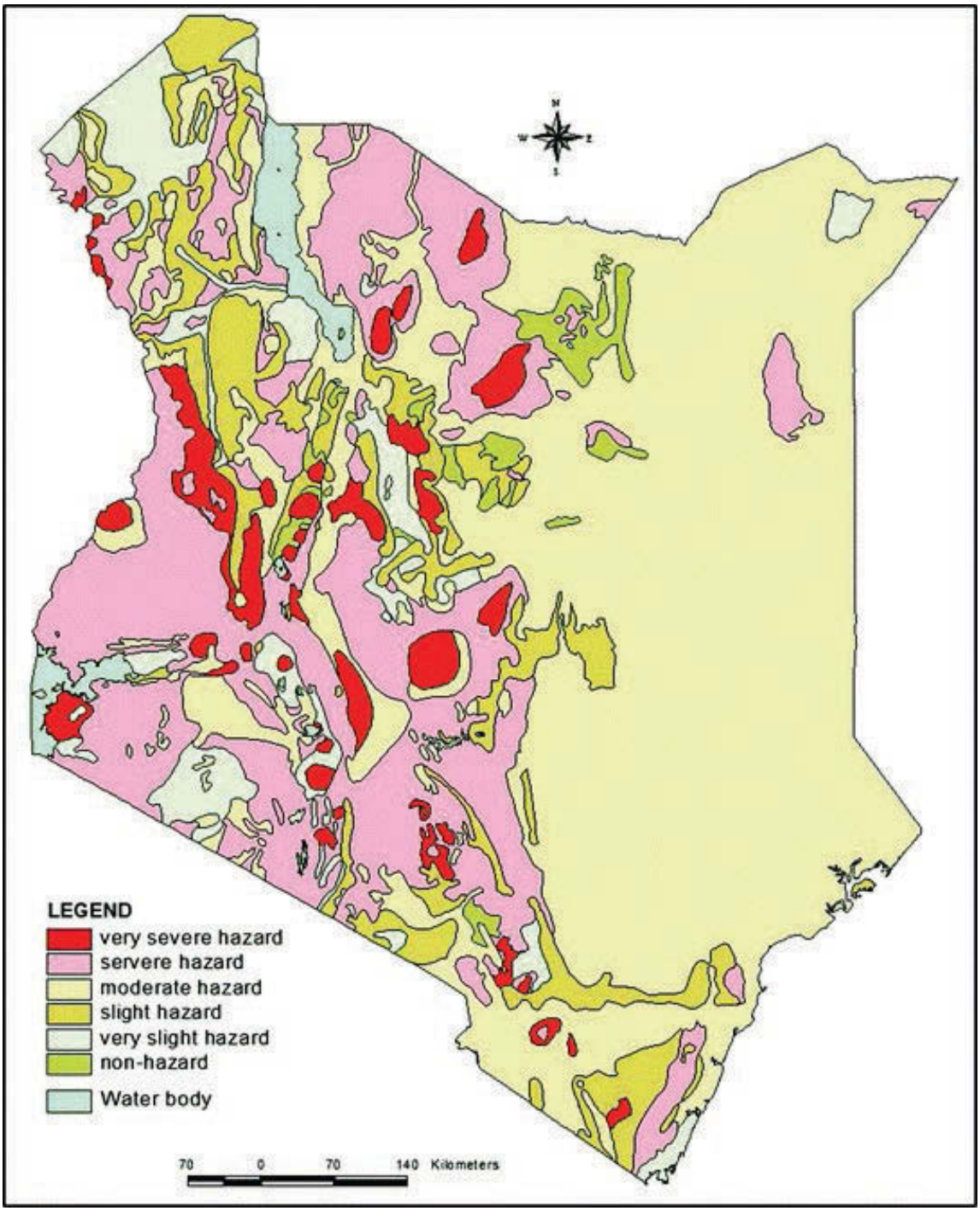
Source: FPP. 2013.[189]

188 FAO. 2016. *Land use.*

189 FPP. 2013. *Report on National Forest Resource Mapping and Capacity Development for The Republic of Kenya, Volume 2. Forest Preservation Programme (FPP).*

The 2016 Kenya Land Degradation Assessment (LADA) study identified that 88.6 percent (514,205 square kilometers) of the country's land mass suffered from land degradation.[190] Of this total, 27.2 percent is very highly degraded, and 61.4 percent is highly degraded. Figure 38 maps how land degradation affects different parts of Kenya and shows how most of Kenya's land faces some level of risk.

FIGURE 38. Land degradation hazard areas in Kenya



Source: Mulinge et al. 2016.[191]

190 MENR. 2016b. *Land Degradation Assessment (LADA) in Kenya.*

191 Mulinge et al. 2016. *Economics of Land Degradation and Improvement in Kenya. In Nkonya et al. 2016. Economics of Land Degradation and Improvement–A Global Assessment for Sustainable Development.*

Over 80 percent of Kenya's total land mass is classified as ASAL and is at risk of degradation and desertification. Approximately 30 percent of Kenya's human population and 50 percent of its livestock live in the ASALs. Land degradation also is severe in humid and sub-humid areas in the center and southwest of the country, due to deforestation and land use and land cover (LULC) change, which replaces high-value biomes with low-value biomes.

Kenya's major land degradation problems are the loss of soil fertility, wind and water erosion of the soils, degrading rangelands, deforestation, and desertification. These underlying processes manifest their impacts in different ways in different locations and ecosystems. The types of land degradation found most frequently in Kenya are soil erosion, loss of soil fertility, increased sediment loads in water bodies, salinity in irrigated areas, reduced ground cover, and reduced carrying capacity of pastures and grazing lands.

An estimated 12 million people, close to 25 percent of the Kenyan population, subsist on land that is being degraded.[192, 193] The northern rangelands within the ASALs are home to 10 million Kenyans, 70 percent of whom live below the poverty line. In these rangelands, approximately 12.3 percent of the land is classified as severely degraded, 52 percent moderately degraded, and 33 percent lightly degraded. Recent studies estimate that degradation is increasing in severity and extent, although the rate of increase appears to be decreasing from a peak in the 1990s.[194] Any degradation of land resources has a disproportionally high adverse impact on the rural poor because a high proportion of their livelihood strategies depend on natural resources.[195]

Smallholder farms, which dominate farming in Kenya,[196] are particularly vulnerable to the effects of land degradation.[197] Agriculture contributes a dominant share of Kenya's GDP (26 percent directly and a further 27 percent indirectly through linkages with other sectors).[198] Smallholder farms generally produce lower and more volatile yields than large-scale commercial farms. This may be partly due to the low use of fertilizers. However, deteriorating soil fertility caused by poor land management, including continuous cropping, and soil erosion are also big factors.[199] For example, the maize farmers in Kisii county produced less than 2 tons per hectare, whereas yields from comparable fields on a nearby research station were approximately 9 tons per hectare.[200]

Livestock production is also highly vulnerable to the impact of land degradation. And yet, it is an important factor in Kenyan agriculture. It accounts for approximately 50 percent of the agriculture share of the GDP and is a key source of livelihood for many in the more remote North and North-Eastern (NNE) rural areas. The NNE is home to approximately 5 million people,[201] and to approximately 70 percent of the national livestock herd. These herds are mainly part of a pastoralist agriculture system and make a significant contribution to the economy.

Land degradation in Kenya results in a loss of land productivity and a decrease in ecosystem services, such as flood control and landslide prevention. The loss of land productivity is being accelerated by the increasing cultivation of marginal lands, overgrazing land, and encroaching on forests, magnified by the impacts of climate change. Land degradation has also resulted in loss of forest and woodland in Kenya. A recent study estimated a 0.7 percent per annum loss of forest and woodland in Kenya.[202] The study linked these losses to the decline in the productive quality of the land, resulting from a plethora of drivers and causes, including inappropriate and unsustainable agronomic and animal husbandry practices, vagaries and impacts of climate change, soil erosion, pollution and toxicity from agro-chemicals, and invasion by alien and noxious species.

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192 See Convention to Combat Desertification website: https://www.unccd.int/

193 Le et al. 2014. *Biomass productivity-based mapping of global land degradation hotspots.*

194 MENR. 2016b. *Land Degradation Assessment (LADA) in Kenya.* And UNEP. 2009. *Kenya: Atlas of Our Changing Environment.*

195 Nkonya et al. 2008. *On-site and off-site long-term economic impacts of soil fertility management practices: The case of maize-based cropping systems in Kenya.*

196 Rapsomanikis. 2015. *The economic lives of smallholder farmers: An analysis based on household data from nine countries.*

197 NEMA. 2015. *Second National Communication to the United Nations Framework Convention on Climate Change (UNFCCC).*

198 See FAO webpage: http://www.fao.org/kenya/fao-in-kenya/kenya-at-a-glance/en/

199 Kamoni and Makokha. 2010. *Influence of Land Use Practices and Socio-Economic Factors on Land Degradation and Environmental Sustainability in Gucha District, Kenya.*

200 Mulinge et al. 2016. *Economics of Land Degradation and Improvement in Kenya. In Nkonya et al. 2016. Economics of Land Degradation and Improvement—A Global Assessment for Sustainable Development.*

201 Current estimate of Kenya's total population is just over 50 million.

202 Nkonya et al. 2016. *Economics of Land Degradation and Improvement: A Global Assessment for Sustainable Development.*

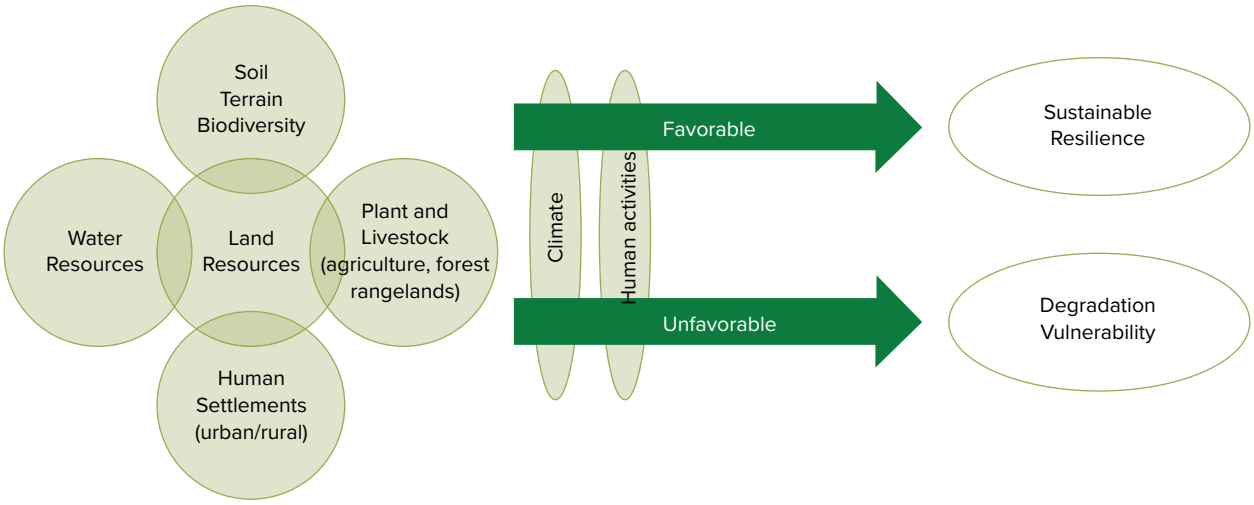
BOX 11. Sustainable land management (SLM)

SLM integrates land, water, biodiversity, and environmental management to meet rising food and fiber demands while sustaining livelihoods and the environment. Any land-use system's productivity and sustainability is a result of the interaction between land resources, climate, and human activities. Selecting suitable land uses for specific combinations of biophysical and socioeconomic conditions, and implementing SLM, are necessary to minimize land degradation, rehabilitate degraded land, and ensure the sustainable use of land resources (such as soils, water, and biodiversity). See Figure 39.[203]

SLM typically involves activities that:

- Preserve and enhance the productive capabilities of cropland, forestland, and grazing land (such as upland areas, down-slope areas, flatlands, and bottomlands);
- Sustain productive forest areas and potentially commercial and noncommercial forest reserve conservation zones;
- Maintain the integrity of watersheds for water supply and hydropower-generation needs and water conservation zones;
- Maintain the ability of aquifers to serve the needs of farm and other productive activities; and[204]
- Decide the sustainability, resilience, degradation, and vulnerability of land resources.

FIGURE 39. Land resource components



Source: FAO. 2019.[205]

203 FAO. 2019. *Climate-Smart Agriculture Sourcebook.*
204 World Bank. 2008. *Sustainable Land Management Sourcebook.*
205 FAO. 2019. *Climate-Smart Agriculture Sourcebook.*

DRIVERS OF LAND DEGRADATION

The underlying drivers of land degradation include climate change (with cyclic droughts and floods), the physical and geological properties of the catchments, and human-induced factors. A rising population (2.6 percent growth per year) contributes to increasing demands for land use for economic development. This increase is causing unprecedented changes in the way the land is managed. Bringing more land under cultivation without parallel investments in soil and water conservation contributes to increases in soil erosion, and loss of vegetative cover.[206] On static biomes, that is, biomes that did not undergo changes to land use or cover, land-degrading management practices have reduced the productivity of both cropland and grazing lands. This type of land management change represents unsustainable land use, and drives land degradation across a wide variety of landscapes. These include ASALs, forests, grasslands and shrublands, agriculture, and grazing lands.

Overgrazing grasslands and shrublands are another contributory factor. Between 1990 and 2017 livestock numbers increased markedly. The number of cattle increased by a third, sheep and goat numbers more than doubled, and camel numbers trebled, while the area under grassland and pastures remained more or less constant.[207, 208] The resulting pressure on grasslands, shrubs and pastures leads to increased overgrazing.

The decline in Kenya's forests is also partly responsible for land degradation. Between 1982 and 2006, 46 percent of Kenya's forestland degraded.[209] In recent years there has been some recovery, although total forest cover has not yet returned to 1990 levels. Deforested areas can quickly degrade because they are exposed to wind and rain erosion, and the soil loses its main source of nutrients. In ASAL areas, deforestation is often severe. Increasing human and livestock populations causes grazing to extend into forest areas. This results in both degraded forest resources and lowered livestock productivity. (For more detail on Kenya's forest resources, see section on Forests).

Climate change

Climate change is likely to increase and accelerate land degradation. Projected increases in the frequency and intensity of extreme weather events such as droughts, heatwaves, and floods will inevitably increase the exposure of vulnerable landscapes to further soil and vegetation losses. These effects then lead to knock-on adverse impacts on agricultural productivity, soil health, soil erosion, and water holding capacity. As land resources degrade in this way, they become ever more vulnerable to the recurrent impacts of climate change, triggering a downward spiral of degradation and productivity losses.

Drylands are valuable carbon sinks, but degraded landscapes become a source of greenhouse gasses. Depending on their health and management, dryland ecosystems can be either a source or a sink of carbon. The total carbon stock in drylands comprises around 36 percent of the total carbon stock in terrestrial ecosystems.[210] However, deforestation and land degradation are a major source of greenhouse gas emissions. The process of land degradation means that carbon that would normally be stored in terrestrial ecosystems is lost and added to the atmosphere in the form of greenhouse gases—mainly carbon dioxide (CO2) and methane (CH4).[211]

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206 See for example: Nyssen et al. 2009. *Land degradation and soil and water conservation in tropical highlands.*

207 See FAO FAOSTAT database: http://www.fao.org/faostat/en/#data

208 Different data sets provide different perspectives on whether or not there has been a loss of grazing land to cropland. FAO data indicate land under permanent meadows and pastures remained fairly constant between 1990 and 2016. Other data sets suggest both a reduction and an increase in grazing land. A possible explanation of this variation is the fact that, at different time periods, cropland is left as fallow for long periods, and some parcels drift into grasslands and *vice versa.*

209 Le et al. 2014. *Biomass productivity-based mapping of global land degradation hotspots.*

210 IPCC. 2000. *Land use, land use change and forestry. A special report of the Intergovernmental panel on Climate change (IPCC).*

211 FAO. 2004. *Carbon sequestration in dryland soils, World Soil Resources Reports:102.*



Weather extremes accelerate the loss of productive soils.

POLICIES AND INSTITUTIONS

The Government of Kenya's (GoK's) 'Vision 2030' identifies land degradation as a high priority and aspires to promote sustainable land use as part of proposed land reforms. GoK has developed the Kenya Strategic Investment Framework (KSIF) to provide evidence-based decision support for SLM planning.[212] GoK implements the KSIF through the Kenya Agricultural Productivity and Sustainable Land Management Project (KAPSLMP). Other important initiatives include the Kenya Climate-smart Agriculture Project, Kenya National Agriculture and Inclusive Growth Project, and the Kenya Pastoral Livelihoods Resilience Project.

GoK has committed to restoring over 5.1 million hectares of degraded land by 2030.[213] This is a substantial commitment with the area representing close to 9 percent of Kenya's total landmass. This has been undertaken as part of Kenya's response to the Bonn Challenge, a global initiative, and the African Forest Landscape Restoration Initiative (AFR100) Kenya, a regional initiative. Kenya completed a National Forest and Landscape Restoration Opportunity Assessment in 2016—the first African country to do an exercise of this nature.

COSTS OF LAND DEGRADATION

Land degradation has significant cost implications for the economy of Kenya. A 2010 study estimated that the annual costs of land degradation in Kenya was approximately US$390 million.[214] A later study in 2016, using the total economic value (TEV) approach, concludes the costs are far higher.[215] It estimates that between 2001 and 2009, Kenya's annual cost of land degradation due to LULC changes was approximately US$1.3 billion every year, the equivalent of nearly 5 percent of Kenyan GDP in 2007. This later study also found that the likely annual cost of using land-degrading management practices on static cropland and grazing lands was roughly US$116.7 million and US$77.9 million, respectively.

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212 MENR. 2016c. *Kenya Strategic Investment Framework for Sustainable Land Management 2017–2027.*

213 MENR. 2016d. *Technical Report on the National Assessment of Forest and Landscape Restoration Opportunities in Kenya 2016.*

214 IMF. 2010. *Kenya: Poverty Reduction Strategy Paper.*

215 Mulinge et al. 2016. *Economics of Land Degradation and Improvement in Kenya. In Nkonya et al. 2016. Economics of Land Degradation and Improvement—A Global Assessment for Sustainable Development.*

TABLE 10. Annual cost of land degradation due to LULC change, 2000–2009

Province	Percent of Kenya Land Area	Annual Cost of Land Degradation, 2007 US$ Million	Annual per Capita Cost of Land Degradation, 2007 US$
Central	2.0	80.9	144
Coast	14.2	290.2	680
Eastern	25.0	214.2	296
Nairobi	0.1	2.3	8
North-Eastern (includes Garissa and Wajir)	22.7	187.8	640
Nyanza	2.2	72.1	104
Rift Valley (includes Turkana)	32.5	452.1	352
Western	1.3	31.0	56
Total	**100**	**1,330.6**	**2,280**
Cost of land degradation as percent of GDP		**4.92**	

Source: Mulinge et al. 2016.[216]

The authors of this CEA estimate that the cost of degradation for crop producing counties[217] in 2015 was around US$308 million. This figure was derived using the static cost estimate of cropland degradation in Kenya used in an earlier study.[218] This cost estimate was then modified to include the costs of deforestation and degrading shrubland as the other study had mainly associated cropland degradation to soil erosion. This points to the importance of accounting for the full cost of ecosystems degradation when assessing the costs of reduced ecosystem services in any location.

It is more difficult to estimate the costs of land degradation in the NNE and coastal areas. Agriculture in the NNE is mainly pastoralist by nature and there is a lack of information on cropland degradation in the coast. While maize is the most dominant crop in the coastal areas, yields tend to be much lower than in other areas, constantly putting food security at risk.[219] The coast only produces about 1.5 percent of Kenya's total maize. Thus, cropland degradation could not be a substantial share of the total cost of environmental degradation at the coast.

Land degradation also reduces the productivity of grazing lands through losses in milk and meat. Table 11 shows that reduced productivity of grazing lands costs Kenya approximately US$89 million annually (as of 2015).[220] In the ASALs, annual degradation costs approximately US$61 million (from Table 10, adjusted to 2015 US$); and in the coast, approximately US$1 million. It is not surprising that the costs of degradation on the NNE grazing lands are so high with pastoralism being the dominant form of livestock-keeping. While pastoralism is inherently adaptive, climate change is exacerbating the impacts of water resource degradation and increasing the frequency of extreme weather events making it ever harder to cope. Overgrazing pressures on grasslands and pastures are made worse by the traditional practice of free-range grazing and by poor management of state and communal grasslands. This constrains pastoralists' livelihoods and introduces additional uncertainties to already existing vulnerabilities.

216 Mulinge et al. 2016. *Economics of Land Degradation and Improvement in Kenya. In Nkonya et al. 2016. Economics of Land Degradation and Improvement—A Global Assessment for Sustainable Development.*

217 Counties of the NNE and Coast were not considered in the estimation because the mainstay of agriculture is pastoralism, but also because of the lack of available data on cropland degradation.

218 Nkonya et al. 2018. *Land and natural resources degradation in the Arid and Semi-Arid Lands, Kenya; Technical Report. Prepared by Unique forestry and land use for World Bank, Washington.*

219 Wekesa et al. 2003. *Adoption of Maize Production Technologies in the Coastal Lowlands of Kenya.*

220 This calculation includes tropical worm and tropical cool arid and semi-arid zones.

TABLE 11. Estimated annual cost of grazing lands degradation in Kenya (in 2007 US$)

Agro-Ecological Sones	Cost of Milk Loss, US$ Mn.	Cost of Meat Loss, US$ Mn.	Total Costs of Milk and Meat Production Losses, US$ Mn.	Total Gross Loss Including Weight Loss of Animals Not Slaughtered/Sold, US$ Mn.
Tropic-cool semi-arid	4.1	0.9	4.9	6.4
Tropic-cool arid	1.2	0.1	1.2	1.8
Tropic-cool humid	0.8	0.1	0.9	1.3
Tropic-cool sub-humid	9.0	1.1	10.1	14.2
Tropic-warm semi-arid	13.4	2.7	16.1	21.1
Tropic-warm arid	20.6	3.9	24.4	32.3
Tropic-warm sub-humid	0.5	0.0	0.5	0.8
Total 2007 US$ million	49.5	8.7	58.2	77.9
Total US$ million (at 2015 values)	56.4	9.9	66.4	88.8

Source: Adjusted by authors based on estimate from Nkonya et al. 2016.

RESTORATION AND INCENTIVISING ACTION

Investments in actions to counter land degradation are highly cost effective. Economic analysis indicates that the costs of taking action to combat land degradation is far lower than the costs of taking no action. This is the case over both a shorter term of six years and a longer term of 30 years. Over a short-term (six years) period, there is a four-fold return on investment—a return of US$4 for every dollar invested.[221]



Western Kenyan small-scale farmer practicing conservation agriculture to enhance food security.

221 Mulinge et al. 2016. *Economics of Land Degradation and Improvement in Kenya. In Nkonya et al. 2016. Economics of Land Degradation and Improvement—A Global Assessment for Sustainable Development.*

Restoration

Soil erosion has disastrous impacts on crop yields and livestock productivity, but it is possible to offset these pressures through innovation, intensification, or collaboration in food production. The 2016 National Assessment of Forest and Landscape Restoration Opportunities in Kenya[222] discusses several restoration options based on biophysical and socioeconomic criteria. Table 12 summarizes these restoration options applicable to ASAL and associated justification and main challenges of implementing them.

