Climate Change Action in the Water Sector in Kenya: Status Review

On the Road to Implementing Kenya's NDC

November 2021

GNI plus
THE GLOBAL NDC IMPLEMENTATION PARTNERS

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ACKNOWLEDGMENTS

AUTHORS

This report was funded by International Climate Initiative (IKI) and was developed by AECOM under the Global NDC Implementation Partners (GNI^{plus}) project for the Ministry of Environment and Forestry, Government of Kenya. It was authored by Lillian Kipchumba and Emily Le Cornu, with contributions from Michael Oluku, Jonathan Schroder and Benjamin Fredlund.

The authors would like to thank and acknowledge the inputs from Renard Teipelke, Jane Sladen, Jon Robinson and Eoin Harris for their advice and internal review. As well as Sarah McFadden for the design of the report.

The authors worked in close collaboration with the other partners of GNI^{plus} who also contributed to sections in or reviewed this report: Climate Policy Initiative, Pollination, and Ricardo Energy and Environment. As well as a Clarice Wambua from Kieti Advocates who undertook the legal and policy analysis.

We are grateful for guidance received during the stakeholder consultation phase and the external reviews that were undertaken from March to May 2021 that helped shape the end publication: Joseph Keter (Ministry of Water, Sanitation and Irrigation), Chrispine Juma (Ministry of Water, Sanitation and Irrigation), Eng. Samuel Gichane (Ministry of Water, Sanitation and Irrigation), Gibson Kiragu (Ministry of Water, Sanitation and Irrigation), Teresia Mucia (Ministry of Water, Sanitation and Irrigation), Dr. Mary Morara (Ministry of Water, Sanitation and Irrigation), Daniel Kihara Mutune (Ministry of Water, Sanitation and Irrigation), Jairus Serede (National Irrigation Authority) Fred Nyongesa (Water Resources Authority), Dr Caroline Ouko (Centre for Training and integrated Research in ASAL Development), Ann Nabangala (Water Sector Trust Fund), Rose Akombo (Kenya Forest Service), Haji Massa (Coast Water Works Development Agency), Ibrahim Oluoch (Lake Victoria North Water Works Development Agency), Leonard Akwany (Conservation International), Simon Thuo (The Nature Conservancy), Andrew Amadi (World Bank), James Origa Otieno (World Bank), Raji Rajan (Gatsby Africa), Joseph Murabula (KIFFWA), Elizabeth Wanja (Kenya Climate Change Working Group), Tom Owino (Climate Care), Suresh Patel (Elekea Ltd and Vice Chairman of KAM Environment Committee), Akshay Shah (KAM member and Director Silafrica Ltd) Mary Ngechu (Plast Packaging Ltd and KAM member), and Georgina Wachuka (KAM).

Report citation:

AECOM (2021) Climate Change Action in the Water Sector in Kenya: Status Review

Cover photo
Adobe Stock | *Brother pumping water for his sister, Kenya*

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GNI^{plus} combines the strengths of three world-leading organisations – Climate Policy Initiative, AECOM, and Pollination. It provides governments with the best available policy, technical, financial, governance, and legal expertise to support the implementation of their NDCs. GNI^{plus} also supports governments as they work to mobilise private investment and create long-term, sustainable growth and development.

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Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

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EXECUTIVE SUMMARY

The climate is changing and will continue to change affecting many aspects of human society and the natural world. Climate change is impacting global water resources by affecting their availability, quantity and quality for human and wildlife use. These impacts are further exacerbated by a variety of anthropogenic factors including the mismanagement of water regulation and withdrawal systems, surface and ground water contamination, as well as land-use changes. Hydrological changes induced by climate change will result in major risks for society both directly and indirectly, impacting economic development, food security, energy production and exacerbating social inequality. Currently, around one million plants and animal species are facing extinction. Freshwater species have suffered the greatest decline, falling by 84% since 1970. Humans are also affected: around four billion people currently experience severe water scarcity for at least one month per year, a situation that has been worsened by the climate change crisis. Climate change also generates additional risks to water-related infrastructure such as damaged sanitation systems and sewer pumping stations causing severe health hazards.

Climate change projections on water resources indicate that most African countries, including Kenya, will suffer from water scarcity. Water scarcity is also caused and aggravated by population densities, increasing urbanisation and manufacturing. In Kenya, the impacts of climate change on water resources have affected nearly all sectors including, among others, agriculture through unpredictable rainfall patterns, human health through water-borne diseases during flooding, as well as trade through destruction of road and telecommunication infrastructure. Therefore, investment is needed for new water infrastructure and for the maintenance and upgrading of existing infrastructure to improve their efficiency and climate resilience. Furthermore, various water-related climate change investments can provide co-benefits such as job creation, improved public health, reduced poverty, and enhanced livelihoods. Water can also support efforts to mitigate climate change through sequestering carbon in biomass and soils.

Although water is not mentioned in the Paris Agreement, it is a vital component in addressing nearly all climate change adaptation and mitigation strategies. Water is also essential in achieving most of the 2030 Agenda for Sustainable Development such as the Sustainable Development Goals (SDGs) 5 (human rights), 6 (water and sanitation for all), 14 (life below water), and 15 (life on land).

The purpose of this report is to address the linkage between water and climate change in Kenya and provide stakeholders responsible for delivering the Nationally Determined Contribution (NDC) and associated climate change actions in the country with a broad overview of the sector to aid informed decision-making across different sub-topics of the sector. The Government of Kenya is responsible for leading climate mitigation and adaptation measures and governance in the sector. However, the process of bringing about change is multifaceted, and is evidenced by the active involvement of the youth both internationally and in Kenya, private companies' commitments to reducing their water footprint and greenhouse gas emissions and the active involvement of non-governmental organisations (NGOs) in water conservation and advocacy.

The first five chapters of this report provide information on the country background and the water situation in Kenya by analysing the current and future surface and groundwater demand and supply from the major water catchments as presented in the National Water Masterplan 2030. The legal and institutional framework governing the water sector is also discussed, as are climate change impacts and climate finance flows in the sector.