TABLE 12. Restoration options, justification, and main challenges for degraded biomes

Biome	Restoration Options	Justification	Main Challenges
Rangelands	Rotational grazing and farmer managed natural regeneration (FMNR).	Indigenous knowledge, proven to be effective.	Formal land tenure and fencing block livestock movements along stock routes.
		Low-cost practice.	Degradation, climate change, and increasing livestock population overwhelm existing pasture resources.
	Vegetation reseeding.	Seeding leguminous plants significantly increases nutritive value of rangelands.	Collection of seeds is labor intensive. Limited distribution of formal and informal suppliers of seed and planting material.
Forests	Reforestation and afforestation of community forests.	Timber and non-timber forest products are highly beneficial to communities. Growing value of timber and NTFP.	Weak tenure security of community forests. Rampant deforestation due to high demand for charcoal and wood fuel. Low survival rates due to moisture deficiency.
Riverbanks	• Planting trees along buffer zone. • Trees to be planted to cover 30 m from main river and 15 m from secondary river.	Water is a priority resource in drylands for both people and livestock.	Weak tenure security of community forests. There is no riparian planning which will ensure ownership and payment for ecosystem services for rewarding those who invest in planting and managing trees.
Cropland	SLM, FMNR, and agroforestry.	Low cost and high returns.	SLM is labor intensive, making the production of manure or other biomass a challenge. However, this challenge could be addressed by using FMNR and agroforestry.

Source: Nkonya et al. 2018; the second column is extracted from MENR (2016d).[223]

Local communities hold critical traditional knowledge. This includes pasture management strategies and the use of medicinal plants, both of which are essential for land management and biodiversity protection and conservation. Indigenous and traditional communities are disproportionately impacted by natural hazards and climate change impacts. Their traditional knowledge provides ways to successfully manage hostile arid and semi-arid landscapes and includes skills and expertise that can support sustainable livelihoods. For instance, traditional pastoral practices provide many examples of expert livestock management that do not degrade pastures and rangelands over time.[224] The knowledge, use, and trading of multipurpose medicinal plants not only helps protect and conserve biodiversity, but can also provide valuable income streams for local people.[225]

Traditional indigenous knowledge (IK) is often overlooked in research, policy, and planning. Despite recognition of the wealth of IK within Kenyan communities and ongoing attempts to integrate this into the country's education system,[226] 'western' approaches to science and technology still dominate,[227] with IK relatively neglected and sometimes stigma-

222 MENR. 2016d. *Technical Report on the National Assessment of Forest and Landscape Restoration Opportunities in Kenya 2016.*

223 MENR. 2016d. *Technical Report on The National Assessment of Forest and Landscape Restoration Opportunities in Kenya.*

224 Catley et al. 2016. *Pastoralism and development in Africa: Dynamic change at the margins.*

225 Lambert et al. 2005. *Capitalizing on the Bio-Economic Value of Multi-Purpose Medicinal Plants for the Rehabilitation of Drylands in Sub-Saharan Africa.*

226 MEST. 2010. *Mapping and Documenting Indigenous Knowledge in Science, Technology and Innovation in Kenya.*

227 Owuor. 2007. *Integrating African Indigenous Knowledge in Kenya's Formal Education System: The Potential for Sustainable Development.*

tized.[228] Making use of indigenous knowledge in land rehabilitation programs requires the input of pastoralist herders, traditional healers, and medicinal plant collectors. However, because IK is often less valued by some researchers, policy makers, and planners, openings for this exchange of knowledge remain constrained in practice. As a result, IK is often insufficiently integrated into environmental conservation initiatives.[229] The greater emphasis now being placed on public consultation in environmental planning may help to increase the recognition and effective use of IK.

Incentivizing action

Rural households and communities need incentives to take action to counter land degradation. A recent study in ASAL counties[230] identifies a range of socioeconomic and biophysical indicators that correlate strongly with households investing in integrated soil fertility management practices (ISFM) (Table 13). ISFM practices are key to addressing degraded lands (Box 12).

TABLE 13. Indicators that incentivize actions to counter land degradation in ASALs

Indicator	Actions and Institutional Arrangements That Reduce Impact of Drivers of Land Degradation	Comment
Access to rural services	● Membership of farmer groups. ● Proximity of all-weather roads. ● Access to agricultural, agroforestry, and pastoral extension services. ● Access to credit.	● Supporting wider access to rural services must be part of land restoration efforts. ● Gap in extension services due to freeze on hiring and older staff retiring.
Human capital	● Level of education.	● SLM practices are knowledge-intensive. ● SLM adoption rates low in counties with lowest levels of education.
Family labor	● Male-headed household. ● No. of adults in household.	● SLM practices are labor intensive. ● However, surprisingly larger household size is negatively correlated with adopting SLM—perhaps due to correlation of large families and higher poverty rates?
Capital endowments and land tenure	● Land tenure security. ● Land holding size.	● Insecure land tenure can lead to adoption of unsustainable land management practices. ● Land holding size is a reflection of wealth, and hence financial ability to adopt SLM. ● Both factors only weakly correlated with adopting SLM practices in ASALs.
Livestock numbers	● Availability of manure. ● Draught power.	● Both availability of manure and draught animal power support SLM practices. ● In pastoral areas, livestock numbers only weakly correlated with SLM—perhaps because of less reliance on crop production?
Overgrazing	Improved access to markets provides incentives for pastoralists to invest in rangeland improvement.	● Main driver of degradation in rangelands. ● Livestock numbers have increased by around 80% since 1990 (increase in ASALs is predominantly sheep and goats), while the quality of grazing lands have deteriorated.[231]
Charcoal making	Charcoal Regulations of 2009 (the "Charcoal Rules")—licenses charcoal producers, who have to be members of the Charcoal Producer Associations (CPAs).	● Major driver of deforestation. ● 60% of Kenya's charcoal is produced and sold by non-CPA member. ● Rapidly increasing price of charcoal in major urban areas.

Source: Based on Nkonya et al. 2018.[232]

228 Kibe, L. 2017. *The role of indigenous knowledge in Kenya's Vision 2030.*
229 Kibe, L. 2017. *The role of indigenous knowledge in Kenya's Vision 2030.*
230 Nkonya et al. 2018. *Land and natural resources degradation in the Arid and Semi-Arid Lands, Kenya.*
231 Pricope et al. 2013. *The climate-population nexus in the East African Horn: Emerging degradation trends in rangeland and pastoral* livelihood zones.
232 Nkonya et al. 2018. *Land and natural resources degradation in the Arid and Semi-Arid Land.*

BOX 12. Integrated soil fertility management (ISFM)

ISFM is a concept developed initially by the International Center for Tropical Agriculture (CIAT). It is defined as:

"The application of soil fertility management practices, and the knowledge to adapt these to local conditions, which maximize fertilizer and organic resource use efficiency and crop productivity. These practices necessarily include appropriate fertilizer and organic input management in combination with improved germplasm."

Source: Sangina and Woomer. 2009.[233]

Access to rural services had the strongest impact on household involvement in ISFM practices. This is unsurprising, as access to extension services and markets raises awareness of degradation issues, provides access to information of ways to address them, and provides financial incentives to increase land productivity. However, it is interesting to note that, despite the fact that ISFM practices tend to be labor intensive, there was not a particularly strong correlation between household size (a proxy for labor availability) and adopting ISFM. This Illustrates the importance of ensuring a full understanding of household-level incentives which are part of the design of projects intended to address land degradation.

WAY FORWARD

1. **Reform incentives to increase the adoption of SLM and restoration practices.** Current subsidy packages encourage the expansion of cropland into marginal lands. Subsidy programs should be reformed from the current focus on inputs (mostly maize seed and fertilizer) to a focus on land stewardship and promote restoring degraded land, agroforestry, and SLM practices. Land rehabilitation efforts work best when linked to socioeconomic and biophysical factors that incentivize household involvement.
2. **Enhance the effectiveness and reach of the extension service.** Expanding the uptake of SLM, climate smart agriculture (CSA), and improved pasture management requires more field staff. Extension staff need to be mobile to reach remote rural areas as well as incentivized to work in ASAL areas. Extension services need not rely solely on government staff, but active efforts are required to encourage and ensure adequate training for private and NGO extensionists. Cell phone networks offer increasing opportunities to share and spread information.
3. **Promote risk management tools such as early-warning systems and market-driven livestock insurance to reduce risks to pastoral production systems.** Considerable work is still required to develop and commercialize suitable index-based insurance products that are acceptable to pastoralists. Currently, pastoralists mitigate the risks of livestock losses to drought by overstocking, which then leads to overgrazing as well as engaging in armed raids to restock. Insurance can play an important role in removing these inherent risks to pastoral livelihoods.
4. **Ensure IK of rangeland, livestock, and medicinal plant husbandry is effectively incorporated into SLM programs.** There is a vast store of technical IK embedded within the cultures of Kenya's rural communities. This is not always incorporated into the design and implementation of land management and environmental conservation initiatives.
5. **Take advantage of new digital technology, which allows multi-level monitoring to facilitate both large-scale land restoration and payment for ecosystem services (PES) schemes.** Modern digital technologies have transformed the capabilities of management information systems (MISs) which can now allow policy makers and investors to quickly understand what restoration or SLM options are effective and why they work and support informed decision making on investment needs, along with improved planning and targeting.

233 Sanginga and Woomer. 2009. *Integrated Soil Fertility Management in Africa: Principles, Practices and Development Process.*

Forests

- Kenya's forests are in decline, with modest gains in overall forested area outweighed by quality losses as dense forests are degraded.
- Key drivers of deforestation and forest degradation are agricultural expansion and urbanization, but behind these lies a complex mix of failings in governance, policy, and technology.
- Charcoal production, illegal logging, and climate change impacts all intensify pressures on Kenya's forests.
- Forests provide important economic gains for the country, contributing at least 3–3.6 percent of gross domestic product (GDP) with between 4 and 5 million Kenyans benefitting from forests in some way.
- Forest and shrubland degradation cost Kenya at least US$1.5 billion every year.

Kenya' s forest cover currently stands at 7.8 percent, a small increase since 2013.[234] This forest cover is diverse in nature and includes categories such as montane, western rainforest, bamboo, afro-montane, and coastal and dry forests. Data on the extent of Kenya's forest cover generally uses a criterion of 10 percent canopy cover to determine forested areas. However, Kenya's 'closed canopy' forest cover (where tree canopies cover 60–70 percent of the land surface) currently stands at about 2 percent of the total land area, compared to the African average of 9.3 percent and a world average of 21 percent.[235]



Forests provide important ecosystem services and livelihood opportunities, while protecting land from degradation.

234 World Bank. 2019b. *Forest Area (% of Land Area).*

235 MENR. 2018. *Taskforce report on forest resources management and logging activities in Kenya.*

Forest areas have important environmental and livelihood roles. While forests cover a relatively small land area, they provide important livelihood opportunities for large numbers of people, mainly through both timber and non-timber forest products. They also help protect the land from degradation, provide important eco-system services, and reduce the risk of flooding. Crucially, 75 percent of the country's renewable surface water originates from forested land.[236] However, it should be noted that in a recent study on the wealth of natural capital, forests constitute just 1 percent of Kenya's natural wealth.[237] (See section on Wealth and Natural Capital).

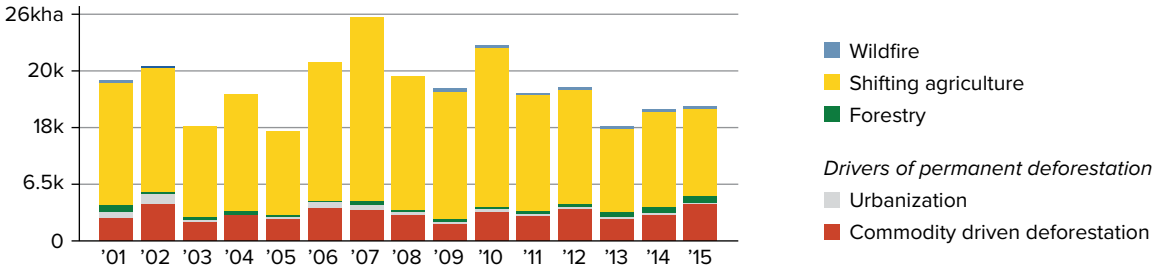
A STORY OF DEFORESTATION AND SOME RECOVERY

Kenya's forests are mainly in decline, with large areas of tree cover succumbing to the pressures of human activity and climate driven changes—but there is some revival of forested areas, particularly plantations.[238] There have been significant losses in major forest areas (where canopy cover is above 30 percent), and between 2001 and 2017 Kenya lost 310,000 hectares of tree cover (around 20 percent) in these denser forested areas.[239] Closed canopy forest now covers just 2 percent of the total land area, compared to the African average of 9.3 percent and a world average of 21.4 percent.[240] However, using a lower canopy cover of 10 percent as the basis for defining forest land, there has been a marked recovery since 2000,[241] when total forest cover had dropped to 35,570 kilometers^2. Total forest cover in 2017 stood at 45,260 kilometers^2 and has not yet returned to 1990 levels of over 47,000 kilometers^2.[242]

FIGURE 40. Rates of permanent deforestation in Kenya

ANNUAL TREE COVER LOSS BY DOMINANT DRIVER IN KENYA

In **Kenya** from **2001** to **2015**, **20%** of tree cover loss occurred in areas where the dominant drivers of loss resulted in **permanent deforestation**.



2000 tree cover extent | >30% tree canopy | these estimates do not take tree cover gain into account

Source: Global Forest Watch.[243]

236 MENR. 2016c. *Kenya Strategic Investment Framework for Sustainable Land Management.*

237 Lange et al. 2018. *The Changing Wealth of Nations 2018: Building a Sustainable Future.*

238 NB: There are some differences between data sets on Kenya's forest cover. This is due to different criteria used to define 'forest cover'. FAO data on forest cover are reflected in the World Bank data portal. Kenya Forest Services data differs to some degree on absolute numbers—but the trend is similar.

239 Global Forest Watch. 2019. *Kenya Tree Cover Loss.*

240 MoEF. 2018. *Taskforce Report on Forest Resources Management and Logging Activities in Kenya.*

241 World Bank. 2019b. *Forest Area (% of Land Area).*

242 MoEF. 2018. *Taskforce Report on Forest Resources Management and Logging Activities in Kenya.*

243 See Global Forest Watch website: https://www.globalforestwatch.org/dashboards/country/KEN

Forest cover figures from different sources vary, but all point in major economic losses due to deforestation. Government figures place the loss at close to 5,000 hectares per year, and this level of forest depletion is estimated to reduce annual water availability by around 62 million cubic meters, and cause an economic loss of over US$19 million.[244] However, the figure of 310,000 hectares identified by Global Forest Watch (Figure 40) represents an annual loss of over 19,000 hectares every year, implying far greater economic losses. A joint report by United Nations Environment Programme (UNEP) and the Kenya Forestry Service (KFS) in 2012, found that the economic cost of degradation of Kenya's forests exceeds the gains from legal forestry and logging initiatives by four to one.[245] Table 14 shows the annual rates of tree cover losses, depending on tree cover density.

TABLE 14. Annual rates of tree cover losses in Kenya, 2001–2015

Tree Cover Density (%)	Annual Loss (ha)	Annual Tree Cover Loss (%)
>10	24,594	0.2
>15	22,775	0.3
>20	19,582	0.5
>25	19,129	0.5
>30	17,914	0.5
>50	13,902	0.7
>75	8,744	0.9

Source: Global Forest Watch.[246]

Much of the loss of forest is a result of direct deforestation, population pressures, and climate change. Forest excisions (where tracts of forest are cleared for settlement or logging) and forest fires are also contributory factors. Of 33 legal excisions since 1986, totaling 290,000 hectares, only two improved ecological protection.[247] Some forest depletion was part of a government effort to create agricultural space and to settle the homeless. Deforestation is particularly severe in Turkana, Garissa, and Wajir.[248] Over 70 percent of forests in Turkana and Garissa are degraded, and in Wajir 97 percent of forest is degraded.

THE DRIVERS

Human activity has been identified as one of the main drivers of the depletion of Kenya's forests. The key activities are agricultural expansion and urbanization.[249] However, it is the activities and impacts driven by poverty and a rising population that contribute to this deteriorating situation. These activities include the use of wood for energy, expansion into forests, wetlands and hillsides caused by reductions in soil fertility, an expanding illegal trade in forest products, and an increase in the risk of forest fires. Climate change exacerbates the situation, as increased extreme weather events and a changing climate add further pressure to Kenya's already struggling natural resources. See Table 15 for details of the direct and indirect drivers of deforestation.

244 MoEF. 2018. *Taskforce Report on Forest Resources Management and Logging Activities in Kenya.*
245 UNEP. 2012. *The Role and Contribution of Montane Forests and Related Ecosystem Services to the Kenyan Economy.*
246 See Global Forest Watch website: https://www.globalforestwatch.org/dashboards/country/KEN
247 KLA. 2015. *Land Use in Kenya: The case for a national land use policy.*
248 UNIQUE. 2018. *Land and natural resources degradation in the Arid and Semi-Arid Lands, Kenya.*
249 MENR. 2016e. *National Forest Programme of Kenya 2016–2030.*

TABLE 15. Drivers of deforestation

Categories	Direct Drivers	Indirect Drivers
Governance	• Inadequate application of basic silvicultural and ecological principles for forest management. • "Tragedy of the commons" resulting in conflicts over natural resources.	• Inadequate integration of the forest sector with other stakeholders. • Unclear forest responsibilities and weak conflict management capacity. • Weak forest governance and institutions. • Corruption, illegal logging, weak enforcement. • Inadequate benefit sharing from forest resources. • Diverse perceptions of importance of forests. • Communal land tenure systems and their application. • Lack of private ownership, unclear tenure and access to forest resources.
Policy	• Overgrazing and inadequate regulation of grazing in forest reserves and community lands.	• More focus shifted to water towers, paying less attention to dryland woodlands, including the coastal and riparian forests.
Economic drivers	• Clearing of forest for agriculture. • Degradation of forest. • Charcoal and wood fuel from unsustainable production. • Infrastructure and urbanization. • Conversion of communal forest to agriculture. • Mining within forest areas. • Illegal logging.	• Demand is higher than supply. • Heavy bureaucracy and poor efficiency obstructing competitiveness. • Limited knowledge of tree growing (and necessary silviculture) as an enterprise. • Poverty, high prices for agriculture products, subsidized fertilizer, tax exemption for certain agricultural machinery resulting in unhealthy competition for land. • Fixed timber prices at low levels. • Rapidly increasing population has heightened the demand for land. • Few or no livelihood options have created overdependence on agriculture and mounting pressure on forest lands.
Technology drivers	• Poor uptake of new technologies. • Poor awareness of deforestation impacts. • Poor knowledge of tree planting.	• Uncertain availability of timber and wood for processing enterprises. • Low investment in wood processing resulting in ineffective processing.
Cultural and environmental drivers	• Unsustainable utilization, including overgrazing. • Conflict at multiple levels. • Fires are deliberate, accidental, poorly managed and they destroy forests. • Wildlife damage impacting regeneration.	• Traditional farming methods in a context of increased population and overstocking of animals.

Source: MENR. 2016.[250]

THE ROLE OF CHARCOAL

Unsustainable charcoal production activities are a large contributor to deforestation in Kenya. Nearly all charcoal consumed in Kenya is made from local indigenous tree species. However, charcoal is a prime energy source for poor households, both urban and rural, and as the population increases, especially to urban environments, the demand for charcoal is expected to also increase. It is estimated that Kenya consumes approximately 16.3 million cubic meters of charcoal every year, and it is said to employ over half a million people.[251]

250 MENR. 2016e. *National Forest Programme of Kenya 2016–2030.*

251 SEI. 2018. *Overcoming Barriers to Sustainable Charcoal in Kenya.*



Charcoal for sale.

Approximately 70 percent of Kenyan households burned biomass and 30 percent use other fuels.[252] In rural areas, wood is often the most commonly used fuel. In dense urban settlements, people favor charcoal over wood, kerosene, liquid petroleum gas (LPG,) and electricity. This is because:

- Charcoal's higher energy density causes it to burn more cleanly than wood, reducing exposure to harmful pollutants and household air pollution.
- Charcoal is easier than wood to transport, handle, and store.
- Charcoal can be purchased in small quantities. This makes it more affordable and a more flexible option for even the poorest households.
- Charcoal-burning stoves are not expensive.
- Alternative fuels, LPG and kerosene, are expensive compared to wood and charcoal (Table 16).

TABLE 16. 2017 retail prices of various fuels

	Monthly Average
Fuel	**Price**
Wood fuel	Free (if collected)
Charcoal	K Sh 81 for a 4 kg tin (K Sh 20/kg)
Kerosene	K Sh 67/liter
LPG	K Sh 160/kg (K Sh 82/liter)

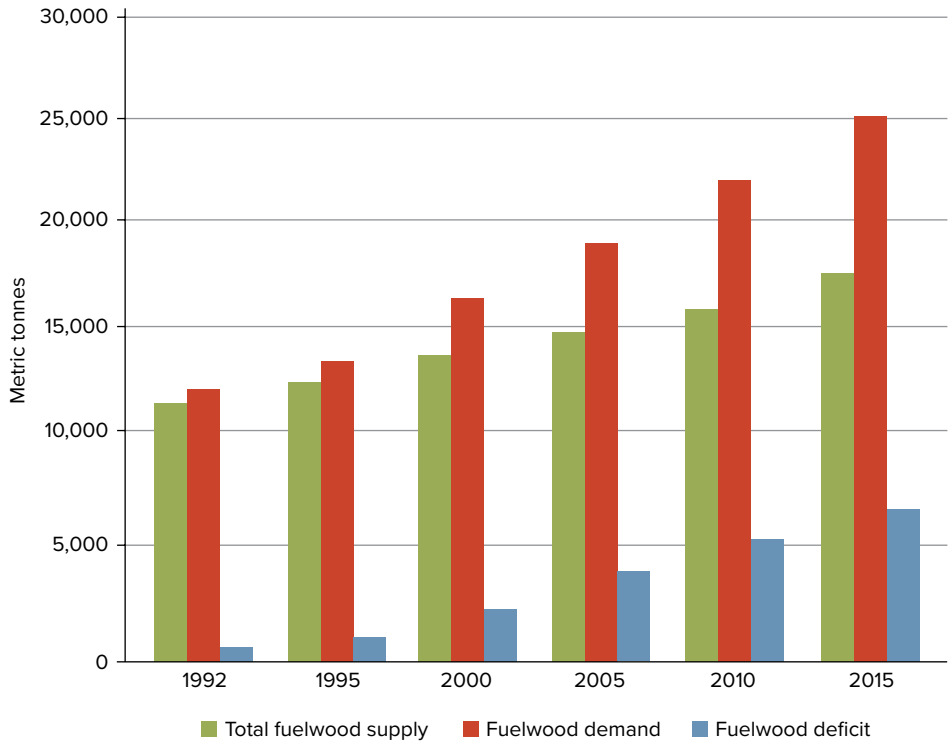
Source: World Bank. 2018.[253]

This excessive reliance on wood fuel, and the imbalance between the demand and supply of charcoal, are leading causes of deforestation and forest fragmentation. As a result, forest resources are under particular pressure, the rate of

252 Mutimba and Barasa M. 2005. *National charcoal survey: Exploring the potential for a sustainable charcoal industry in Kenya.*
253 World Bank. 2018c. *Kenya's Strategy to Make Liquefied Petroleum Gas the Nation's Primary Cooking Fuel.*

land degradation accelerates, and water catchments are threatened.[254] The wood fuel resource base is rapidly shrinking as demand exceeds supply of local wood fuel and charcoal (see Figure 41). In addition, inefficient technologies for both cooking and charcoal making are common, including traditional three-stone fireplaces and earth-mound charcoal kilns. Inefficient earth kilns, with a 10–15 percent rate of carbonization, remain the predominant production process.[255]

FIGURE 41. Wood fuel supply, demand, and deficit in Kenya, 1992–2015 (metric tons per year)



Source: UNEP. 2009.[256]

However, charcoal production and trade is an important income generator for many people and contributes extensively to rural economies. Roughly 50 percent of all the charcoal in Kenya comes from the arid and semi-arid land (ASAL) areas, where many tree species are considered to produce high-quality and preferred charcoal.[257] Kenya's charcoal industry also represents an estimated annual market value of over K Sh 32 billion, contributing primarily to government revenues through licenses and business permits. There are around 200,000 charcoal producers in Kenya. This would suggest that at least 700,000 people are employed by this industry. Taking dependents into account, this indicates that the industry potentially supports the livelihood of over 2 million people.[258]

ILLEGAL OR AN IMPORTANT LIVELIHOOD?

Government of Kenya (GoK) is increasingly concerned about the impacts of illegal timber extraction from Kenya's forests. Early in 2018, the government issued a moratorium on logging activities in both public and community forests.[259] The intention was to provide the government with the space to run a country-wide review to assess the extent of the

254 UNEP. 2009. *Kenya: Atlas of Our Changing Environment.*
255 Wanjiru and Omedo. 2016. *How Kenya can transform the charcoal sector and create new opportunities for low-carbon rural development.*
256 UNEP. 2009. *Kenya: Atlas of Our Changing Environment.*
257 MENR. 2016e. *National Forest Programme of Kenya 2016–2030.*
258 Mutimba and Barasa. 2005. *National charcoal survey: Exploring the potential for a sustainable charcoal industry in Kenya.*
259 See Ministry of Environment and Forestry press release: http://www.environment.go.ke/wp-content/uploads/2018/11/4048264.pdf

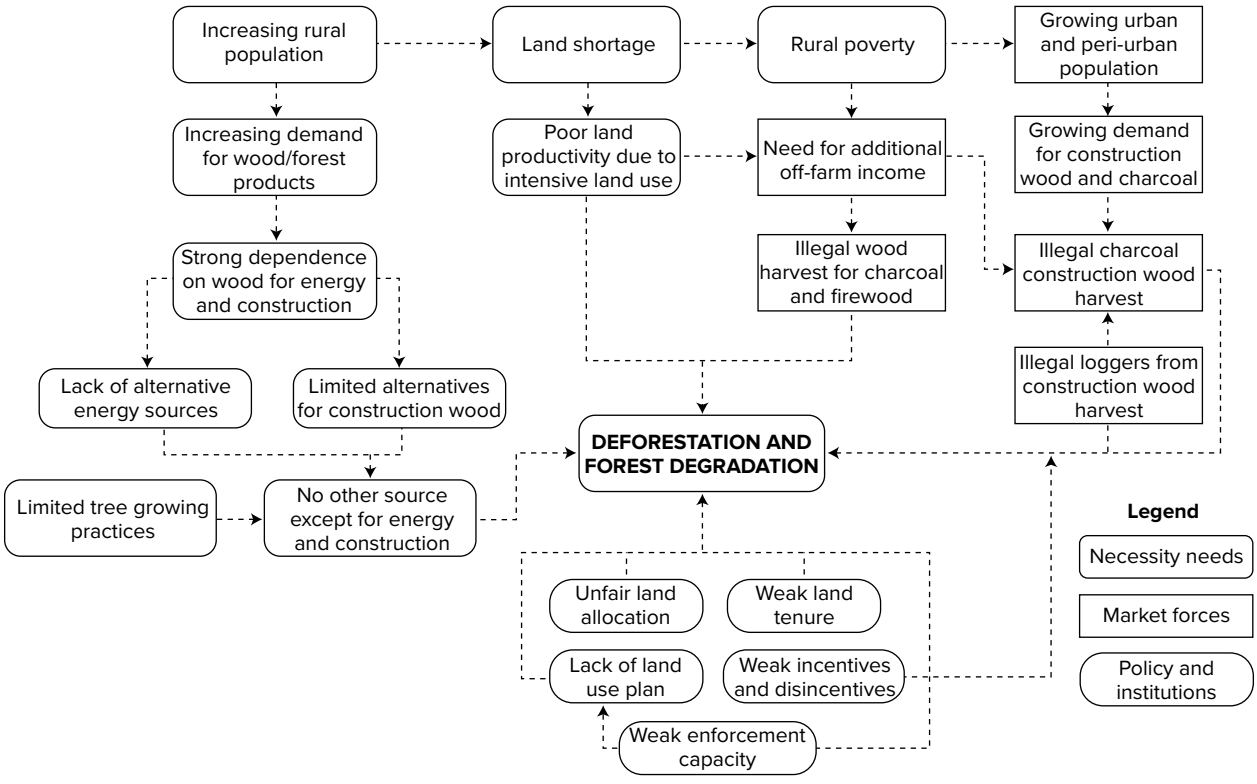
illegal logging trade and the management of forest resources. This moratorium has now been extended for a further year until November 2019.[260]

While the moratorium should provide GoK with the information it needs to tackle the decline of its forests, the ban itself could well result in an increase in forest degradation.[261] Logging bans mean forest-dependent communities lose a vital source of their economy. This results in an increase in poverty, which conversely encourages people to resort to illegal logging.

To address charcoal production's role in deforestation, Kenya set the Charcoal Regulations of 2009 (also known as the 'Charcoal Rules') requiring charcoal producers to be licensed. Charcoal producers need to have a license to produce charcoal and have to be members of the Charcoal Producer Associations (CPAs). CPAs' responsibilities include identifying sources of wood, ensuring sustainable harvesting and carbonization technologies, and selling from centralized points.[262] Despite this effort, it is estimated that 60 percent of Kenya's charcoal is produced and sold by non-CPA members.

A recent study argues that it is important to understand the relationship between the livelihood needs of local communities and deforestation and forest degradation.[263] Tackling illegal logging by charging and convicting offenders does not necessarily deter the trade, as economic and contextual drivers often force people into illegal logging. In addition, while it is often external markets that drive the trade, it is local smallholders who are targeted as the culprits. The study argues that much more emphasis should be placed on understanding the behaviors that drive illegal logging, as this provides a more holistic way of approaching the problem of forest degradation. Figure 42 shows the complex drivers that lead to smallholder-driven forest degradation.

FIGURE 42. Drivers of smallholder–driven forest degradation



Source: Duguma et al. 2019.

260 See Ministry of Environment and Forestry press release: http://www.environment.go.ke/wp-content/uploads/2018/11/4048264.pdf

261 UNEP. 2012. *The Role and Contribution of Montane Forests and Related Ecosystem Services to the Kenyan Economy.*

262 Wanjiru and Omedo. 2016. *How Kenya can transform the charcoal sector and create new opportunities for low-carbon rural development.*

263 Duguma et al. 2019. *Deforestation and Forest Degradation as an Environmental Behaviour: Unpacking Realities Shaping Community Actions.*

CLIMATE CHANGE

Climate change and the increasing human activities in forests and national parks are increasing the number of wildfires. The damage caused by these fires further reduces the forest cover. Because most of Kenya's forests are in the relatively highly fire-prone areas, any increase in hot dry spells tends to increase the fire risk. The never-ending search for agricultural and pastureland pushes communities to live on forest fringes, adding pressure on forest resources. Fire is also often used to clear forested land for agriculture, which can quickly burn out of control if the forest is very dry.

Deforestation and forest degradation have implications for climate change because forests have a crucial role in both mitigating against and adapting to projected changes.[264] Forests function as a valuable ecosystem and habitat for rare wildlife. They also mitigate the effects of natural disasters and increase resilience to extreme events, by (among others) mitigating soil erosion and contributing to water recharge.

BOX 13. Forest fires in the Aberdares and Mount Kenya

Mount Kenya and the Aberdares are the two most important water towers in Kenya. These high elevation areas provide much of the country's water through precipitation and runoff into the major rivers. Mount Kenya alone provides about 40 percent of the country's water.[265]

The Aberdares is one of the few remaining rainforests and the largest in East Africa. The Aberdares biodiversity is vast and includes leopards, elephants, black rhinoceros, and the rare African golden cat. Over 778 plant species can be found, including exotic hardwoods such as camphor, cedar, podo, and hagenia. Importantly, the Aberdares is the source of Kenya's two largest rivers, the Athi and the Tana.

These forest areas are subject to seasonal fire outbreaks, which disturb the region's ecological balance. In addition, rising temperatures and prolonged dry seasons contribute to the degradation of the forests and increase the fire risk. In the recent past, a surge in forest fires has posed a significant threat to these water towers. In 2012 and 2014, the Aberdares and Mt. Kenya forests, respectively, lost approximately 80 sq. kilometers[266] and 100 sq. kilometers[267] of forest and grassland to forest fires.

BOX 14. Impact of deforestation on Kenya's water towers

Between 2000–2010, an estimated 50,000 hectares was deforested around the country's water towers—a depletion rate of about 5,000 hectares per annum. This translates to a reduction in water availability of around 62 million cubic meters per year with a consequent annual loss to the economy of over US$19 million.

Losses of this magnitude provide a major risk to attaining the goals of Vision 2030 and the Government's 'Big 4 Agenda'[268] of food and nutritional security, affordable and decent housing, universal healthcare and manufacturing. A rapidly rising population adds to the pressure to convert forestland into farms and human settlements.

Source: MENR. 2018.[269]

264 Aleman et al. 2018. *Forest Extent and Deforestation in Tropical Africa Since 1900.*
265 UNEP. 2009. *Kenya, Atlas of Our Changing Environment.*
266 Wangari et al. 2018. *The effects of fires on plants and wildlife species diversity and soil physical and chemical properties at Aberdare Ranges, Kenya.*
267 Downing et al. 2016. *Fire occurrence on Mount Kenya and patterns of burning.*
268 See GoK website: https://big4.president.go.ke/
269 MENR. 2018. *Taskforce report on forest resources management and logging activities in Kenya.*

COSTS

A recent World Bank assessment[270] placed the annual total cost of forests and shrublands degradation at US$1.52 billion in 2015. This study used existing estimates of annual costs of environmental degradation (CoED) of forests and shrublands degradation in several parts of Kenya.[271, 272] It then assumed that the cost of environmental degradation was growing at the same rate as the population (2.6 percent per annum) and arrived at a total cost of land degradation of approximately US$1.52 billion for 2015 (Table 17).

TABLE 17. Estimate of annual cost to Kenya of forest and shrubland degradation

	Cost of Forest and Shrubland Degradation 2001–09 (US$ mil 2007)	Annual Cost of Forest and Shrubland Degradation (US$ mil 2007)	Annual Cost of Forest and Shrubland Degradation, 2015 (US$ mil)
Central	647.4	80.9	92.5
Coast	2,321.5	290.2	331.7
Eastern	1,713.7	214.2	244.9
Nairobi	18.5	2.3	2.6
North-Eastern	1,502.8	187.8	214.7
Nyanza	577.1	72.1	82.4
Rift Valley	3,616.6	452.1	516.8
Western	247.7	31.0	35.4
Total	**10,645.3**	**1,330.6**	**1,521.0**

Source: Strukova. 2017, using data adjusted from Nkonya et al. 2016.

The cost of degradation in the North and North-Eastern (NNE) regions of the country are similarly high.[273] The annual cost of forest and shrubland degradation in NNE is estimated at US$216 million. This cost includes the cost of losing the important cultural service provided by the NNE counties. Approximately 40 percent of NNE land area is classified as a biodiversity hot spot, which is 10 percent more than the Kenyan average. The annual cost of forest and shrubland degradation in the coastal region is estimated at US$329 million (excluding Mombasa deforestation).

Forests and forest products also make an important contribution to Kenya's economy. According to government figures[274] forests' contribution to the Kenyan economy is estimated at 3–3.6 percent of gross domestic product (GDP). However, this figure excludes the sector's contributions to household wood energy in charcoal, the values of non-timber forest products (NTFPs), and ecosystem services. NTFPs account for an estimated US$40 million per year. Forests also provide home for wildlife and have a 'scenic' value that contribute to Kenya's tourism industry, which generates approximately US$1 billion of foreign revenue each year.[275] (See section on Wildlife and Tourism.) It is suggested that when the support that forests and the forest industry provide to agriculture, livestock, energy, trade and tourism are also factored in, forests gross contribution expands to about 39 percent of GDP.[276]

The forest sector is also a significant employer and provider of livelihoods. The formal forest sector employs 18,000–50,000 people directly and 300,000–600,000 indirectly.[277] Overall, the forest industry (formal and informal) directly employs an estimated 750,000 Kenyans and indirectly benefits at least 4 million more.[278]

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270 Strukova. 2017. *Cost of Environmental Degradation in Kenya.*

271 Nkonya et al. 2016. *Economics of Land Degradation and Improvement: A Global Assessment for Sustainable Development.*

272 Using "The Economics of Ecosystems and Biodiversity (TEEB)" methodology and the Total Economic Values framework taking into account provisional, regulating, and cultural services provided by ecosystems.

273 Strukova. 2017. *Cost of Environmental Degradation in Kenya.*

274 MENR. 2016e. *National Forest Programme of Kenya 2016–2030.*

275 MENR. 2016e. *National Forest Programme of Kenya 2016–2030.*

276 UNIQUE. 2018. *Land and natural resources degradation in the Arid and Semi-Arid Lands, Kenya.*

277 See FAO *AQUASTAT website:* http://www.fao.org/nr/water/aquastat/main/index.stm; KFS. 2015. *Kenya Forest Service Strategic Plan 2014–2017.*

278 MENR. 2016f. *National Assessment of Forest and Landscape Restoration Opportunities in Kenya.*

The Kenya Forest Service's (KFS) development budget is increasingly constrained, which undermines its ability to adequately address forest management, protection, and assessment. The KFS is the lead government agency responsible for assessing and monitoring Kenya's forest resources, managing protected forests, supporting counties to build their forestry capacity, and assisting Community Forest Associations (CFAs) develop and implement management plans for public forests. The proportion of the KFS budget available for development activities (as opposed to recurrent expenditures such as salaries, administration, and equipment and building maintenance) has shrunk from over 20 percent of revenues in 2012/13 to between 1.9 and 2.6 percent between 2013/14 and 2016/17. This means that the KFS cannot effectively develop and improve its infrastructure and capital formation programs and undermines the capacity of the KFS to achieve its mandate.[279]

WAY FORWARD

1. **Promote agroforestry and farmer managed natural regeneration (FMNR) to reduce pressure on natural forests.** Initiatives that solely focus on tree planting are often unsuccessful because returns do not justify the land, labor, and other resources farmers must invest. Agroforestry and FMNR can offer ratios of investment to returns that are more attractive to farmers.



This farmer's tree nursery helps him use agroforestry to build his farm's resilience to climate change.

279 MENR. 2018. *Taskforce report on forest resources management and logging activities in Kenya.*

2. **Use limited public finance to leverage additional private sector investment in forest management and restoration.** Forest restoration is an urgent but massive task, with formidable financial and implementation challenges. Priority actions are:
    - Further developing and adjusting institutional and licensing frameworks for legal and sustainable charcoal value chains.
    - Expanding opportunities for small and medium sized enterprises (SMEs) to become more involved in forest management—for example, in plantation forestry and value addition to forest products.
    - Supplementing scarce public finance through mechanisms that ensure payment for ecosystem services (PES).
3. **Scale up forest comanagement approaches to balance responsibility and authority between communities and government.** Centralized forest management does not provide incentives for local communities to manage forests sustainably.
4. **Update forest data to include information on biomass energy, other informal forest activities, and the value of ecosystem services.** This is required to better understand both the contribution of forests to national wealth accounts and the scale of forest degradation linked to greenhouse gas emissions. Data gaps on forest cover changes and the production and use of forest products limits understanding of the contribution forest resources make to the national economy.

Water

- Kenya is chronically water scarce, with long-standing problems of water quantity, quality, and conflict associated with water scarcity.
- The demand for water will grow rapidly, driven by population and economic growth, and exacerbated by climate change.
- Water degradation currently costs Kenya at least US$82.9 million every year.

THE SITUATION

Kenya is a chronically water scarce country with one of the lowest natural replenishment rates in the world.[280] Around 90 percent of the country is either arid or semi-arid, rainfall patterns are highly variable, and climate change is likely to exacerbate these stresses. Yet, water is an essential contributor to Kenya's vibrant and varied economy, and the health and well-being of Kenya's 50 million people requires increasing access to safe water and sanitation. Effective development and management of water resources is critically important for the economy, the environment, and society.[281]



Water often has to be transported by hand—in this case the water is being collected for a building site.

280 Mogaka et al. 2006. *Climate Variability and Water Resource Degradation in Kenya: Improving Water Resources Development and Management.*
281 WRG. 2015. *Water Resources in Kenya: Closing the Gap. 2030*. Water Resources Group and IFC, Washington.

In the future, water demand is projected to grow rapidly. Population growth, a changing climate, and ambitious national plans to expand irrigation for agribusiness development will all contribute to an increased demand for water in an already water-stressed environment. However, at local levels, water stress is already a noticeable factor. This is the case for both arid areas and water-rich regions such as Naivasha, greater Nairobi, and northern Mount Kenya, where water-intensive economic activity has grown rapidly.

Water scarcity, water conflict, and water quality have presented problems for Kenya for many years, and the situation is getting worse.[282] The causes are complex but there are six main contributing factors which work together to generate a water crisis. These are droughts, forest degradation, floods, poor management of water supply, water contamination (particularly in slums), and population growth.

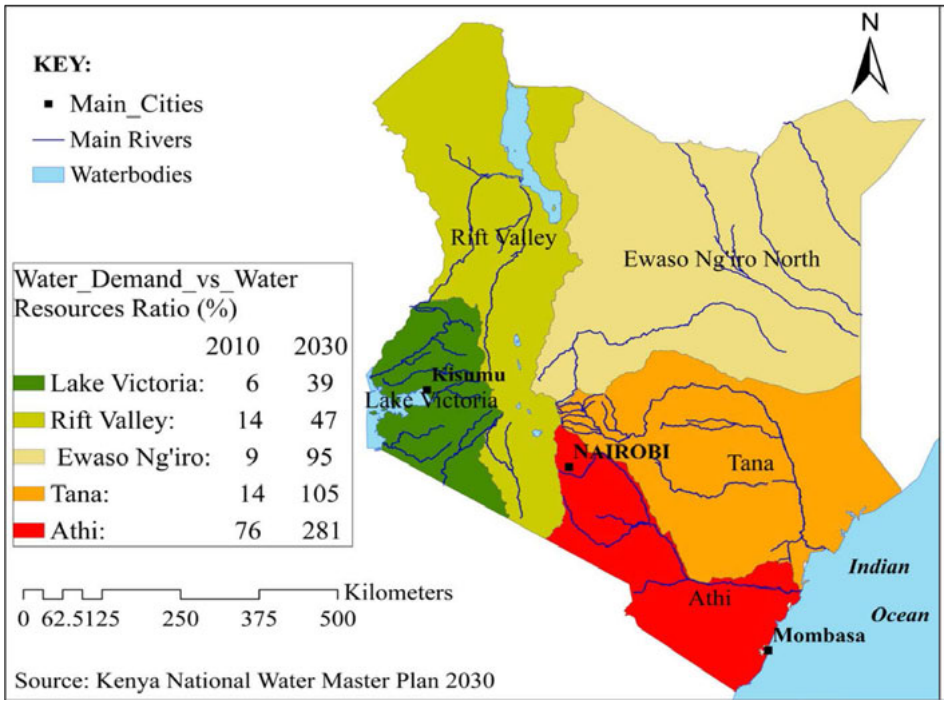
There are two main government policy initiatives to address water scarcity and conflicts: (i) the Masterplan for the Conservation and Sustainable Management of Water Catchment Areas in Kenya[283] and (ii) the National Water Master Plan 2030.[284] These target the rehabilitation of all of Kenya's water catchment zones and the five water catchment towers Mt. Kenya, Mt. Elgon, the Aberdare range, the Cherengani Hills, and the Mau forest complex (see Figure 43 and Figure 44).

Water tower—definition

"In the context of hydrology, it is used as a symbolic term for a mountain area that supplies disproportional runoff as compared to the adjacent lowland area."[285]

In this chapter, we explore the issue of water degradation, water, and conflict; the situation in the wetlands; and present a cost analysis of the impact of water degradation. See Coast and Marine for information on the environment and the sea.

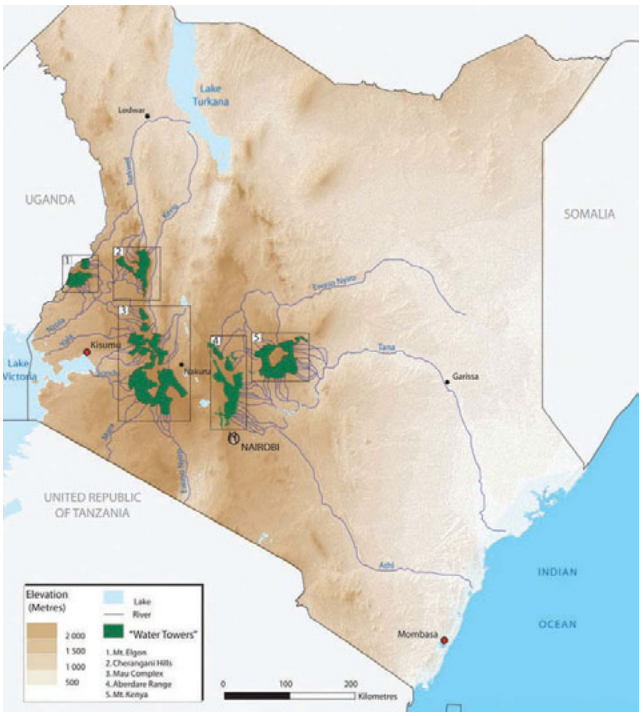
FIGURE 43. Kenya's catchment zones and projected water demand



Source: MEWNR. 2013[286]

282 The Water Project. 2019. *Water in Crisis—Kenya.*
283 MEMR. 2012a. *Masterplan for the Conservation and Sustainable Management of Water Catchment Areas in Kenya.*
284 MEWNR 2013. *The Project on the Development of the National Water Master Plan 2030.*
285 Viviroli et al. 2007. *Mountains of the World, Water Towers for Humanity: Typology, Mapping, and Global Significance.*
286 MEWNR. 2013. *The Project on the Development of the National Water Master Plan 2030.*

FIGURE 44. Kenya's water towers



Source: MEMR. 2012b.[287]

WATER RESOURCE DEGRADATION

Catchment degradation, which increases the risk of droughts and floods, is the most widely faced challenge. Kenya's catchments zones face differing levels of vulnerability, with the Athi and Tana catchments the most vulnerable to a range of water stress factors. Catchment degradation increases risks for all water users, including farmers, pastoral groups, industry, and energy producers. Figure 45 illustrates the various vulnerabilities of Kenya's six major catchments.

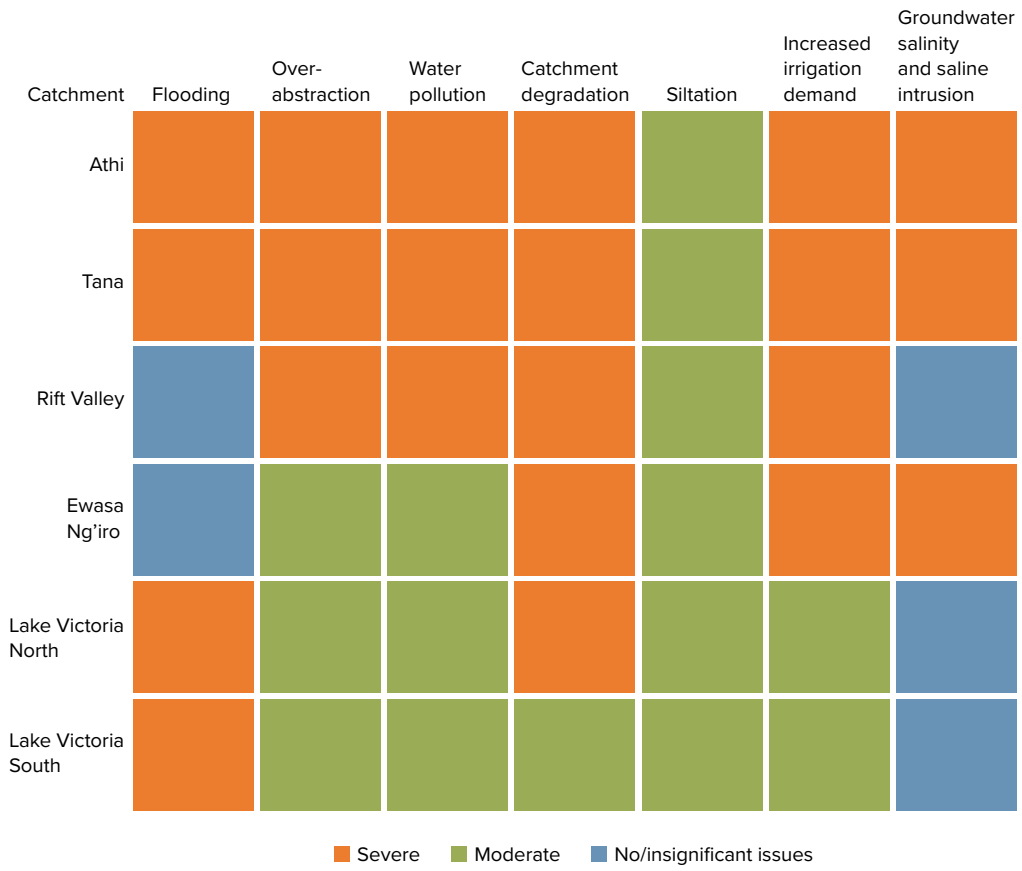
WATER SCARCITY

Kenya is official classified as a chronically water-scarce country. The country's natural endowment of freshwater is limited by an annual renewable freshwater supply of only 692 cubic meters per capita. By comparison, Kenya's neighbors, Uganda and Tanzania, have renewable freshwater supplies of 2,940 and 2,696 cubic meters per capita per year respectively.[288]

287 MEMR. 2012b. *Kenya Wetlands Atlas.*

288 See FAO AQUASTAT website: http://www.fao.org/nr/water/aquastat/main/index.stm

FIGURE 45. Vulnerabilities of Kenya's catchment zones



Source: WRG. 2015.[289]

In the future, Kenya faces an even greater water deficit situation. Figure 46 shows water scarcity in 2010 and projections for 2030.[290] However, these projections may underestimate the degree of water scarcity. Climate change is likely to exacerbate the situation with rainfall variability projected to increase, although the impacts of climate change in 2030 are difficult to predict and need to be considered with care. See **Climate change and natural disasters** chapter for more information.

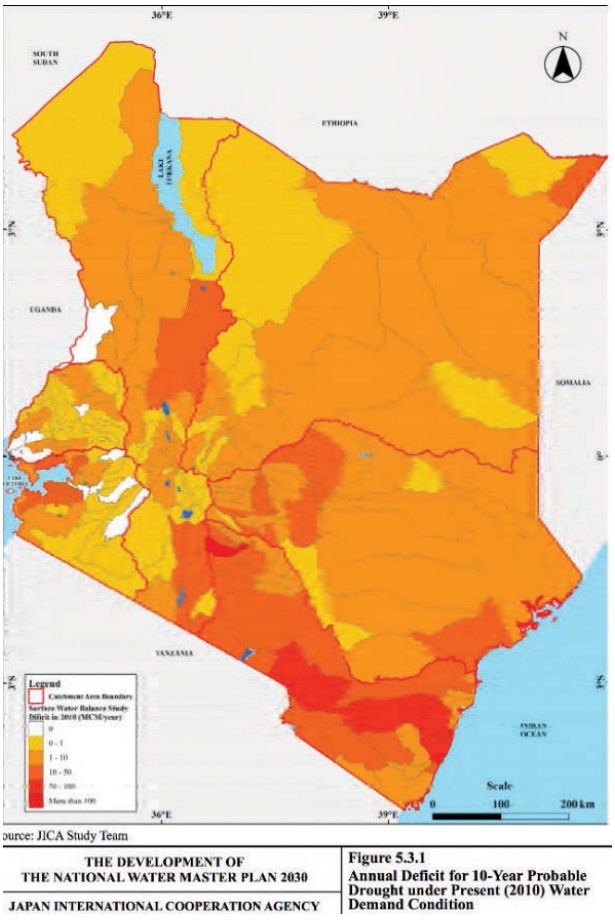
These limited freshwater resources place both a severe financial and health burden on the population of Kenya. Contaminated water resources typically result in multiple illnesses, such as malaria and intestinal worm diseases, schistosomiasis, typhoid fever, cholera, diarrhea, dysentery, eye infections, and skin diseases. (See **Environmental pollution and health**).

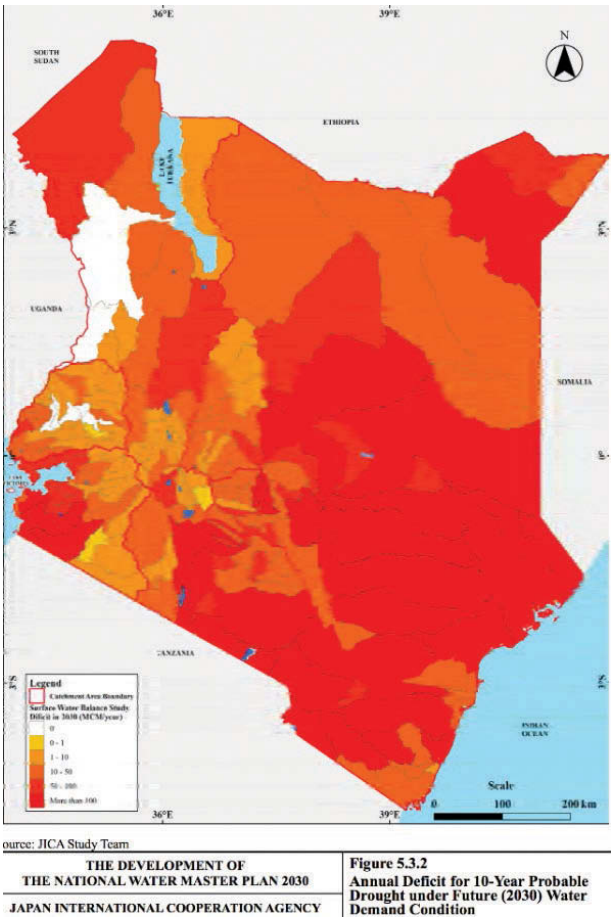
Kenya's groundwater resources are not well mapped, and their potential is not fully understood. Groundwater resources may offer opportunities to meet some of Kenya's future water demand. However, until these resources are mapped, and their recharge and sustainable abstraction rates better understood, it is not possible to assess their potential yields or safely exploit these resources.

Irrigation water is often used wastefully. Despite being a scarce resource, water use in agriculture is commonly characterized by inefficient irrigation technologies.[291]

289 WRG. 2015. *Water Resources in Kenya: Closing the Gap.*
290 MEWNR 2013. *The Project on the Development of the National Water Master Plan 2030.*
291 GWP. 2015. *Integrated Water Resources Management in Eastern Africa: coping with 'complex' hydrology.*

FIGURE 46. Comparison of water deficit in Kenya, 2010 and 2030





Source: MEWNR. 2013.[292]

WATER AND TOURISM

In the future, Kenya faces a further water burden due to the Vision 2030 plan to increase tourism numbers to over 5 million. Tourism is a thirsty industry, and, in this water scarce environment, difficult decisions will have to be made about where to direct limited supplies of water. A recent study on tourism in Kenya determined that the use of water in the tourism industry was more valuable to the Kenyan economy than water used by agriculture.[293] However, the study pointed out that there would need to be a more careful analysis of this conclusion going forward.

WATER QUALITY

Kenya's natural water sources are increasingly being polluted by agricultural chemicals and industrial and urban effluents. The dangers of polluted water supplies are made more severe because of the large numbers of people who are dependent on natural water sources for drinking water (although not all-natural sources are unsafe). An estimated 85 percent of Kenya's rural population depend exclusively on natural sources for water supply, with 57 percent having access to a safe water source, up from just 39.9 percent in 1997.[294] In urban areas, the proportion of people using a safely managed

292 MEWNR 2013. *The Project on the Development of the National Water Master Plan 2030.*
293 World Bank. 2017a. *Standing Out from the Herd: An Economic Assessment of Tourism in Kenya.*
294 See FAO AQUASTAT website: http://www.fao.org/nr/water/aquastat/main/index.stm

water supply was 54.5 percent in 2015, a marked decline from 62.5 percent in 2000.[295] Pollutants originate from domestic, municipal, and industrial sources and reflect the fact that water quality and distribution infrastructure has not kept pace with Kenya's recent industrial expansion and social transformation. In particular, inhabitants of large urban centers such as Nairobi, Mombasa, Kisumu, Eldoret, and Thika are at risk of water pollution from industrial and domestic sources.

The enforcement of water quality standards is weak. Monitoring systems for enforcing water quality standards have not been developed. Similarly, approved standards for drinking water and effluent discharges exist, but are not enforced.

WATER AND CONFLICT

Since the 1970s, Kenya has experienced increasing numbers of conflicts related to water resources. Many of these conflicts happen in the arid parts of the country, such as the NNE regions, the coast, and some parts of the Rift Valley where farmers move with livestock over vast distances in search of water. Conflicts over water resources also tend to happen in remote areas with lack of access to government mediation. Here, traditional cultural rules often are relied on to help solve intra- and inter-tribal conflicts.

BOX 15. Impact of deforestation on Kenya's water towers

Loochi Kidewa (a 13-year-old and partially blind Turkana boy) and his tribe walk eight miles in 110 degrees to an underground spring, accompanied by their goats and cattle. They approach the spring cautiously. The increasing number of droughts caused by climate change and marginalization caused by successive governments have put pressure on already limited resources. The resulting increased competition between tribes for these scarce resources, especially water, means tensions are even higher than before. Loochi randomly fires his AK-47 into the hills. They are expecting rival tribes to also be attempting to access this spring and with most nomad villages having access to approximately 50,000 weapons, the chance of armed conflict today is high.

At least 75 people die in Kenya every year as a result of cattle rustling and conflict over water. It is a worsening situation that can easily spill over across borders. Ethiopia is said to be in the process of building two new dams that may make the situation in Northern Kenya even worse than it already is, and the resulting further tension caused by this may result in a situation Kenya will be unable to ignore.[296]

Source: In these times: 2010. *Tribes in Kenya wage water war.* http://inthesetimes.com/article/6335/tribes_in_kenya_wage_water_war

Also see: KHRC. 2010.[297]

Tensions also exist over the Government of Kenya (GoK) policy to increase self-sufficiency in food production. GoK's Vision 2030 economic policy is committed to expanding the amount of land under irrigation to build local self-sufficiency in food production. However, it is argued that the plan fails to take into account what could be achieved from investing in pastoralism instead. Pastoralism is considered by some as being the most viable approach to managing drylands. In addition, this government policy is set to heighten tensions with many pastoralist communities who face having to change their traditional way of life.[298]

295 World Bank data portal: https://data.worldbank.org/indicator/SH.H2O.SMDW.UR.ZS?locations=KE

296 See: https://www.reuters.com/article/us-kenya-water-ethiopia/ethiopias-dams-threaten-thousands-of-kenyans-environmentalists-idUSKBN1JT1QU

297 KHRC. 2010. *Moran No More—The Changing Face of Cattle-rustling in Kenya.*

298 Nyanjom. 2014. *Remarginalising Kenyan pastoralists: The Hidden Curse of National Growth and Development.*

Population growth is another driver of water conflict. The resulting increase in the demand for scare water resources leads to more unsustainable water usage in many regions. Examples include draining wetlands, overextraction of ground water, deforestation in catchment zones, and settlement and cultivation on riverbanks. These unsustainable water practices create tensions among the communities who live upstream and downstream of water catchment areas. In addition, Kenya's urban population is estimated to grow by 4 percent each year between 2010 and 2040.[299] This will add further pressure on available water resources, increasing the likelihood of future conflict and making the life of the urban poor even more deplorable.

WETLANDS

Kenya's wetlands are biologically productive ecosystems that are critical for water purification and storage, support to biodiversity, flow regulation, and flood control. The National Wetlands Conservation and Management Policy (2013) fosters government collaboration with stakeholders to map wetland areas. The policy also encourages, promotes, and supports devising retention-based wetlands management plans using a participatory process. Furthermore, the wetlands policy outlines the government's aspiration to meet the Ramsar guidelines.[300]

BOX 16. Kenya's international commitments to protect water resources

The Ramsar Convention on Wetlands (1971), Kyoto Protocol (1995), and Rio de Janeiro Conference and Copenhagen Climate Meeting (2009) resulted from the international community's recognition that global and regional climate changes critically threaten the land and water resources on which human survival depends. As a signatory to all these instruments, Kenya has designated a number of lakes and sites as Ramsar sites,[301] committing to their conservation and "wise use."

At local levels, the counties have enacted additional policy measures, such as law enforcement to conserve wetlands, biodiversity planning, advice on proper types of trees to grow, and mass awareness programs.

Despite recent actions, lack of compliance with policies is a serious concern, as there are frequent cases of wetland conversion to agricultural, residential, or industrial development, including solid waste utilization. The rapid growth of Kenya's large cities has increased their ecological footprint far beyond their actual geographic borders. The governments of these metropolitan areas often drain wetlands in neighboring counties, including Nandi, Vihiga, Siaya, and Nyeri, to use these fertile soils for urban agriculture. Deforestation and overgrazing frequently degrade land around wetlands and lead to siltation caused by bare soil washed into wetlands by rainwater. Industrial growth can also result in the pollution of nearby wetlands. In addition, wetlands also face the potential for reduced rainfall due to climate change.

299 Hope. 2012. *Urbanisation in Kenya.*
300 Ramsar. 2013. *The Guidelines adopted by the Conference of the Contracting Parties.*
301 Ramsar. 2014. *Kenya.*

TABLE 18. Main pressures on Kenya's wetlands and their impacts

Pressures	Impacts
Expansion of agriculture into wetland areas	• Reclamation and draining of wetlands (e.g., Yala swamp, Tana Delta). • Agrochemical pollution. • Reduction in subsistence activities that rely on wetland goods.
Urbanization and expansion of human settlements into wetlands	• Encroachment on wetlands (e.g., Lake Ol Bolossat). • Loss and degradation of Nairobi River Basin wetlands. • Declining water levels. • Degraded water quality (pollution). • Increased water abstraction. • Loss of wildlife habitats and species biodiversity.
Deforestation of major water catchment areas, e.g., Mau Forest Complex, Mount Kenya, Aberdare Range, Mount Elgon, and the Cherangani Hills	• Hydrological changes in Lakes Victoria, Nakuru, Naivasha, Baringo as well as the Tana River Delta and Ewaso Ng'iro North River and Lorian Swamp. • Loss of resources, increased poverty, and unsustainable development.
Pollution consisting of industrial effluent and, agricultural and domestic wastes in wetlands	• Water pollution (e.g., domestic waste from the Kibera informal settlements). • High nutrient loadings resulting in dense colonies of water hyacinth (e.g., Lake Victoria) and algal blooms (e.g., Yala Swamp).
Overgrazing	• Soil erosion, siltation, and sedimentation (e.g., Lake Baringo).
Invasive alien species (e.g., Nile perch in Lake Victoria, water hyacinth)	• Threats to indigenous species. • Water hyacinth stifles wetlands, making fishing difficult and thereby threatening local livelihoods.
Overexploitation of wetland goods, such as fish, plants, etc.	• Decline in biodiversity. • Increased extinctions and number of threatened species.
Over-abstraction of ground and surface water	• Drying up of wetlands.
Climate change and variability	• Changes in weather patterns such as decreased rainfall levels. • Coral bleaching. • Threats to wetland species.
Hydropower development	• Reduced peak flows. • Displacement of people.

Source: MEMR. 2012b.[302]

COST OF WATER RESOURCE DEGRADATION

It is estimated that water degradation costs Kenya at least US$82.9 million every year. Overall, this is the cost of maintaining water quality and quantity and the increased cost of maintaining reservoirs. However, there are particular activities that contribute to this high price. The cost of treating water is the biggest expense accounting for about 45 percent of the full amount. Another very large expense is the cost of the pumping that is required to deal with Nairobi's lower water table—around 26 percent. Finally, roughly 20 percent of the total amount is due to the reduced fish production caused by eutrophication.

However, these costs do not tell the whole story. The cost estimate is based on figures from a 2006 study[303] that estimated an annual cost of approximately US$41.87 million. A later study used this data and adjusted the figures to 2015 using a GDP deflator from 2000 to 2015 (see Table 19).[304] However, they do not include the cost of infestation and management of invasive aquatic species (such as water hyacinth) or the cost of water degradation in the NNE counties.

Revenue streams are currently inadequate to provide the finance required for water resource management and the provision of water and sanitation services. There is insufficient cost recovery through tariffs and taxes and an overreliance on donor support to provide much needed finance, and this is not sustainable in the longer-term. However, there

302 MEMR. 2012b. *Kenya Wetlands Atlas.*

303 Mogaka et al. 2006. *Climate Variability and Water Resource Degradation in Kenya: Improving Water Resources Development and Management.*

304 Strukova. 2017. *Cost of Environmental Degradation in Kenya.*

are also some good experiences in raising revenue in innovative ways. One example includes raising money directly from local users. Another is from large companies engaging in public private partnerships (PPPs) through: (i) Build, Operate and Lease (BOL); (ii) Build, Operate and Sell (BOS) and (iii) Build, Operate and Transfer (BOT) arrangements.[305]

TABLE 19. Annual cost of water resource degradation

Attribute	Effects	Associated Costs	Estimated Annual Cost in 2005 (mil.)		Annual Cost (US$ mil.) Adjusted to 2015 with GDP Deflator
			K Sh	US$	
Water reservoirs	**Siltation**	● Increased maintenance cost for minor dams/pansa.	6	0.07	0.14
		● Reduced life of pumps (Mombasa) leading to abandonment of water supply.	3	0.04	0.07
		● Extension cost of Malindi jetty.	8	0.09	0.19
Water quantity	**Increased flooding downstream**	● Health effects in Kano Plains.	4	0.05	0.09
	Crop production	● Reduction in crop production in Budalangi area.	170	2.00	3.96
	Lowered water table	● Increased pumping costs for Nairobi.	870	11	21.78
Water quality	**Water treatment**	**a.** Cost of urban water treatment	850	11	21.78
		b. Desalination	600	7	13.86
		c. Water hyacinth in Lake Victoria	50	0.59	1.16
	Transportation	● Water hyacinth impediments.	2	0.02	0.05
	Fisheries	● Water hyacinth impediments.	79	1	1.98
		● Reduced fish production from eutrophication.	680	9	17.82
	Replacement cost of shifting water intake points	**a.** Upper catchment	1	0.01	0.02
		b. Lower catchment	11		0.00
Total (excluding water hyacinth costs)			**3,334**	**41.87**	**82.9**

Source: Adapted by authors from Mogaka et al. 2006.

WAY FORWARD

1. **Monitor and enforce water quality standards.** Poor water quality is a major public health hazard. Regulations exist but are not adequately enforced. Monitoring systems that are capable of supporting enforcement have not been properly developed.
2. **Invest in improving the efficiency of irrigation.** This will require dissemination of information on efficient irrigation technologies and efficient irrigation water management practices. Community-based organizations (CBOs), such as Water Resource User Associations (WRUAs), are the obvious entry point for information dissemination, along with the extension service, and TV and radio. Incentives, such as short-term subsidies for improved irrigation equipment, should be explored as a way to kickstart wider uptake by farmers.
3. **Map and assess groundwater resources.** Relatively little is currently known of the extent, quality, recharge rates, and abstraction potential of much of Kenya's groundwater. This will become an increasingly important resource as the demand for water increases. Improving the understanding of the potential of groundwater resources is a prerequisite for future water resource planning and management.
4. **Explore and promote innovative markets for financing water resources management.** Analysis of lessons learned from existing experience with public private partnerships, BOL, BOT, and BOS arrangements can provide guidance and insights on opportunities to fill the finance gap.

305 GWP. 2015. *Integrated Water Resources Management in Eastern Africa: coping with 'complex' hydrology.*

Coast and marine

- Kenya's 'blue economy' is worth around US$4.4 billion a year.[306]
- Mangrove forests are under threat and around 40 percent are degraded.
- Weak governance of marine fisheries and population growth presents greatest barriers to sustainable development of Kenya's coastal and marine resources.
- Climate change is making a precarious situation worse by adversely impacting on the health, structure, and function of marine and coastal ecosystems.
- Marine pollution is an increasingly important issue requiring baseline studies for sources and pathways toward reduction of plastic waste.

KENYA'S COAST

Kenya's coastline has a rich diversity of marine and coastal ecosystems. The 640 kilometer coastline is part of the Indian Ocean marine ecological complex. The ecosystems include mangroves, coastal forests, estuaries, sandy beaches and dunes, coral reefs, and seagrass beds that support an array of marine and coastal faunal and floral species.[307] However, these marine and coastal ecosystems are under threat.

This chapter explains why this sector is so important to Kenya's economy and some of the challenges it faces.



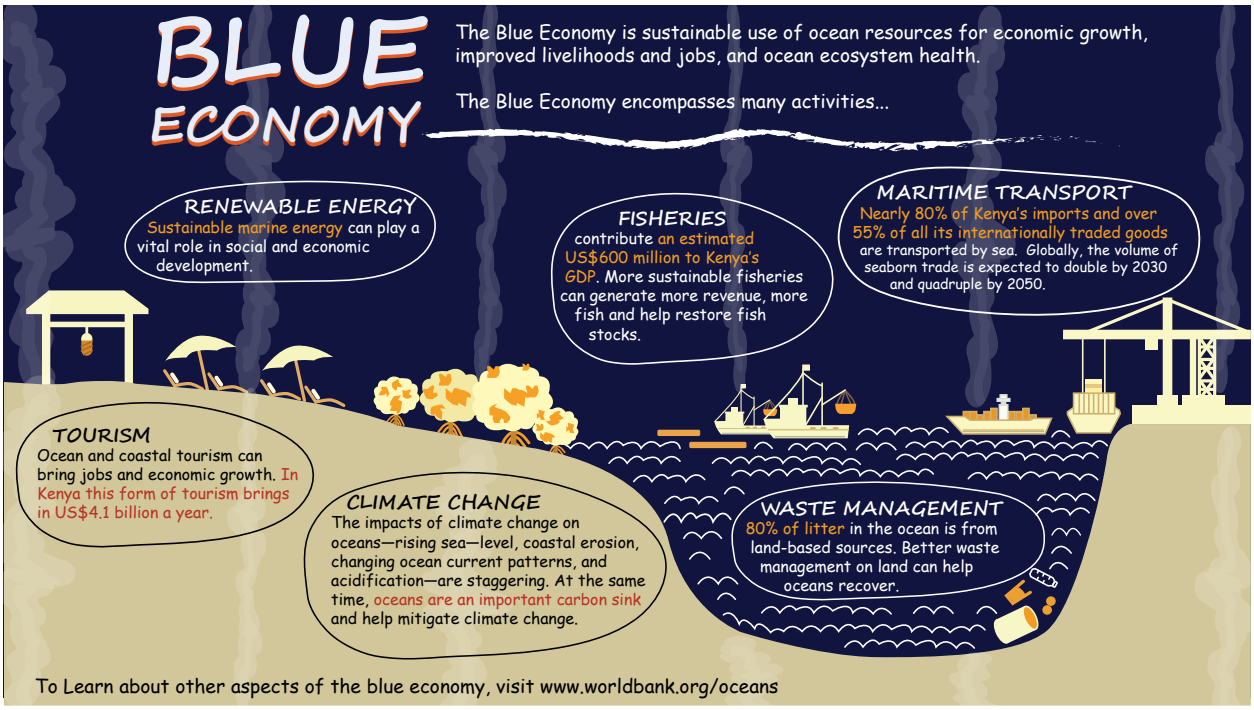
Colorful anemone and tropical fish on a coral reef in Watamu Marine National Park.

306 This is roughly 5.5 percent of GDP, with over 90 percent of that dependent on the tourism sector, and fisheries contributing much of the remainder.
307 Tuda and Omar. 2012. *Protection of Marine Areas in Kenya.*

The blue economy

The blue economy has significant value to Kenya's economy. The 'blue economy' refers to economic activities linked to oceans, seas, and coasts (Figure 47).[308] It is worth about US$4.4 billion every year. This is roughly 5.5 percent of gross domestic product (GDP) and US$4.1 billion of that is dependent on the tourism sector.[309] Fisheries is another important component of the blue economy.[310] The fisheries sector's contribution to the country's GDP is said to be about 0.8 percent,[311] with the inland fisheries subsector making up about 95 percent and marine fisheries subsector 5 percent of contributions. 79.3 percent of Kenya's imports and 20.8 percent of exports are transported by sea.[312] Government of Kenya (GoK) has prioritized the blue economy as a key pillar of its Vision 2030 development agenda.

FIGURE 47. The Blue Economy



Source: World Bank News[313] http://www.worldbank.org/en/news/infographic/2017/06/06/blue-economy

Overall production level of fish production and aquaculture resources in 2016 from the inland, coastal, and marine waters was 150,000 metric tons (inland capture contributing 73 percent), with a market value of approximately US$240 million.[314] GoK's Big 4 Agenda,[315] underpins the Third Medium-Term Plan (2018–2022) and confirms Kenya's commitment to leveraging emerging opportunities in the Blue Economy. GoK has prioritized the blue economy as a key pillar of its Vision 2030 development agenda. Recent estimates suggest that the annual economic value of goods and services in Kenya's blue economy could be worth approximately US$4.4 billion.[316]

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308 Note: The World Bank includes sustainable resource use in its definition of the Blue Economy. Sometimes the term is used by others to simply refer to maritime economic activities, whether they are sustainable or not.

309 Muigua, K. 2016. *Utilizing Kenya's Marine Resources for National Development.*

310 See KMFRI press release: https://www.kmfri.co.ke/index.php/26-blue-economy/91-ratification-of-ports-state-measures-agreement-a-great-step-for-kenya-towards-blueing-the-national-economy

311 See FAO Kenya Profile: http://www.fao.org/fishery/facp/KEN/en

312 These are the World Trade Organization's 2016 figures, the most recent they provide. http://stat.wto.org/CountryProfile/WSDBCountryPFView.aspx?Language=E&Country=KE

313 See: http://www.worldbank.org/en/news/infographic/2017/06/06/blue-economy

314 Muigua. 2016. *Utilizing Kenya's Marine Resources for National Development.*

315 See GoK website: https://big4.president.go.ke/

316 UNDP. 2018. *Policy Brief: Leveraging the Blue Economy for Inclusive and Sustainable Growth.*





Kenya's wetlands and mangrove forests are important fish production and aquaculture resources.

It is frequently stated that the coastal and marine waters have the potential to sustainably produce between 150,000 and 300,000 metric tons of fish annually. However, this estimate is over 30 years old,[317] and there have been no recent surveys to determine this potential.[318] The fisheries sector provides direct employment to over 500,000 and indirectly supports 2 million people.

Mangrove forests

Kenya's mangrove forests are particularly important to both Kenya's environment and its economy. They provide fuelwood, building materials, and nursery habitats for fisheries, and significantly protect the shoreline from severe weather events. In addition, their ability to absorb carbon dioxide means they also provide a natural form of carbon sequestration. A conservative estimate of the total economic value for mangroves in Kenya is approximately K Sh 270,000 per hectare per year.[319] Table 20 gives a breakdown of the different products and services mangroves provide and their economic value.

TABLE 20. Valuation of mangrove ecosystem in Kenya

Product and Services	Per Hectare Each Year (K Sh)
Building poles	30,659
Fuelwood	4,505
Onsite fisheries	9,612
Beekeeping	1,249
Integrated aquaculture	408
Education & research	65,469
Tourism	782
Carbon sequestration	21,896
Shoreline protection	134,866
Total	**269,448**

Source: MENR. 2017.[320]

317 De Souza. 1988. *Summary of Fisheries and resources information for Kenya, Kenya Marine and Fisheries Research Institute*.
318 Aloo et al. 2014. *A Review of the Status and Potential of the Coastal and Marine Fisheries Resources in Kenya.*
319 MENR. 2017a. *National Mangrove Ecosystem Management Plan. Summary for Policy Makers 2017–2027.*
320 MENR. 2017a. *National Mangrove Ecosystem Management Plan. Summary for Policy Makers 2017–2027.*

However, Kenya's mangroves are under threat and on average over 40 percent of mangrove forests are degraded. There are 12 patches of mangrove forests covering about 53,000 and 62,000 hectares along the Kenyan coast, with the largest of these found in the Lamu district (61 percent) and Kilifi and Kwale districts (14 percent each). Table 21 provides details of the total area of mangrove in each coastal county and the proportion that is degraded. Mombasa county has the worst rate with nearly half of their mangroves now degraded. The root causes of mangrove loss and transformations have been identified as: population pressure combined with high levels of poverty and limited livelihood options for many coastal communities, a lack of awareness of mangrove ecosystems' true value, weak governance, and inadequate management plans and practices.[321]

TABLE 21. Mangrove coverage in the coast counties in Kenya

County	Area (ha)	Degraded Area (ha)	Degraded Area (%)
Lamu	37,350 (61%)	14,407	38.6
Tana River	3,260 (5%)	1,180	36.2
Kilifi	8,536 (14%)	3,422	40
Mombasa	3,771 (6%)	1,850	49.1
Kwale	8,354 (14%)	3,725	44.6
Total	**61,271 (100%)**	**24,585**	**40.1**

Source: MENR. 2017.[322]

Marine protected areas (MPAs)

MPAs play an important role in the management of Kenya's coast and marine ecosystems. The Government of Kenya (GoK) has allocated a total of 1,139 square kilometers of Kenya's coastal and marine ecosystem as MPAs. Table 22 provides details of these MPAs.

TABLE 22. Kenya's MPAs

MPA	Size (km^2)	IUCN Category	Year Established
Diani Chale Marine National Reserve	75	VI	1995
Kenya Seascape	450	None	Information not available
Kisite Marine National Park	28	II	1978
Kiunga Marine Conservancy Community Nature Reserve	287	Not reported	2010
Malindi Marine National Park	213	Not reported	1968
Mallindi Marine National Park	6	II	1968
Mombasa Marine National Park	200	Not reported	1986
Mombasa Marine National Reserve	10	II	1986
Mpunguti Marine National Reserve	28	VI	1978
Watamu Marine National Reserve	32	Not reported	1968
Watamu Marine National Park	10	Not reported	1968

Source: Marine Conservation Institute. 2019.[323]

321 MENR. 2017a. *National Mangrove Ecosystem Management Plan. Summary for Policy Makers 2017–2027.*
322 MENR. 2017a. *National Mangrove Ecosystem Management Plan. Summary for Policy Makers 2017–2027.*
323 See Marine Conservation Institute website: http://www.mpatlas.org/region/country/KEN/

In addition to the MPAs, Kenya also has a number of community-based marine protected areas that have been established. None of these areas have a reported International Union for Conservation of Nature (IUCN) category. Table 23 shows their reported size and the date they were established.

TABLE 23. Community-based MPAs

Community-Based MPAs	Size (km^2)	Year Established
Kuruwitu locally managed marine area	0.3	2005
Lower Tana Delta Conservation Trust Community Nature Reserve	512	2010
Majoreni locally managed marine area	11	2011
Mkokoni locally managed marine area	3	2009
Msambweni locally managed marine area	0 reported	2011
Pate Island locally managed marine area	2	2008
Pate Marine Community Conservancy Community Nature Reserve	192	2010
Shimoni locally managed marine area	3	2011
Tiwi locally managed marine area	0 reported	2009
Vanga locally managed marine area	12	2011
Wasini locally managed marine area	3	2004

Source: Marine Conservation Institute. 2019.[324]

MPAs provide valuable income and livelihood opportunities to the coastal and marine areas. Between 1997 and 2010, there were between 70,000 to 160,000 visits to MPAs every year. In addition, annual revenues of more than US$1.5 million were generated from the MPAs alone[325] (this does not factor in the wider contribution made to the overall economy—see the section above on the Blue Economy). Watamu Marine Park and Reserve, which covers an area of roughly 42 kilometers, has been found to generate over US$135,000 per hectare per year in goods and services—and that significant figure excludes the value of biomass-based fuel sources, timber, carbon sequestration, and coastal protection. Job creation is also an important benefit. At least 2,000 local boat operators are known to conduct marine park tours and excursions.[326]

THREATS AND RISKS

The greatest barriers to sustainable management of the country's coastal and marine resources are from the weak governance and high population growth rate. Kenya's coastal communities are poor, have a narrow income base, and depend on marine fisheries for livelihoods. This leads to overfishing pressures, made worse by the Kenya's 2.6 percent population growth rate. These human-related pressures include overexploitation of resources such as fisheries and mangroves, urbanization, lack of adequate waste management systems, tourism development and expansion, agriculture, manufacturing and processing, and transportation and industrialization, including mining for sand and oil and gas exploration.

Changes to the climate (resulting in increases in sea temperature, irregularity in precipitation, sea level rises, increased frequency of severe storms, and ocean acidification and sedimentation)[327] make an already precarious situation worse. Climate change poses extreme challenges to the health, structure, and function of marine and coastal ecosystems.[328] One manifestation of a changing climate within the Kenyan marine and coastal system has been the bleaching and

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324 See Marine Conservation Institute website: http://www.mpatlas.org/region/country/KEN/

325 Kenya Wildlife Service (unpublished report). Cited in: Tuda and Omar. 2012. *Protection of Marine Areas in Kenya.*

326 Tuda and Omar. 2012. *Protection of Marine Areas in Kenya.*

327 USAID, 2018. *Climate Risk in Kenya: Country Risk Profile.*

328 World Bank. 2018d. *Groundswell: Preparing for Internal Climate Migration.*

mortality of coral and the sporadic infestation of coral reefs by the invasive crown-of-thorns starfish. Kenya's reefs have not yet fully recovered from the extensive coral bleaching induced by the 1998 El Niño.[329]

Increased siltation and sedimentation of estuaries and the resulting mangrove dieback is already happening. This is due to both rises in precipitation and land use changes in adjacent watersheds.[330]

Various forms of pollution threaten the health, structure, and function of marine and coastal life. These include run-off, industrial charges, drainage schemes, ballast discharges, oil spills, and sewage from ships. There have even been reports of the presence of heavy metals such as cadmium (Cd), copper (Cu), iron (Fe), and zinc (ZN) in fluvial input.[331] Marine plastic pollution is now a serious problem for both Kenya and the world. It not only threatens marine wildlife and habitats directly, but also has an adverse impact on tourism by placing the draw of pristine beaches and clean seas in jeopardy.

WAY FORWARD

1. **Invest in measures to restore, conserve, and expand Kenya's coastal mangrove forests.** Mangrove forests serve a dual role as sources of livelihood and providers of coastal protection. Climate change is already increasing the frequency and severity of tropical storms, and sea levels are slowly rising. Climate projections indicate these impacts will increase in severity. To protect coastal towns, infrastructure, and livelihoods it is vital to reverse the decline and degradation of mangrove forests.
2. **Update data and analysis of Kenya's marine fisheries potential.** Kenya's marine fisheries appear to have potential to expand, but often quoted headline data on marine fish stocks are decades old. Updated research can factor in the impact on fish stocks of the climate change–driven warming of the western Indian Ocean. Marine fish stocks are also an important draw for Kenya's tourist industry. It is important to understand how expanding commercial marine fisheries would affect the coral and game fish species that attract tourists.
3. **Escalate the efforts for management of marine pollution.** The impact of solid waste on marine and coastal ecosystems has become a serious threat to the coastal tourism, forest resources, including mangrove forests, and fisheries. Tackling marine pollution should be one of the specific priorities for improving the waste management system in Kenya.

329 USAID, 2018. *Climate Risk in Kenya: Country Risk Profile.*

330 Tuda and Omar. 2012. *Protection of Marine Areas in Kenya.*

331 Kamau. 2009. *Heavy metal distribution and enrichment at Port Rietz, Mombasa.*

Waste management (including solid, liquid, and electronic)

- Managing Kenya's ever-increasing volumes of solid, liquid, and e-waste management is a huge ecological challenge.
- Waste management policies, laws, and regulations exist, but weak implementation endangers both public health and the environment.
- Human waste is a particular challenge, with around 10 percent of the population defecating in the open, while improved sanitation increased by only 5 percent between 1990 and 2015.
- Electronic waste, the fastest growing waste component, is linked to serious environmental and public health hazards.

SOLID AND LIQUID WASTE

One of the greatest ecological challenges facing the whole of Kenya is the management of solid, liquid, and electronic waste (e-waste). It is a situation made worse by poor funding and limited establishment of proper waste management systems for urban sanitation departments. There is also a lack of developed sewerage systems and facilities, as well as inadequate gaseous, liquid, and solid waste collection, treatment, and disposal. This limits the sustainable development of the waste management sector. In addition, many of the uncontrolled dumpsites across Kenya's cities are a major source of greenhouse gases that add to Kenya's emissions.

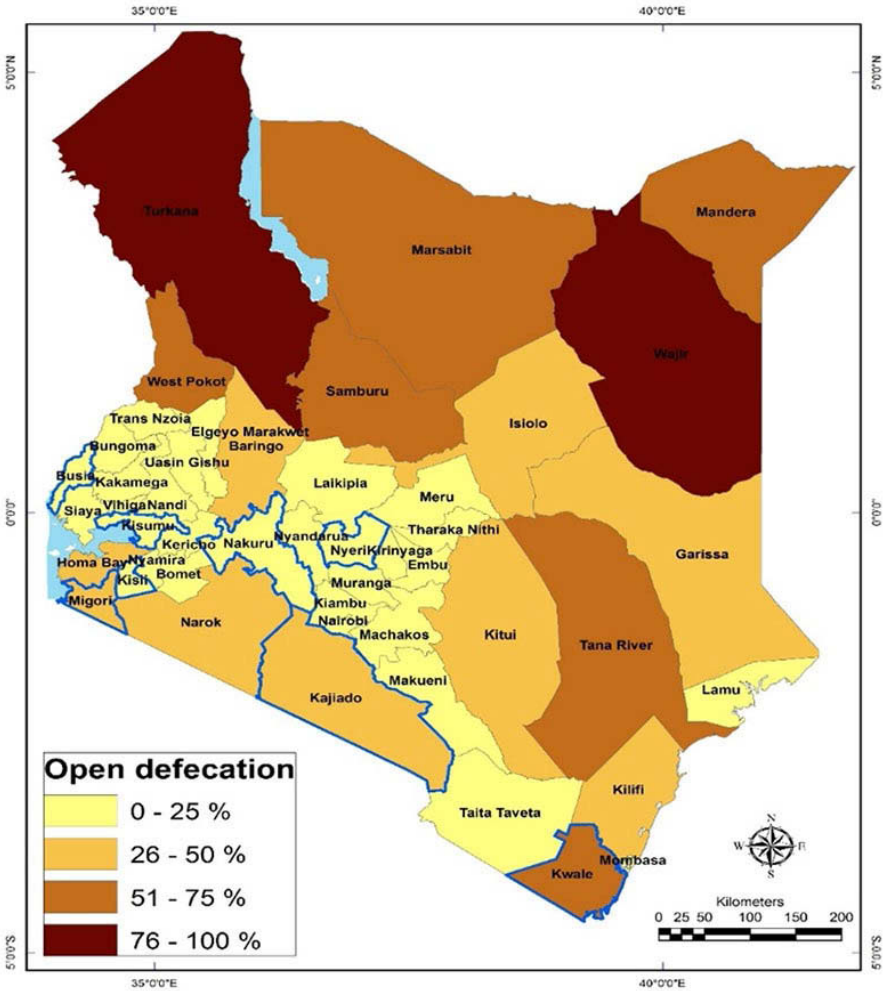


Some urban areas are overwhelmed with waste.

Population growth and increased urbanization across the country result in ever increasing volumes of waste and further complicate the flows of waste through to disposal. Despite the existence of policies, laws, and regulations that guide waste management, weak implementation and poor practices have led to towns and cities being overwhelmed with waste, endangering both public health and the environment. Without proper controls, solid waste is often dumped in abandoned quarries or gullies, or along the waterways.

Human waste, including open defecation and untreated municipal sewage are a particular issue. In 2015, open defecation was the only option available to around 5.6 million Kenyans (Figure 48) and access to improved sanitation increased by only 5 percent between 1990 and 2015.[332]

FIGURE 48. Open defecation rates in Kenya



Source: Ndungu. 2018.[333]

It is children and women who suffer most due to poor sanitation. Lack of access to proper sanitation, including clean water, is a major cause of diarrhea—a leading cause of child mortality and morbidity globally.[334] Untreated municipal sewage is also a major source of groundwater and surface water pollution in Kenyan counties. Many bodies of water near urban areas, including Nairobi, Kisumu, Nakuru, and Naivasha, are highly polluted.

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332 Njuguna and Muruka. 2017. *Open defecation in newly created Kenyan counties: A situational analysis*.

333 Ndungu. 2018. *Why Kenya's sanitation challenge requires urgent attention.*

334 See WHO fact sheet on diarrhoeal disease: https://www.who.int/news-room/fact-sheets/detail/diarrhoeal-disease

BOX 17. Sanitation in urban areas

Providing safe sanitation in urban areas is made more difficult because of the inter-linkages with other services such as storm water drainage, solid waste, and water supply.

Wajir town has a high groundwater table and shallow water wells, which are the main source of water for domestic and livestock use. This makes the construction of simple pit latrines unfeasible. Instead, about 68 percent of the 100,000 residents use bucket latrines, a system introduced during colonial times to protect the groundwater. During the rainy seasons, fecal waste overflow from buckets is swept away by the storm water, resulting in fecal contamination of the shallow wells. Consequently, Wajir town suffers from frequent outbreaks of waterborne diseases, especially cholera and diarrhea.

Source: Ndungu. 2018.[335]

Unmanaged or poorly managed solid waste often includes and dangerous chemicals. Household garbage is frequently just dumped because there are no managed disposal points or garbage collection service. In addition, dangerous chemicals are dumped legally or illegally by agricultural, chemical, and manufacturing industries, health centers, schools, and market places. Uncontrolled burning is a common form of waste disposal which can release persistent organic pollutants (POPs). Burning plastics[336] is a particular health risk because this releases dioxins which are highly toxic.[337]

Waste collection and recovery status for major cities and towns in Kenya is quite low. In Nairobi, for example, only about 60 percent of municipal waste is taken to the Dandora dumping site, a former quarry 15 kilometers east of the city, with the remainder left uncollected.[338] A large percentage of Nairobi's solid waste is managed by the private sector and NGOs in public-private partnerships.

Vision 2030, Kenya's 20-year development plan, has prioritized five urban centers to implement sustainable solid waste management systems. To address poor solid waste management, minimum requirements are being set as a baseline for implementation by the counties, including designating, securing, and staffing the disposal sites, as well as promoting efficient collection and transportation of waste.

Where solid waste is becoming an increasing priority, specific regulations that govern sectoral waste management and the "polluter pays principle" are in place. Despite these regulations, landfill owners usually do not adhere to soil quality standards. In addition, the million or so small and medium enterprises (SMEs) that produce much of Kenya's industrial waste have limited awareness of waste management regulations, and a large percentage of solid waste is not disposed of at designated sites.

A recent review of Kenya' solid waste management (SWM) policy provisions[339] indicates that there are good macro-level policies in place, but implementation and coordination is generally poor. SWM remains a major challenge that will expand its scale as the country continues to urbanize rapidly. The gaps between policy and practice are primarily because:

- SWM policies and their implementation mechanisms do not fully consider how best to deal with the ever-changing dynamics of solid waste management, and do not include systems to 'learn' what works and what does not.
- Government drives SWM policy making in a top-down manner, with limited participation and ownership by the public and private sectors.

335 Ndungu. 2018. *Why Kenya's sanitation challenge requires urgent attention.*
336 Stable burning of plastics at 1000°C greatly reduces dioxin emissions, but this is difficult without specialist technology.
337 WHO. 2016b. *Dioxins and their effects on human health.*
338 World Bank. 2012b. *Nairobi Metropolitan Services Improvement Project.*
339 Haregu et al. 2016. *Integration of Solid Waste Management Policies in Kenya: Analysis of coherence, gaps and overlaps.*

- There are inadequate resources and institutional capacity to enforce implementation of recommended SWM procedures and practices.
- There is weak political commitment to addressing SWM.
- Solid waste is seen as a 'problem', rather than a resource that could be recycled, and there is a lack of recycling infrastructure.

ELECTRONIC WASTE MANAGEMENT

Electronic waste is Kenya's fastest growing waste component. Recent data on Kenya's e-waste is not available but, 10 years ago, United Nations Environment Programme (UNEP) estimated that Kenya generated 17,000 tons of electronic waste annually,[340] which is equivalent to 130 million mobile phones. It is safe to assume, given the rapidly increasing ownership of mobile phones, TVs, and computers, that the amount of waste generated is now far higher. When e-waste is burnt, toxic substances controlled under the Stockholm Convention on Persistent Organic Pollutants (POPs) are emitted. Unintentional POPs (UPOPs) are generated and POPs contained in the waste are released.

Informal e-waste recycling is causing serious environmental and public health hazards in rural and urban areas that need to be addressed collaboratively. The high rate of e-waste accumulation in Kenya is caused by incomplete product life cycles, the increasing affordability of electronics, and donations of used electronics from other countries. Illegal import of e-waste or used electronics from all over the world is a fourth major source of e-waste in African countries including Ghana, Kenya, and Nigeria. This illegal import is driven by the demand for inexpensive e-waste and secondary materials, as well as cheap dumping prices compared to the treatment in the export countries, which have stricter standards.

There are some government, private sector, and civil society supported initiatives in place to address the issue of e-waste. The Computer for Schools Kenya (CFSK) program started in 2002, and one of its missions is to recycle computers to use in schools across Kenya. It also supports the management of e-waste through its Waste Electrical and Electronic Equipment Centre (WEEEC)[341] and operates a couple of e-waste recycling centers. Nokia and Hewlett Package (HP) have also set up mobile phone collections.

Nevertheless, recycling of e-waste in Kenya usually is carried out informally and often involves open burning in unmonitored dumpsites or landfills. Such predominantly rudimentary recycling has substantially damaged the health of human waste pickers and the local environment. In fact, managing hazardous waste and toxic pollutants from the informal waste recycling sector is an emerging challenge for Kenya.

Government of Kenya (GoK) is in the process of addressing the issue of e-waste. Kenya is a party to the Stockholm Convention on POPs, which was ratified on September 24, 2004. Kenya then developed its National Implementation Plan (NIP) in 2007, updated in 2014,[342] with the assistance of UNEP. In addition, in January 2019, it published a draft National e-Waste Management Strategy[343] which aims to make sure that e-Waste has a zero negative impact by 2030 and to also achieve a sustainable e-waste management system in Kenya.

340 UNEP. 2009. *Recycling—From E-Waste to Resources. Sustainable Innovation and Technology Transfer Industrial Sector Studies.*
341 See Computers for schools' website: http://cfsk.org/about-us/
342 MEWNR. 2014b. *Kenya National Implementation Plan for the Stockholm Convention on Persistent Organic Pollutants, 2014–2019.*
343 MoEF. 2019. *National e-Waste Management Strategy.*

WAY FORWARD

1. **Tackling waste management challenges in Kenya will require a comprehensive approach.** This must include strengthening the regulatory and policy capacity of the government so that standards are enforced, and coherence and integration is achieved, from local through to national levels.
2. **Develop and implement sustainable urban plans that include investments in practical waste management.** Kenya's current rapid pace of urbanization means the problems of waste management will rapidly worsen. It is urgent to close the gap between the need to manage waste more effectively and efficiently and the current shortfalls in infrastructure, finance, and management capacity. Prioritizing investments in the short term will be far more cost effective than postponing them, as 'catching up' will become more and more difficult and expensive.
3. **Accelerate and scale up the roll-up of WASH programs.** Kenya has significant mortality rates due to unsafe water and sanitation. However, providing more people with access to improved sanitation has been extremely slow for many years. These mortality rates will not reduce without significantly increased numbers of WASH programs.
4. **Leveraging private sector resources for SWM could improve the current situation at local levels.** The financial resources required at a national scale are so large that, without engagement with the private sector, GoK does not have the fiscal or political space to reallocate the substantial sums required. Public-private partnerships have the potential to go some way toward providing the level of resource required for the scale of solid waste management. Local level and private sector initiatives could include:
    - Actively supporting private initiatives for waste management and marketing, including regularizing informal sector waste pickers.
    - Adjusting regulations as necessary to support these private initiatives.
    - Actively supporting the separation, processing, and sale of recyclable and compostable waste.
    - Actively enforcing the 'polluter pays' principles for larger enterprises.
    - Raising public awareness of waste management by providing practical guidelines through municipalities, NGOs, and schools.
    - Working with large and medium enterprises in trades and professions with significant waste management issues—with the aim of reducing and self-managing waste and creating less dependence on regulation.



Kenya's vast herds of wildlife draw huge numbers of tourists.

Wildlife and nature-based tourism

- **Biodiversity and tourism coexist in a contested way.** The tourist industry needs thriving and diverse wildlife, but too much tourism puts pressure on the environment.
- **Wildlife and biodiversity are in decline.** Sixty-eight percent of wildlife was lost over the last 40 years and Kenya is ranked the 5th worst country in Africa for numbers of threatened species.
- **Drivers of decline are complex and interrelated.** Major factors include: (i) the design of the national parks and the management of land around parks; (ii) the increasing population and expansion of agriculture; and (iii) the demand for improved infrastructure (including tourist infrastructure).

Kenya's biodiversity and tourist industry are two sectors that coexist, yet in a contested way. On one hand, the tourist industry needs thriving and diverse wildlife to attract tourists (a reality that has encouraged relatively strong government action to enforce natural resource conservation). Yet, on the other hand, too much nature-based tourism puts pressure on the environment and threatens Kenya's biodiversity.

Kenya's biodiversity is amongst the richest and most diversified in Africa. It harbors a wide variety of wildlife in its 51 national parks and diversified private, state, and trust lands. Wildlife is key to Kenya's tourism sector, which accounts for about 9 percent of the national GDP and employs approximately 1.5 million people.[344] It is the third largest source of foreign exchange in the country, contributing K Sh 790 billion (US$7.66 billion) to the economy in 2018.[345] It is also a significant generator of employment and wealth, especially in rural areas where livelihood opportunities are limited.

In the past decade, Kenya has significantly improved the management of its natural ecosystems. This is mainly as a result of the Government of Kenya's (GoK's) decision, in partnership with other state and nonstate actors, to aggressively implement and support the conservation of natural resources. This development is supported at the national level by the Wildlife Conservation and Management Act of 2013[346] and the Wildlife Conservation and Management Policy published in 2017.[347] However, there remains the issue of the struggle between the need for wildlife conservation versus the need to build and maintain the important economic tourism industry.

344 World Bank. 2017a. *Standing Out from the Herd: An Economic Assessment of Tourism in Kenya.*
345 WTTC. 2019. *Kenya Travel and Tourism exceeding global and regional levels in 2018.*
346 GoK. 2013b. *Wildlife Conservation and Management Act, 2013.* Nairobi: Government of Kenya.
347 MENR. 2017b. The National Wildlife Conservation and Management Policy.

KENYA'S KEY ECONOMIC ASSET—WILDLIFE AND BIODIVERSITY

Nature-based tourism is, and will remain, the key to attracting tourists to Kenya. A recent World Bank study that used rigorous modeling approaches found that the tourism sector is deeply integrated into Kenya's economic fabric in complex ways. In particular, safari-based tourism is found to be pro-poor, with diffuse and significant backward links into the economy, creating employment and stimulating economic activity where it is most needed—in rural areas.[348] This is a strong justification for classifying Kenya's wildlife and biodiversity as key economic assets.

There is recognition that the current approach to managing nature-based tourism may be contributing to an irreversible deterioration in the actual assets it needs to exist. Many of Kenya's key tourist attractions are under pressure and showing distinct signs of degradation.[349] Perhaps most troubling, recent population monitoring suggests long-term declines of many of the charismatic big mammal species that attract tourists. Figure 49 shows that Kenya has lost at least 68 percent of its wildlife over the last 40 years, and Figure 50 presents these declines at county levels.

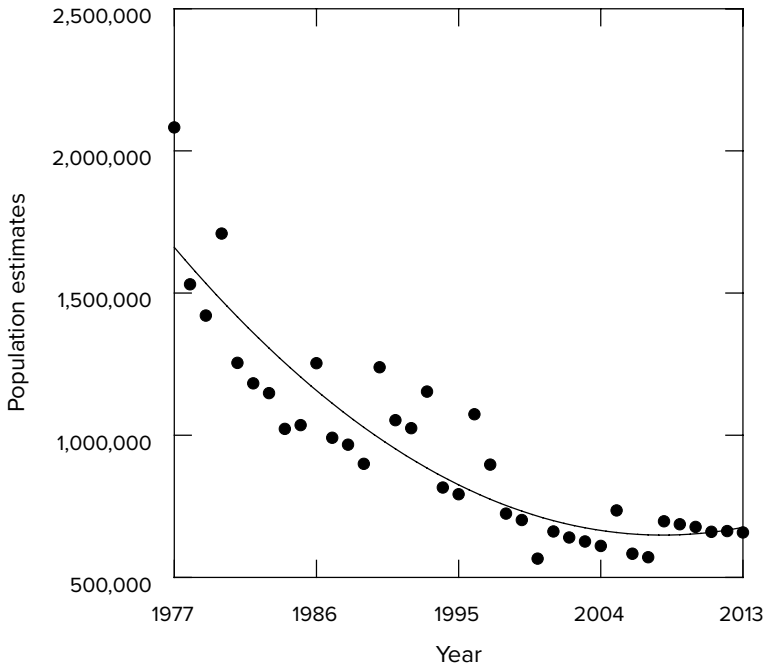


Kenya's wildlife helps bring tourist dollars into rural areas.

348 World Bank. 2017b. *World Bank Support to the North and Northeastern Development Initiative (NEDI), Kenya.*

349 Ogutu et al. 2017. *Wildlife Population Dynamics in Human-dominated Landscapes under Community-based Conservation: The Example of Nakuru Wildlife Conservancy, Kenya.*

FIGURE 49. Kenya has lost 68 percent of its wildlife in the last four decades



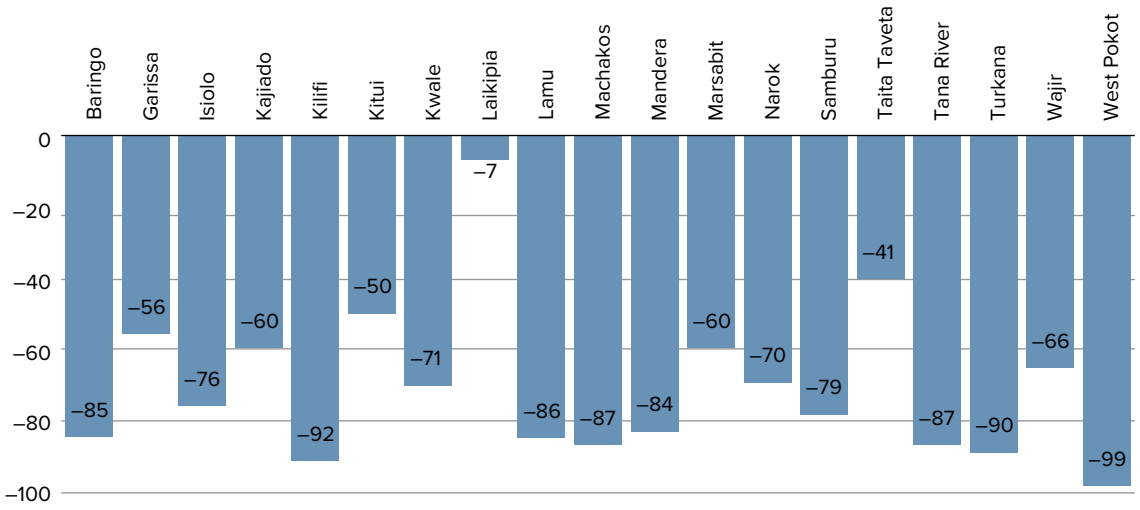
Source: Ogutu. 2017.[350]



But can Kenya sustain the pressures of mass tourism?

350 Ogutu et al. 2017. *Wildlife Population Dynamics in Human-dominated Landscapes under Community-based Conservation: The Example of Nakuru Wildlife Conservancy, Kenya.*

FIGURE 50. Wildlife population decline at county level



Source: Ogutu. 2017.[351]

BOX 18. Biodiversity in Kenya (based on the data by National Museums of Kenya)[352]

According to the 2015 national Biodiversity Atlas, Kenya's most distinguishing "biogeographic feature is that ten of the world's fourteen biogeographical biomes are found within its borders."

Plants

Data collected by National Museums of Kenya (NMK) shows that the country features at least 57 percent of the 29,614 African plant species, with 577 (or 8 percent) of which are endemic, and 232 species classified as threatened.

Animals

- Currently 107 wildlife species in Kenya are listed as threatened. Of these, 16 are classified as critically endangered, 34 as endangered, and 55 as vulnerable (with 20 being endemic to Kenya).
- Kenya is home to about 800 bird species (plus 230 migratory species), 220 reptile species, 206 fish species catalogued in freshwater basins, and 36 (or 17 percent) of which are endemic freshwater species).

Biodiversity in Kenya is also under threat. Kenya has been ranked the 5th worst country in Africa for numbers of threatened species with 232 plant species and 107 wildlife species classified as threatened.[353] See Box 18 for information.

351 Ogutu et al. 2017. *Wildlife Population Dynamics in Human-dominated Landscapes under Community-based Conservation: The Example of Nakuru Wildlife Conservancy, Kenya.*

352 Western et al. 2015. Kenya's Natural Capital: A Biodiversity Atlas.

353 Western et al. 2015. Kenya's Natural Capital: A Biodiversity Atlas.

PROTECTED AREAS

For many years, Kenya has invested heavily in creating national parks and protected areas in order to preserve its wildlife. The first protected areas in Kenya were established in 1896 and there are now 51 national parks and reserves dedicated to the conservation of wildlife. This does not include the marine parks and reserves which are discussed in the Coast and Marine chapter. Approximately 8 percent of Kenya's land is dedicated to protecting wildlife.[354]

However, protected areas do not necessarily provide protection. Recent research suggests that protected areas do not protect wildlife, as wildlife is declining in these parks at the same rates as outside the parks.[355]

Drivers of decline

The drivers of wildlife decline are complex and interrelated. The design of the parks is one part of the problem. How the land around parks is managed is another factor. Population increase and the resulting expansion of agriculture add further pressures on the environment. In addition, the demand for improved infrastructure needed due to an expanding population, and to cater for an expanding tourism industry, has resulted in more roads and plans for further roads and infrastructure development—all of which negatively impact Kenya's wildlife and diversity.

Initially, protected areas in Kenya were established in haste. They chose areas where large aggregations of animals were observed typically during the dry seasons. However, policy makers neglected the migratory needs, especially of the ungulate herds. They created areas that failed to take this into account and disrupted the dispersal process of these herds. Dispersal is a fundamental biological process that influences the distribution of biodiversity in every ecosystem and is needed to ensure a species survives. Among other things, the process of dispersing from a natal territory is essential to avoid inbreeding and strongly influences individual fitness. As a result, wildlife depends as much on adjacent land as it does on the protected areas for continued viability.

Population in Kenya has grown from 8.4 million in 1961 to over 50 million in 2018. This has resulted in land use changes that directly impact wildlife. Increasingly, natural habitats are converted for agriculture and other purposes. In addition, the important land around the parks, needed to ensure the dispersal process, is vulnerable, and the way land outside of protected areas is utilized and managed will become a crucial determinant of the industry's future. Expanding tourism to these areas remains among the most successful approaches that have been piloted—under the rubric of "community conservancies." But the feasibility of this approach depends upon whether economic incentives are sufficient to encourage local communities to protect and live alongside wildlife and the opportunity costs of land.

An increasing population results in an increasing demand for infrastructure across all sectors. Improved roads and irrigation are needed to increase agricultural yields, promote greater commercialization of agriculture, and connect remote parts of the country. Dams, powerlines, and power plants are constructed or planned for protected areas, and agencies approve these because of the large financial compensation offered.[356] Infrastructure is important too for the tourism industry. Efficient travel hubs, robust road networks, and reliable electricity can also improve a tourist's experience and reduce the cost, both in terms of time and money. However, more roads, the expansion of agriculture, and greater numbers of tourists just quicken the cycle of environmental decline.

Kenya also has a plan to significantly increase the numbers of tourists, and yet ironically this could result in lower tourist revenue. Vision 2030 sets a target of five million tourists—which would require a four- to five-fold increase in current tourist numbers. However, to attract tourist numbers in these numbers would need substantial reductions in prices. Cheaper prices would result in less revenue to provide increased services and put unsustainable environmental pressures on the important assets that attract tourists in the first place.[357]

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354 See Kenya Wildlife Service website: http://www.kws.go.ke/content/overview-0

355 Ogutu et al. 2016. *Extreme wildlife declines and concurrent increase in livestock numbers in Kenya: What are the causes?*

356 Welz. A. 2019. *How Kenya's Push for Development Is Threatening Its Famed Wild Lands.*

357 World Bank. 2017a. *Standing Out from the Herd: An Economic Assessment of Tourism in Kenya.*



Innovative transport approaches can reduce wildlife tourism's environmental footprint.

BOX 19. Conservation versus infrastructure

Roads are needed to accommodate much larger tourist numbers, but they bring their own environmental challenges.

Roads disrupt wildlife migration routes. They bring more people into fragile ecosystems. Deforestation and forest degradation increase. With improved access to markets, illegal activities increase, including poaching. More people bring more pollution and increase the potential for the spread of disease. A recent study that mapped the impact of road construction confirmed that land areas less than 20 kilometers from a road suffer from an additional decrease in wildlife population of up to 76 percent.[358] Conversely, roads provide multiple benefits to local populations and encourage farmers to manage land in a more sustainable way, as they now have improved access to markets and livelihood opportunities.[359]

The question must be asked about how to square these conflicting challenges. On one hand, roads build livelihoods, help tackle poverty, and contribute to improving the environment. On the other hand, roads have a direct impact on the numbers of wildlife.

OPPORTUNITIES TO PROTECT WILDLIFE AND TOURISM

Green infrastructure

Roads allow more tourists to access wildlife areas, but also have an adverse impact on wildlife. Constructing more roads in and around wildlife areas will increase the numbers of safari tourists, who generate the most employment and economic activity. However, road construction disturbs and displaces wildlife by both diminishing and degrading migration corridors and opening wild areas up for human activities such as farming.

Balancing the economic gains roads bring to rural communities with the costs they add to wildlife habitats is a complex challenge. Roads bring economic gains by improving the connectivity of distant, often poor, communities. They expand market

358 World Bank. 2019c. *When Good Conservation becomes Good Economics: Kenya's Vanishing Herds [Draft].*
359 UNIQUE. 2018. *Land and natural resources degradation in the Arid and Semi-Arid Lands.*

access and provide more opportunities for economic activities, along with easier access to health and education services. The question that requires answers is whether the costs to wildlife outweigh the potential economic benefits of road building.

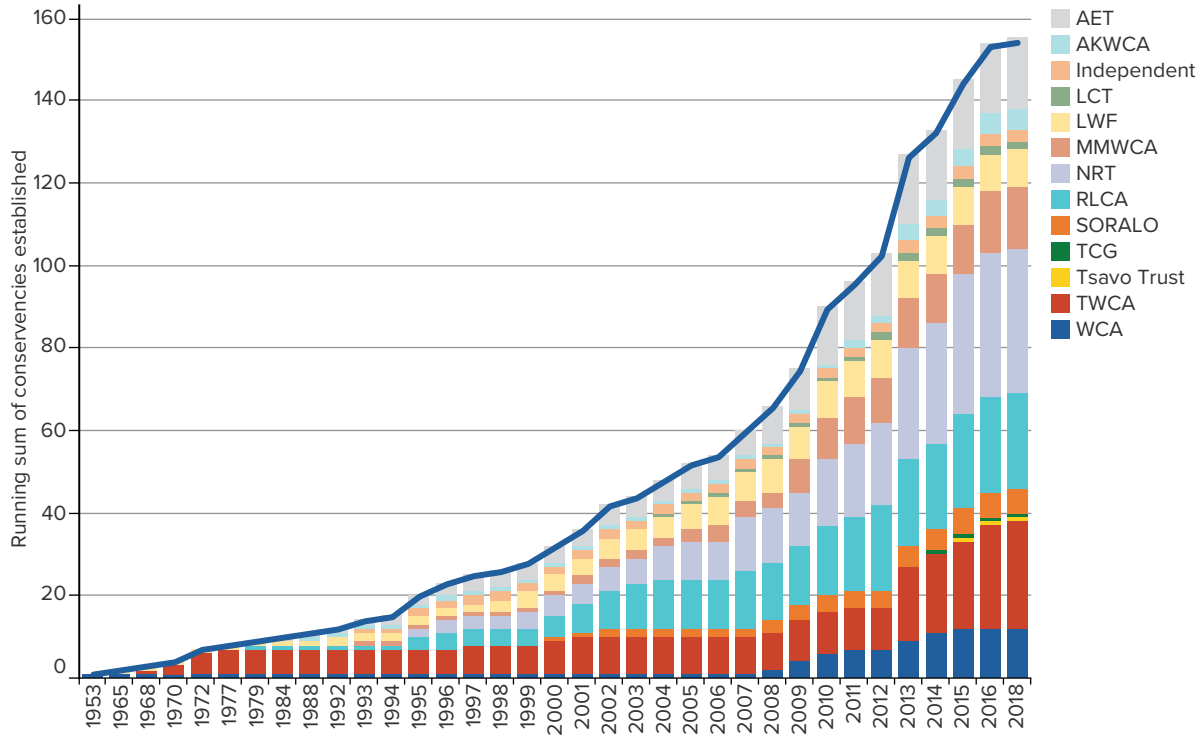
Recent economic analysis of the cost and benefits of roads on wildlife habitats[360] suggest that it is possible to identify situations where road construction make sense and where it should be avoided. In the context of protecting and managing wildlife, the analysis shows that a key factor for deciding whether or not to construct a road, are data on wildlife migration routes.

Currently, this data are not used to determine road construction priorities or routes. However, the economic model used in the recent analysis can include this information, along with information on other factors, such as the number of people and the areas of highest agricultural potential who would be connected. This would allow the sensitive balance between the costs and benefits of protecting wildlife habitats and broader economic and social development objectives to be assessed and provide evidence to support road building decision making.

Conservancies

Conservancy is a growing movement in Kenya. They are said to offer a more exclusive tourist experience and provide landowners and communities with the opportunity to benefit from preserving and rehabilitating wildlife populations and conserving the land. There are now more than 160 conservancies across Kenya. Figure 51 shows the rise in conservancies since 1953.

FIGURE 51. Conservancy year of establishment



Source: World Bank. 2019c.[361]

It is argued that conservancies take the pressure off the current protected areas, can help reestablishing wildlife corridors, and build local livelihood opportunities at the same time.[362] They are an effective way of increasing biodiversity, and case studies and some research so far suggests they conserve wildlife too. They also allow for the benefits to be shared across communities. Box 20 shows the three types of conservancies in Kenya and the three ownership models.

360 World Bank. 2019c. *When Good Conservation Becomes Good Economics: Kenya's Vanishing Herds.*
361 World Bank. 2019c. *When Good Conservation becomes Good Economics: Kenya's Vanishing Herds.*
362 World Bank. 2019c. *When Good Conservation becomes Good Economics: Kenya's Vanishing Herds.*

Unfortunately, in practice it has been found that conservancies in Kenya do not always provide the expected benefits to the local communities and the environment.[363] Some challenges persist, and new ones have emerged. There are reports of improved livelihoods, peace and security, social services and amenities, reduced levels of poaching, and declining losses of tree species previously used for charcoal production. Conversely, there has been an increase in the coexistence of livestock and wildlife with inadequate compensation for farmer losses causing resentment and conflict. Relationships between conservancy and non-conservancy members can also be problematic.

BOX 20. The three types of conservancies in Kenya (State of Conservancies Report 2016)

Conservancy type

1. Community conservancy: a conservancy set up by a community on community land.
2. Private conservancy: a conservancy set up on private land by a private individual or corporate body for the purpose of wildlife conservation.
3. Group conservancy: a single conservancy created by the pooling of land by contiguous private landowners for the purpose of wildlife conservation.

Ownership model

1. Owned and managed by the community.
2. Owned by the community and managed by an operator.
3. Owned and managed by an operator.

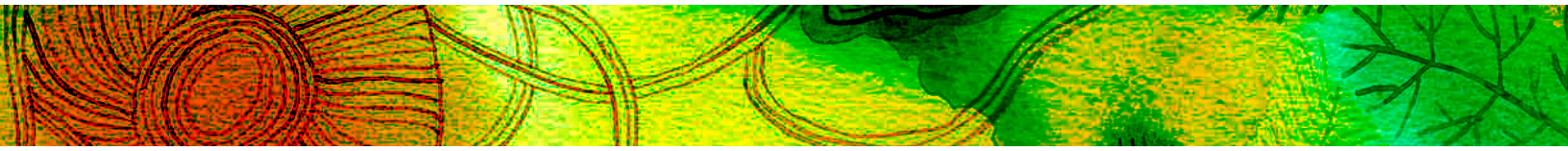
Source: World Bank. 2019c.[364]

The existing compensation system for human-wildlife conflicts is ineffective. The 2013 Kenya Wildlife Conservation and Management Act mandates the Kenya Wildlife Service to pay compensation for losses resulting from human-wildlife conflicts. In 2019, in an exclusive interview to industry insurance companies, the Kenyan Minister for the Tourism and Wildlife portfolio revealed that during 2014–2018 the KWS received about 14,000 claims (494 of the claims related to deaths from human-wildlife conflicts) amounting to K Sh 10 billion (about US$100 million). In 2018, the government allocated US$4 million for human-wildlife conflicts compensation (the proposed allocation for 2019–2020 is US$5.4 million). KWS annual revenue is about US$30 million. A recent assessment by Kenya's Auditor General found major delays and shortcomings in implementing the act. Particular areas of concern were unimplemented management plans, insufficient monitoring and evaluation, and inadequate investigation and prosecution capacity, along with inadequate mechanisms to address human-wildlife conflicts (such as promoting community involvement, operationalizing county wildlife conservation and compensation committees, and paying compensation).[365]

WAY FORWARD

1. **Ensure data on wildlife migration routes are both collected and incorporated into planning rural infrastructure development.** The first step is to make sure that adequate data on migration patterns exist, and fill gaps as necessary. At the same time, rural infrastructure development should ensure that the data are used in infrastructure design, to avoid blocking wildlife corridors and to discourage wildlife movements to shift toward existing cultivated or highly populated areas.
2. **Implement the 2013 Wildlife Act—in particular to provide compensation for crop or livestock losses resulting from wildlife predation.** Compensation that is seen to be fair and paid in a timely manner can reduce communities resenting wildlife and promote community participation in conservation efforts. Legislation exists but is currently poorly implemented.

363 Few et al. 2015. *Vulnerability and Adaptation to Climate Change in Semi-Arid Areas in East Africa.*
364 World Bank. 2019c. *When Good Conservation becomes Good Economics: Kenya's Vanishing Herds.*
365 MTW. 2018. *Performance Audit Report on Effectiveness of Measures Put in Place by Kenya Wildlife Services in Protecting Wildlife.*



Opportunities for Change

The analysis provided in this report shows that Kenya's environmental challenges have a strong potential to undermine the path of economic growth the country seeks. The results of this country environmental analysis (CEA) indicate that a number of crucial environment and natural resource (ENR) sectors, such as agriculture, forestry, and tourism, are significantly affected by the environmental stressors described. These recommendations also reflect feedback during stakeholder consultations in July 2016 and May 2019.

Environmental policies are receiving increasing attention from Kenyan policy and decision makers and the public. It is recognized that the future of economic growth lies in fostering sustainable development that incorporates environmental policies and considerations. It is also noted that mitigating environmental health impacts can strengthen development. However, these necessities require collaboration between national and county governments, as well as private-public synergy in planning and implementing environmental conservation and management activities to address environmental challenges.

Consensus exists at both the national level and across counties that environmental issues are still not given the necessary attention. The devolving of multiple government functions and responsibilities to the counties provides an opportunity to transform environmental management, promote innovation, provide a strong focus on sustainable infrastructure investments, and strengthen natural resources capital assets. Unfortunately, devolution is too often characterized by weak governance structures and technical and managerial capacity constraints, along with poor inter- and intra-agency communication. These then combine with limited political prioritization, and inadequate financial resources and budgetary processes to frustrate the intentions underpinning Kenya's environmental policies.

Implementing improved environmental management practices must be linked to a clear purpose. Environmental management is not a policy end in itself. A range of national development goals exist and are articulated through high-level policies and strategies such as Vision 2030, the 'Big 4' Agenda, and the Constitution. Environmental management simply provides one of several keys to achieve development goals, such as improving food security, raising sustainable economic productivity, or reducing poverty. Linking environmental management to specific development objectives which, at local levels, may vary in time and location, provides a means to prioritize environmental initiatives and measure both long- and short-term impacts.

The CEA recommendations provide a guide to ensuring environmental issues are effectively incorporated in all development initiatives and investments. The recommendations identify the priority areas that need to be addressed if Kenya's environmental management capabilities are to improve. In addition, if implemented, they will ensure that short- and longer-term development objectives neither undermine environmental benefits nor are undermined by adverse environmental impacts.

Each recommendation provides a range of interlinked actions that can be incorporated into development investments. Development investments can be either large-scale, at the national level or subnational level, or small-scale at the county-level. Ensuring, where appropriate, the actions recommended below are part of the design and implementation of sectoral (or multi-sectoral) initiatives, provides the opportunities and mechanisms to embed improved environmental management into everyday practice.

Six strategic recommendations that will have a transformative impact are presented below. A range of sector-level interventions are provided at the end of each chapter and in a consolidated and tabulated form in Annex 1.

RECOMMENDATION 1: STRENGTHEN ENVIRONMENTAL GOVERNANCE AND SUPPORT INSTITUTIONAL CAPACITY AT ALL LEVELS

- **Enforce existing environmental laws and regulations.** The following areas should be prioritized, as they are all key drivers of environmental degradation. They include: (i) producing and transporting charcoal, (i) illegal logging, and (iii) farmers and settlers encroaching onto forest and wetlands.
- **Support counties to formulate their own subsidiary environmental laws and policies.** Some counties follow recently formulated environmental policy and the revised National Environmental Management and Coordination Act (EMCA) 2015. However, many counties have not yet produced the local-level regulations and policies to implement national policy effectively at the local level. Counties lack both the financial and human resource capacity to develop local-level environmental management strategies, which require broad-based approaches that address not only the direct causes and effects of degradation but also tackle the underlying causes such as poverty and population growth.
- **Strengthen County Environment Committees (CECs).** These are mandated by law, but frequently fail to operate effectively. Challenges that prevent counties organizing their CECs need to be identified and resolved. These challenges are a mix of inadequate technical and managerial capacity, financial constraints, and political leadership, although the exact mix of these challenges varies from county to county.
- **Improve the quality of County Environment Action Plans (CEAPs).** These plans identify the various stakeholders to implement particular initiatives, but frequently lack operational clarity, deadlines, and budgetary details, and sometimes cannot be realistically implemented without additional funding.
- **Ensure a timely and regular flow of environmental information within and among agencies.** Effective environmental management requires knowledge sharing and collaboration. Inter- and intra-agency communication is key both for effectiveness within an agency and for effective collaboration.
- **Promote and support increased community participation in active environmental management.** Public participation is critical to ensure government agencies and other non-state actors are held accountable for delivering both sustainable practices and voluntary regulatory compliance, in line with obligations enshrined in the 2010 Constitution. Public participation is more likely if Environmental and Social Management Plans (ESMPs) and similar reports contain summaries in local languages. Residents should be encouraged to read and comment on Environmental and Social Impact Assessment (ESIA) reports. Citizens' participation in environmental management can initially be accomplished through three pre-existing groups:

    1. **Water Resource User Associations (WRUAs).** WRUAs are required to prepare and implement sub-catchment management plans under the supervision of the Water Resource Management Authority, which was formed by the Water Act of 2002.
    2. **Community Forest Associations (CFAs).** CFAs are required to develop forest management plans in their areas of jurisdiction.
    3. **Charcoal Producer Associations (CPA).** Community leadership and county governments should engage the Charcoal Producer Associations to renew Associations' commitment to implement their management plans as per the Forests (charcoal) Rules of 2009.
    4. **Community Wildlife Conservancies (CWCs).**

RECOMMENDATION 2: ENHANCE COMPLIANCE WITH ENVIRONMENTAL POLICIES TO REDUCE POLLUTION AND IMPROVE ENVIRONMENTAL HEALTH

- **Strengthen environmental accountability mechanisms of industry.** In particular, it is recommended that the manufacturing sector introduces environmental scorecards to track and compare performance of individual companies.
- **Enhance public sector compliance capacity.** Staffing levels dedicated to compliance in all development projects need to be increased, regardless of the source of project financing.
- **Build public awareness of environmental policies.** Increased public awareness of environmental policies is needed to facilitate a change in behavior and to build nationwide appreciation of the need for environmental policies.
- **Strengthen formal education programs on the environment.** These education programs need to focus on sustainability and "greening" the engineering, agriculture, energy, and transport curricula.
- **Improve the use of environmental risk management tools.** These tools include Strategic Environmental and Social Assessments (SESAs) and cumulative impact assessments (CIAs). By law, at the project level, an ESMP must be conducted and a report submitted to the National Environment Management Authority (NEMA) for review and approval. However, the quality and implementation of these assessments is frequently not prioritized.

RECOMMENDATION 3: INTEGRATE DATA AND INDICATORS FOR NATURAL CAPITAL AND ENVIRONMENTAL SUSTAINABILITY INTO ECONOMIC PLANNING

- **Develop natural capital accounts for water, wildlife, fisheries, and forest resources.** The crucial role of natural capital in the Kenyan economy is well recognized by the Government of Kenya (GoK). In 2015, the Ministry of Environment released a Biodiversity Atlas, one of the key publications supporting natural capital recognition for the national economy. The government needs to continue developing natural capital accounts for key natural assets such as water, wildlife, fisheries, and forest resources in order to identify cross-sector linkages and improve available data to guide economic planning by the National Treasury.
- **Utilize the state of environment report (SoER) to support environmental planning and management.** The SoER is a tool that could provide a comprehensive overview of the natural capital accounts. This report was last published in 2010. Between 2016 and 2018, a new report was drafted. However, it has not been finalized or publicly shared. This report should be updated and published on a regular basis and used as the basis for environmental planning and management. It is important to finalize the latest, updated edition, as its focus is on devolved functions of the government and the environmental ranking of the counties. It establishes a national data baseline and highlights the gaps and opportunities for strengthening planning and management of environment and natural resources.

RECOMMENDATION 4: INCREASE BUDGETARY ALLOCATIONS AND STREAMLINE RELEASES TO SUPPORT ENR MANAGEMENT

- **Increase budgetary allocations to ENR institutions.** To date, both national- and county-level ENR institutions have experienced inadequate allocations and untimely releases of budget, exacerbated by the low absorption capacity of allocated funds. The Ministry of Environment and Forestry (MoEF) reported that its budget was insufficient to implement important ministry agendas outlined in its strategic plan. In addition, the money allocated to ENR institutions has gone down rather than up. The average annual allocation of financial resources to MoEF against the national budget was only around 1 percent, while income from natural resources was 2.5 percent of GDP in 2017.[366] Yet, in the final three years before devolution, the ministry's budgetary allocation was higher in comparison to the first three years under devolution.[367]
- **Strong and sustainable financial support for ENR management.** In order to attain the goals set in Vision 2030, and enhance low-carbon, resource efficiency, and economic transformation, the relevant public sector institutions working on ENR sectors will need to rely on the strong and sustainable financial support from the National Treasury.

366 Based on the indicator for total natural resources rents (revenues above the cost of extracting the resources) are the sum of oil rents, natural gas rents, coal rents, mineral rents, and forest rents.—World Bank, 2018. *Changing Wealth of Nations 2018: Building a Sustainable Future.*

367 GoK. 2019. *Estimates of Development Expenditure of the Government of Kenya for the year ending 30th June 2020.*

RECOMMENDATION 5: EXPAND SUSTAINABLE LAND MANAGEMENT (SLM) INTERVENTIONS, WITH A FOCUS ON DIVERSIFYING LIVELIHOODS, PARTICULARLY IN THE NNE AND COASTAL COUNTIES

- **Invest in SLM interventions.** Such investments will reduce the impacts of pressures on water and land and contribute to the Big 4 Agenda aimed at improving food security. There are three main investments needed:
    1. **Provide incentives to land users to invest in SLM approaches.** Subsidies for fertilizer could be redirected to provide financial incentives to small farmers to invest in SLM practices. These existing subsidies have been criticized for encouraging agricultural expansion onto marginal agricultural land (such as forests, slopes, and wetlands). They also mainly benefit larger farmers.
    2. **Create institutional environment and rural services that will support the investments.**
    3. **Focus on reducing the high risks for arid and semi-arid land (ASAL) production systems.**
- **Focus on environmental strategies to improve land management at county levels.** Discussion and decision making on the scope, nature, and implementation mechanisms of environmental strategies need to take place needs to happen in the county assemblies, county cabinet committees, and the Council of Governors' Environment Committee. These are the decision-making assemblies that have the mandate to help to increase and prioritize appropriate funding to address land degradation in Kenya.

RECOMMENDATION 6: BUILD RESILIENCE AND ENHANCE LONG–TERM PLANNING FOR DISASTER RISK MANAGEMENT (DRM)

- **Mainstream climate change risks and opportunities.** Make sure that climate change risks and opportunities are a top priority for government departments and stakeholders working with major vulnerable sectors. This can be done by incorporating climate change awareness in the educational system and encouraging the implementation of policies such as the National Disaster Management Response Plan.
- **Focus on disaster risk management (DRM) solutions in ASALs.** These include developing disaster-proof infrastructure such as climate proofing road design and construction, investing in sustainable livelihoods adaptive to climate change (for example, ensuring knowledge of and access to drought-resistant crop varieties, dryland forestry, and community-based livestock systems), and implementing public awareness programs. Possible support could be given by providing index-based weather insurance schemes.
- **Rehabilitate the main watersheds to expand the water retention areas and decrease the variability of discharges in the rivers to reduce risk and build resilience to weather shocks.** Sustainable water and land management naturally decreases the overall impact of extreme events such as floods and droughts. One of Kenya's Vision 2030 goals is increasing the country's tree cover to 10 percent of the land mass. This has the potential to greatly strengthen sustainable land and water management and decrease the expected impact of natural disasters, erosion, and flood risk. However, it is important that tree planting programs utilize suitable tree species in suitable environments.
- **Target vulnerable communities for local-level disaster preparedness.** Improving emergency and disaster responses requires better preparation in vulnerable communities, ensuring they are aware of early warning systems and know-how to respond if an emergency warning is triggered. Disaster risks can often be reduced through the diversification of rural livelihoods and teaching practical coping mechanisms.
- **Strengthen information linkages between the Kenya Meteorological Service and local communities.** Modernizing meteorological systems should include strengthening links between national-level information and local-level stakeholders to ensure timely information for targeted responses to emerging weather-related disaster risks. This should include a focus on 'last mile' early warnings and improving county-level response planning for droughts and floods.
- **Train county level officials on both disaster risk reduction and disaster management.** Ensuring adequate skills are in place at county levels for effective disaster risk reduction planning will help local authorities mitigate impacts of future disasters. Training county-level disaster management officers for each county will help to ensure more timely and effective responses to disasters.
- **Address the problem of water scarcity.** The current and projected levels of water scarcity need to be urgently addressed, including by implementing the Water Sector Investment Plan for 2008–2030 and the Water Catchment Management Initiative.

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ANNEX 1

Summary of Priority Recommendations

These sectoral and thematic recommendations have been prioritized using a multicriteria approach, factoring in the level of impact, the time frame to see initial positive results, technical and institutional capacity, and the Government of Kenya's political priorities.

In Annex Table 24, the highest ranking is given to actions and investments that are likely to have the highest impact and shortest time to attain initial results.

ANNEX TABLE 24. Priority sectoral and thematic recommendations

Priority Recommendations	Challenges	Lead Agencies
Climate change		
1. Invest in Kenya's weather and climate services capacity to improve flood and weather forecasting and develop more effective early-warning systems for disaster management.	Responses to extreme weather events and efforts to build longer-term adaptation approaches are hampered by the limited quality of climate information.	KMD, MoEF
2. Establish fully-fledged disaster management operation centers at county levels.	Effective early warnings and disaster management require full-functioning local-level coordination.	MICNG
3. Continue to provide finance and technical support for climate smart agriculture (CSA).	Kenya must maintain and increase food production levels in the face of climate change. Most current agricultural practices are not 'climate smart'.	MALFI
4. Improve the planning and design of buildings, roads, and bridges to take account of climate impacts.	'Climate proofing' is not yet included in building regulations or other infrastructure design regulations for public buildings and other economically important infrastructure.	MTIHUD
5. Improve the design and planning of investments in the transport and energy sectors to prioritize to incorporating technologies and approaches that mitigate GHG emissions.	Increases in vehicle numbers caused by economic growth and the planned expansion of coal for energy generation will make it extremely hard for Kenya to achieve its emissions reduction targets.	MTIHUD, MOE
Wealth and natural capital		
1. Include the value of natural capital in economic planning.	In the absence of natural capital accounting it is difficult to mainstream the value of natural resources into national economic policy planning.	**National Treasury**
2. Build capacity in the Kenya National Bureau of Statistics (KNBS) to produce natural capital accounts.	The KNBS does not currently produce natural capital accounts.	**KNBS**

Priority Recommendations	Challenges	Lead Agencies
Policies, laws, and institutions		
1. Embed capacity building and institutional strengthening in the design of all investments in environmental sectors.	Gaps in technical and managerial capacity and ineffective institutional coordination currently undermine policy making, project and program implementation, and enforcement of environmental regulations and legislation.	MoEF
2. Generate environmental data in a systematic manner, at both national and county levels.	Currently monitoring of environmental data, for example using Strategic Environmental Assessments to inform planning decisions, is neither regular nor continuous.	MoEF, NEMA
3. Strengthen links between local authorities and community organizations to improve environmental protection.	Local governments do not involve local communities sufficiently in environmental protection efforts, despite the valuable expertise and knowledge they possess.	NEMA, County administrations
Environmental pollution and human health		
1. Accelerate and scale up the roll-up of WASH programs.	Kenya has significantly higher mortality rates due to unsafe water and sanitation than its neighbors. Progress in providing more people access to improved sanitation has been extremely slow for many years.	MOWS, MOH
2. Immediately implement education and public awareness strategies to make the severe health risks of HAP apparent.	Women, children, and the housebound elderly are at particular risk from HAP.	MOH
3. Provide subsidies for more efficient stoves and improved ventilation.	HAP is the second highest cause of mortality attributed to environmental pollution in Kenya. Inefficient cookstoves and poor ventilation amplify HAP risks.	MOH
Environmental impact of the Kakuma and Dadaab refugee camps		
1. Prioritize environmental rehabilitation activities that provide economic incentives for both refugees and host communities to tackle these large camps' environmental footprints.	The refugee camps have severe adverse environmental impacts on the surrounding areas. The direct environment footprint stretches over 100 km from the camps themselves.	MoEF
2. Map the areas around camps using geo-sensing and GIS data to provide real-time evidence to understand and develop rehabilitation efforts.	Decisions on rehabilitation efforts around the camps are not effectively guided or adjusted by real-time data sets.	MoEF
Land		
1. Reform incentives to increase the adoption of sustainable land management (SLM) and restoration practices.	Current subsidy packages encourage the expansion of cropland into marginal lands.	MALFI
2. Enhance the effectiveness and reach of the extension service.	Lack of extension service field staff is a major constraint on expanding the uptake SLM, climate smart agriculture, and improved pasture management.	MALFI
3. Promote market-driven livestock insurance to reduce risks to pastoral production systems.	Livestock losses remain a major threat to pastoral production systems.	MALFI

Priority Recommendations	Challenges	Lead Agencies
4. Ensure IK of rangeland, livestock, and medicinal plant husbandry is incorporated into SLM programs.	Kenya's rural communities hold a vast store of technical IK which is rarely incorporated into the design and implementation of land conservation initiatives.	MALFI
5. Use new digital technology, which allows multi-level monitoring to facilitate both large-scale land restoration and payment for ecosystem services (PES) schemes.	Decision making on restoration efforts and PES is frequently hampered by a lack of data.	MALFI
Forests		
1. Promote agroforestry and farmer managed natural regeneration (FMNR) to reduce pressure on natural forests.	Initiatives that solely focus on tree planting are often unsuccessful because returns do not justify the land, labor, and other resources farmers must invest.	MoEF, KFS
2. Use limited public finance to leverage additional private sector investment in forest management and restoration.	Kenya's forests are degrading, and restoration efforts face formidable financial and implementation challenges.	MoEF
3. Scale up forest comanagement approaches to balance responsibility and authority between communities and government.	Centralized forest management does not provide incentives for local communities to manage forests sustainably.	MoEF
4. Update forest data to include information on biomass energy, other informal forest activities, and the value of ecosystem services.	Forest data do not adequately indicate the full contribution forests make to national wealth, or adequately capture the link between forest degradation and greenhouse gas emissions.	MoEF, KFS
Water		
1. Monitor and enforce water quality standards.	Poor water quality is a major public health hazard. Regulations exist but are not adequately enforced. Monitoring systems to support enforcement have not been properly developed.	MOWS, WRMA
2. Invest in improving the efficiency of irrigation.	Inefficient irrigation planning and management waste scarce water.	MALFI
3. Map and assess groundwater resources.	Relatively little is currently known of the extent, quality, recharge rates, and abstraction potential of much of Kenya's groundwater.	MOWS
4. Explore and promote innovative markets for financing water resources management.	Currently, the finance allocated to water resource management is inadequate to meet the challenge of chronic and increasing water scarcity.	MOWS

Priority Recommendations	Challenges	Lead Agencies
Coast and marine		
1. Invest in measures to restore, conserve, and expand Kenya's coastal mangrove forests.	Kenya's mangroves are both sources of livelihood and providers of coastal protection. They are under threat and over 40 percent are degraded.	MoEF
2. Update data and analysis of Kenya's marine fisheries potential.	Kenya's marine fisheries appears to have potential to expand, but often quoted headline data on marine fish stocks are decades old.	MALFI
3. Escalate the efforts to manage marine pollution.	Solid waste has become a serious threat to marine resources.	MALFI
Waste management (including solid, liquid, and electronic)		
1. Adopt a comprehensive approach to tackling waste management.	Weak policy and regulatory capacity of the government hinders the necessary collaboration between government agencies at both national and local levels to effectively tackle waste management.	MTIHUD, NEMA
2. Develop and implement sustainable urban plans that include investments in practical waste management.	Kenya's rapid pace of urbanization means the existing severe problems of waste management will rapidly worsen.	MTIHUD
3. Accelerate and scale up the roll-up of WASH programs (see also 1. in 'Environmental pollution and human health')	Kenya has significant mortality rates due to unsafe water and sanitation. Progress in providing more people access to improved sanitation has been extremely slow for many years.	MOWS, MOH
4. Leverage private sector resources for solid waste management (e.g., public-private partnerships) to improve the current situation at local levels.	Government does not have the fiscal or political space to reallocate the substantial sums required to significantly improve waste management.	MTIHUD
Wildlife and nature-based tourism		
1. Ensure data on wildlife migration routes are both collected and incorporated into planning rural infrastructure development.	Rural planning and infrastructure development do not take adequate account of impacts on wildlife habitats and migration routes.	KWS, MoEF, MTIHUD, MTW
2. Implement the 2013 Wildlife Act—in particular to provide compensation for crop or livestock losses resulting from wildlife predation.	Legislation to provide incentives for communities to participate and support conservation efforts exists but is poorly implemented.	KWS, MoEF

ANNEX 2

Key Sectoral Environmental Policies and Legislation

National environmental policies[368]

The Kenya Forestry Master Plan (KFMP) of 1995–2020 provides the framework through which Kenya's forests are managed and developed. This master plan stipulates the dynamic role that forests should have in environmental management, including water values, biodiversity values, and the value of forests for mitigating the impacts of climate change, especially through sequestering carbon.

As part of the KFMP, in 2005 a new Forest Act was signed into law in 2007.[369] The Kenya Forests Act (2005) turned the original Forest Department into the Kenya Forest Service (KFS). It also incorporated the participation of local communities in forest management.[370]

National Forest Policy (2015). The goal of this policy is to increase and improve the contribution the forest sector makes to the economy, and to social and environmental goods and services.[371] This includes reducing poverty, improving land use, increasing private sector and community participation, promoting farm forestry and dry land forestry, and developing a vibrant forest sector.

The National Environmental Sanitation and Hygiene Policy (2016–2030). The new policy is aimed at providing an environment that allows all Kenyans to "enjoy a dignified quality of life in a hygienic and sanitary environment free from suffering ill health caused by poor sanitation."[372] Behavior change is a key part of ensuring this happens, and education and awareness building will be a main focus to ensuring it achieves its aims.

The draft National Wetland and Conservation Management Policy (2013). The development of this policy recognizes the importance of wetlands nationally and Kenya's obligation under the Ramsar Convention. It establishes an effective and efficient institutional and legal framework for integrated management and wise use of wetlands. The policy is calling for enhancement and maintenance functions and values derived from wetlands in order to maintain that ecosystem goods and services protect biological diversity and improve livelihood of Kenyans. The policy takes into consideration the

368 Please note that these have been listed by date and not by importance.
369 See: https://theredddesk.org/countries/policies/draft-forest-policy-kenya
370 GoK. 2016c. *Forest Conservation and Management Act.*
371 MEWNR. 2014a. *National Forest Policy 2014.*
372 MoH. 2016. *Kenya Environmental Sanitation and Hygiene Policy.*

broader national environmental frameworks, particularly the Environment Management and Coordination Cap 387, the country's premier framework environmental law, the Water Act 2002, and the Forest Policy 2007.

The National Disaster Management Policy (2012). This policy institutionalizes disaster management and mainstreams disaster risk reduction in the country's development initiatives. It aims to increase and sustain the resilience of vulnerable communities to hazards.

The Feed-in-Tariffs (FiTs) Policy (2012). This policy promotes the generation of electricity from renewable sources including geothermal, wind, small hydroelectric, solar, and biomass.

National Oceans and Fisheries Policy (2008). The overall objective of this policy is to enhance the role of the ocean and fisheries sectors building wealth, increasing employment opportunities for youth and women, and improving food security through more effective private, public, and community partnerships.

Wildlife Policy (2007). The goal of this policy was to provide a framework for conserving, in perpetuity, Kenya's rich diversity of species, habitats, and ecosystems for the well-being of its people and the global community. This policy was redrafted in 2011 and has since been enacted into law as the Wildlife Conservation and Management Act (2013).

Key national environment legislation[373]

Kenya has a range of national legislation that cover specific environmental issues, such as forests, agriculture, water resources, wildlife, fisheries, and mining. A list of these policies are provided in Annex 3.

The Forest Conservation and Management Act (No. 34 of 2016) provides the legal rights of forests that need special protection and management. This includes public, community, and private forests. It also makes provision for community participation in the management of forest areas, indigenous forests, and related water resources.

Fisheries and Development Act (2016) provides for conservation, management, and development of fisheries and other aquatic resources to enhance the livelihood of communities dependent on fishing and to establish the Kenya Fisheries Services; and for connected purposes.

The Mining Act (2016) applies to minerals, prospecting, mining, processing, refining, treatment, transport of minerals, and related activities.

Climate Change Act (No. 11 of 2016) provides the framework to implement climate resilient low carbon economic development in Kenya. It aims to mainstream climate change responses and risk reduction, build resilience, build capacity, and integrate climate change policy at national and county levels.

373 Please note that these have been listed by date and not by importance.

The Wildlife Conservation and Management Act 2013 (No. 47 of 2013) targets the improvement of protection, conservation, sustainable use, and management of the Kenya's wildlife resources, addressing loss of wildlife. The Act describes restructured governance of wildlife resources by separating the regulation and management functions from those of research.

The Environmental and Land Court Act (2011) established a court to settle disputes over land and environment. However, the lack of capacity within the court constrains the judicial system and remains a big challenge.

The Second National Environment Action Plan (NEAP 2009–2013) is a broad framework for public-private partnerships to coordinate environmental activities to better manage resources.

The Water Reforms Act (2002) serves: (i) as regulation for management, conservation, use, and control of water resources; (ii) for the acquisition and regulation of rights to use water; and (iii) to provide for the regulations and management of water supply and sewerage services. The Act provides for the regulation of riverine forests, catchment forests, and protection of wells and springs in the forest and supports the user pays principle for water benefits. Therefore, it opens opportunities for catchment forest management and conservation by forest communities and revenue generation through payments for ecosystem services.

The Energy Policy and Act of 2004 encourages the use of indigenous renewable energy sources, including wind, biomass, small hydropower, geothermal, biogas, and solar, to supplement hydroelectricity.

The Energy Act of 2006 mitigates climate change by promoting the use of renewable energy.

The Environment Management and Coordination Act (EMCA) (1999) amended in 2015 is an act of Parliament that provides for the establishment of an appropriate legal and institutional framework for the management of the environment. This Act provides for the establishment of an appropriate legal and institutional framework for the management of the environment. Part II of the Act states that every person in Kenya is entitled to a clean and healthy environment and has the duty to safeguard and enhance the environment. This Act provides the legal framework for Environmental and Social Impact Assessments (EIAs and SIAs) which are frequently combined as Environment and Social Management Plans (ESMPs).

The Agriculture Act (Cap 318) (1955) calls for the promotion of good agricultural practice with a focus on developing stable agriculture and preserving the quality of soil and its fertility. The Act has been amended many times over the years with the most recent amendments being in the Land Act, 2012 (No. 6 of 2012). This made changes to Article 68 of the Constitution in relation to land laws to provide for the sustainable administration and management of land and land-based resources.

ANNEX 3

Selected Development Indicators for Kenya by County, 2015

ANNEX TABLE 25. Selected development indicators for Kenya, by county, 2015

County	Area (km^2)	Population (est. mil.)	% Poor, WDI	GDP Mil US$ Mil 2015 Est.	% Population with Unimproved Water Source	Average Length x Dryness of Droughts 1901–2008	Population Density (pers/sq km)	GDP/Cap 2015 US$	Women Who Are Literate (%)	Biodiversity Hot Spot Area (km^2)	Less Favored Agricultural Land (% of total area)
Baringo	10,914	0.66	43	316	42	25.12	60	480	85	1,061	85
Bomet	2,395	0.89	44	432	42	22.63	372	485	85	2,393	46
Bungoma	3,597	1.82	48	1,051	24	22.74	506	578	90	681	59
Busia	1,812	0.84	52	429	24	22.86	462	511	90	0	63
Elgeyo-Marakwet	2,822	0.42	39	176	42	24.31	149	418	85	1,897	56
Embu	2,853	0.58	30	619	46	26.61	203	1,067	89	349	60
Garissa	44,144	0.99	44	675	48	30.79	22	684	24	35,264	85
Homa Bay	4,716	1.05	40	536	38	22.63	223	510	92	0	77
Isiolo	25,609	0.15	55	158	46	33.29	6	1,020	89	46	64
Kajiado	22,141	0.85	32	1,938	42	26.91	38	2,288	85	752	58
Kakamega	2,460	1.65	36	1,194	24	22.63	671	724	90	0	43
Kericho	2,596	0.93	35	933	42	22.64	357	1,006	85	1,904	38
Kiambu	2,592	1.73	20	7,240	21	27.58	666	4,197	95	1,397	71
Kilifi	12,735	1.29	48	2,403	31	24.97	102	1,858	80	8,885	10
Kirinyaga	1,494	0.58	23	725	21	26.61	385	1,261	95	693	53
Kisii	1,323	1.28	43	713	38	22.63	971	555	92	602	75
Kisumu	2,680	1.10	35	1,718	38	22.63	412	1,556	92	0	67
Kitui	30,660	1.13	51	734	46	26.71	37	648	89	0	44
Kwale	8,437	0.74	60	1,325	31	14.57	88	1,783	80	6,622	23
Laikipia	9,589	0.47	40	959	42	30.64	49	2,020	85	2,329	78

County	Area (km^2)	Population (est. mil.)	% Poor, WDI	GDP Mil US$ Mil 2015 Est.	% Population with Unimproved Water Source	Average Length x Dryness of Droughts 1901–2008	Population Density (pers/sq km)	GDP/Cap 2015 US$	Women Who Are Literate (%)	Biodiversity Hot Spot Area (km^2)	Less Favored Agricultural Land (% of total area)
Lamu	6,764	0.12	28	133	31	24.43	17	1,151	80	5,936	3
Machakos	6,073	1.21	38	2,565	46	27.65	200	2,115	89	0	57
Makueni	8,232	1.00	52	658	46	28.24	121	659	89	0	43
Mandera	25,943	1.70	71	212	48	34.29	66	124	24	25,944	90
Marsabit	76,284	0.32	61	202	46	32.05	4	622	89	4,567	52
Meru	7,033	1.53	26	1,687	46	28.52	217	1,105	89	2,562	60
Migori	3,220	1.04	45	642	38	22.63	324	615	92	7	67
Mombasa	269	1.03	29	2,982	31	15.52	3,833	2,889	80	252	0
Murang'a	2,544	1.03	28	2,157	21	26.61	404	2,098	95	966	52
Nairobi	716	3.95	19	12,899	3	28.24	5,510	3,267	97	0	50
Nakuru	7,525	1.96	29	5,051	42	25.73	260	2,581	85	3,093	69
Nandi	2,851	0.94	33	440	42	22.63	328	470	85	1,579	35
Narok	18,137	1.09	37	776	42	23.46	60	710	85	9,047	55
Nyamira	902	0.68	44	359	38	22.63	755	528	92	822	67
Nyandarua	3,288	0.65	34	427	21	28.34	199	651	95	3,187	68
Nyeri	3,357	0.74	24	2,622	21	27.74	221	3,527	95	2,565	47
Samburu	21,103	0.27	60	150	42	31.84	13	553	85	1,863	65
Siaya	3,519	0.97	32	501	38	22.63	275	518	92	0	37
Taita Taveta	17,281	0.34	46	481	31	24.78	20	1,405	80	481	54
Tana River	39,480	0.33	66	200	31	26.53	8	600	80	5,459	79
Tharaka-Nithi	2,586	0.40	35	319	46	26.61	153	804	89	258	45

County	Area (km^2)	Population (est. mil.)	% Poor, WDI	GDP Mil US$ Mil 2015 Est.	% Population with Unimproved Water Source	Average Length x Dryness of Droughts 1901–2008	Population Density (pers/sq km)	GDP/Cap 2015 US$	Women Who Are Literate (%)	Biodiversity Hot Spot Area (km^2)	Less Favored Agricultural Land (% of total area)
Trans Nzoia	2,482	0.99	34	654	42	22.99	398	663	85	684	41
Turkana	64,148	1.01	75	595	42	29.03	16	590	85	122	48
Uasin Gishu	3,452	1.12	31	1,267	42	22.71	325	1,131	85	3,111	13
Vihiga	562	0.63	34	414	24	22.63	1,117	660	90	0	83
Wajir	57,015	1.11	73	355	48	35.13	20	319	24	44,050	97
West Pokot	9,576	0.65	60	313	42	25.32	1	484	85	2,138	0.89
Total Kenya	589,914	46		63,334						183,569	
Average Kenya			42		37	26	439	1,159	84		54
Total NNEs	293,143	5		2,197						109,994	
Average NNEs			63		46	32	22	560	56		73
Total Coast	84,699	3		4,543						27,382	
Average Coast			50		31	23	47	1,359	80		34

Source: World Bank staff estimates provided by the Hidden Dimension of Poverty team, 2017.

Note: Yellow highlights = North and Northeast counties; Blue highlights = Coast counties.

ANNEX 4

Escaping Poverty in Rural Kenya

This table summarizes the key findings of a study on the transitional nature of poverty in rural Kenya.[374] The study sought to understand why some routes out of poverty only offer a temporary (transitional) escape rather than a permanent (sustained) one.

ANNEX TABLE 26. Why some escape routes from poverty are more viable than others

Household resource base	● Accumulating land and livestock no longer a viable escape strategy for the majority.
	● Livestock is an important store of wealth, but the cost of feed, lack of veterinary services, and insecurity pose restrictions on rearing livestock.
	● Land is a valued asset, but over time land holdings are reducing and so land and agricultural activities provide less opportunity to escape poverty.
Household attributes and capacities	● Larger households fare better in in both avoiding and permanently escaping poverty. But household composition is an important factor—those with high dependency ratios are more likely to experience a transitory escape or fall into poverty than have a sustained escape from poverty.
	● Life cycle factors are important. Periods of lower well-being tend to be when families are paying for school fees or headed by an older person.
	● Households where the head is more educated are significantly more likely to experience a transitory poverty escape than a permanent one. Perhaps because formal education does not provide skills required in the labor market.
	● Female headed households are significantly more likely to experience a transitory escape than to have a sustained escape from poverty.
Household activities	● Households cultivating large land areas with crops are more likely to become impoverished or to experience a transitory escape than a sustained escape. This may be due to the production and market risks of cropping.
	● Households with more agricultural assets and near to water supplies are more likely to make a sustained escape from poverty. This suggests preconditions beyond land are necessary for agriculture to provide a sustained escape.
	● Households involved in a business are more likely to experience a transitory escape rather than a sustained escape from poverty. Perhaps due to the low profitability of petty trading, along with risks of business activities.
	● There is not necessarily a significant relationship between salaried employment and sustained poverty escapes. This is possibly due to 'salaried' work spanning both formal and informal sectors. Nevertheless, long-term, formal sector salaried employment remains the surest route to a sustained escape from poverty.

374 Scott et al. 2018. *Resilience and Sustainable Poverty Escapes in Rural Kenya.*

Household shocks	● Rain-fed agriculture is risky. Farmers do adapt to mitigate weather risks, but different strategies will be needed in the future as rainfall becomes more unreliable due to climate change.
	● Health-related shocks are frequently the most severe. They directly impact on both household well-being and finances, draining resources from both.
	● Crime shocks can lead to transitory periods of poverty. There is some evidence that female-headed households are more exposed to this type of shock.
Household strategies for sustained poverty escapes	● Agriculture (crops and livestock) can maintain a household's situation over time and lead to small improvements. However, agriculture on its own is insufficient to lead to sustained poverty escapes.
	● Migration of men to urban centers for work, leaving behind their families, and the associated remittances are the most prevalent strategy for a sustained escape.
	● Education, and the migration of adult children to urban centers are viewed as strategies to ensure well-being gains are protected in old age. However, this can place families into intergenerational cycles of poverty.

ANNEX 5

International and Multilateral Climate Projects (since 2012)

ANNEX TABLE 27. International and multilateral climate projects[375]

Name of Project	Fund	Amount of Funding Approved (US$ millions)	Disbursed (US$ millions)	Dates
Climate Resilient Agricultural Livelihoods Programme (KCEP—CRAL)	Adaptation for Smallholder Agriculture Programme (ASAP)	10	0.40	2015
RLACC—Rural Livelihoods' Adaptation to Climate Change in the Horn of Africa (PROGRAM)	Special Climate Change Fund (SCCF)	10	2.6	2016
Building Resilience to Climate Change & Adaptive Capacity of Vulnerable Communities	Adaptation Fund (AF)	10	5	2014–2019
Concessional Finance Program for Geothermal Generation	Clean Technology Fund	30		2016
Energy Modernisation Project	Scaling Up Renewable Energy Program for Low Income Countries (SREP)	7.5		2015
Sustainable Conversion of Waste into Clean Energy for GHG Emission Reduction	Global Environment Facility (GEF5)	2	2	2013
Menengai Geothermal Development (AfDB)	Scaling Up Renewable Energy Program for Low Income Countries (SREP)	25	12.68	2011 (active)
Kenya: Off-grid solar access project for underserved countries	World Bank	150		2017
Climate-smart agriculture project	World Bank	250		2017

375 MFA. 2018. *Climate Change Profile—Kenya. Ministry of Foreign Affairs.* https://www.government.nl/binaries/government/documents/publications/2019/02/05/climate-change-profiles/Kenya.pdf

Name of Project	Fund	Amount of Funding Approved (US$ millions)	Disbursed (US$ millions)	Dates
Promoting biogas as sustainable clean cooking fuel for rural households in Kenya	World Bank	4.6		2016
Kenya Climate Venture Facility	World Bank	4.9		2015
Kenya water security and climate resilience project	World Bank	155		2013
Additional financing water security and climate resilience project	World Bank	58		2013
Coastal Region Water security and climate resilience project	World Bank	200		2014

Source: MFA. 2018.

ANNEX 6

Key Interview Questions and Discussion Points

The team developed a master checklist of issues from which the key informant interview questions and focus group discussion issues were drawn. The master list was classified broadly to incorporate all terms of reference (TOR) tasks for the assessment:

1. Review Kenya's environmental and natural resource management (ENRM) issues, threats, and challenges.
2. Assess national- and county-level development plans and strategies and their NRM implications.
3. Review methods adopted by national and county governments to integrate ENR issues in current national development agendas and strategies, such as Vision 2030.
4. Review governmental capacity to integrate green initiatives in planning and development processes.
5. Perform institutional analysis pertaining to environment and natural resources (ENR).
6. Assess government's capacity to proactively plan and implement programs.
7. Examine how to address nationwide ENR issues.
8. Measure how counties prioritize and implement ENRM activities.
9. Assess budgets being allocated from national treasury and county governments to support ENR priorities.
10. Monitor existing channels of horizontal and vertical communication and dialogue.
11. Identify channels of inter- and intra-public agency cooperation concerning ENR.
12. Assess the national government's capacity to enhance partnership with private players.
13. Identify weaknesses in public financing of green programs; make recommendations to fill capacity gaps at key public-sector agencies.
14. Report on the efficacy of data- and information-sharing with the public.
15. Explore development partners' ongoing and planned ENR support activities.
16. Review how climate change is being addressed at the national and county levels.
17. Question how counties are dealing with liquid and solid waste management.
18. View the level of involvement of private sector players in managing and conserving and regenerating ENRs.

ANNEX 7

Data Collection

Data were collected from existing bodies of knowledge. Sources included policies and laws for both national and devolved units; County Integrated Development Plans (CIDPs); annual reports for NGOs involved in conservation issues; statistical abstracts; Economic Survey reports; Vision 2030; and National Environment Management Authority (NEMA) reports.

Field interviews were conducted with various national government and county-level institutions. These included the Ministry of Environment, Water and Natural Resources (MENR); Kenya Meteorological Agency; Kenya Forest Service (KFS); Kenya Wildlife Service (KWS); NEMA; National Environment Trust Fund (NETFUND); University of Nairobi (UON); Kenya Public Policy Research and Analysis (KIPPRA); Ministry of Water; Ministry of Livestock; Ministry of Lands; Ministry of Agriculture, Livestock and Fisheries; Kenya Agricultural and Livestock Research Organization (KALRO); Council of Governors Secretariat; and visits to the 47 county governments across the country.

The team also visited multiple development partners, among them civil society organizations (CSOs) and the private sector. These partners include the East African Wildlife Society (EAWS); Kenya Forest Working Group (KFWG); Environmental Resources Management Centre for Sustainable Development (ERMCSD); Climate Change Agriculture and Food Security (CCAFS) of the Consultative Group of International Agricultural Research (CGIAR); United Nations Development Programme (UNDP); United Nations Environment Programme (UNEP); Wangari Maathai Institute for Peace and Environmental Studies (WMI); Danish International Development Agency (DANIDA); Kenya Wetlands Working Group (KWWG); Kenya Association of Manufacturers (KAM); Kenya Private Sector Alliance (KEPSA); Green Africa Foundation (KAF); and the Clean Production Centre (CPC); Kenya's 47 counties; the Ministry of Environment and Natural Resources (MENR) and its affiliate agencies, Ministry of Agriculture, Ministry of Lands, Ministry of Livestock, Ministry of Water; and academic and research institutions and were interviewed.

Focus group discussions (FGDs) were run with a range of important stakeholders. These included members of county departments of environment, water, and natural resources; and departmental heads of the ministry of environment and affiliated agencies; civic organizations and development partners were designed to garner necessary information through structured discussions and consensus.

The findings of these various data collection exercises are summarized in Annex Table 28.

ANNEX TABLE 28. An analysis on what is happening in ENR in Kenya

ENR Problem and Overall Opinion	Main Causes	Main Effects
Land subsystem (%)		
Solid waste management ES = 56% VS = 40%	Lack of a system for solid waste management Lack of designated sites for disposal High rates of urbanization	Environmental health impacts Acting as a breeding ground for vectors and pests Blocking waterways Reducing aesthetic value of land
Sewage management ES = 37% VS = 46%	Heavy capital investment for a sewerage system Unplanned urbanization High rates of urbanization	Pollution of water bodies Diseases like cholera
Quarrying ES = 4% VS = 23%	High demand for construction materials Lack of alternative livelihood sources	Land degradation Open holes with water act as security threats to children
Land slides ES = 0% VS = 10%	High rainfall Sloppy land Poor drainage	Destruction of property including crops Blocking of roads and waterways
Land degradation and soil erosion ES = 11% VS = 58%	High rainfall Lack of terracing Forest degradation Overstocking/overgrazing	Reduced soil fertility Low crop productivity Food insecurity
Drought ES = 0% VS = 10%	Climate change	Destruction of crops and property Waterborne diseases
Forest subsystem		
Illegal logging ES = 0% VS = 10%	High demand for timber Poor enforcement of forest rules	Deforestation Loss of biodiversity Low carbon sequestration capacity Soil erosion
Encroachment of forests (for farming and settlement) ES = 0% VS = 19%	Landlessness Declining soil fertility Poor enforcement of forest rules Political pressure	Deforestation Loss of biodiversity Low carbon sequestration capacity Soil erosion
Illegal extraction of forest products ES = 0% VS = 23%	Lack of affordable alternative source of income Poor enforcement of forest rules	Deforestation Low carbon sequestration capacity Soil erosion
Forest fires ES = 0% VS = 35%	Charcoal burning Deliberate burning of forests	Deforestation Invasive species Loss of biodiversity

ENR Problem and Overall Opinion	Main Causes	Main Effects
Forest subsystem		
Charcoal production ES = 0% VS = 35%	Poverty Poor enforcement of forest rules High demand for charcoal	Deforestation and loss of biodiversity Low carbon sequestration capacity Soil erosion Air pollution
Wetlands subsystem		
Encroachment of river banks (for farming) ES = 2% VS = 77%	Population pressure Land subdivision Declining soil fertility	Siltation of rivers Floods
Sand harvesting ES = 0% VS = 11%	Poverty High demand for construction material	Degraded river water beds Low water holding capacity
Water pollution ES = 0% VS = 19%	Poor disposal of agrochemicals Poor sewage management	Waterborne diseases
Flooding ES = 0% VS = 0%	Climate change Blocking of waterways	Destruction of crops and property Waterborne diseases
Wildlife		
Poaching ES = 0% VS = 12%	High demand for trophies and rhinoceros horns High demand for game meat	Reduction in wildlife population Reduction of revenues from tourism
Human-wildlife conflict ES = 0% VS = 14%	Lack of involving communities in comanagement of wildlife Lack of involving communities in sharing benefits from wildlife resources Human attacks by wildlife animals Damage of crops by wildlife animals	Loss of life Destruction of crops and property

Source: M'Mboyi. 2016.[376]

Note: ES = extremely severe; VS = very severe.

376 M'Mboyi. 2016. *Kenya Country Environmental Analysis [unpublished draft].*


TERRAFRICA
REGIONAL SUSTAINABLE LAND MANAGEMENT


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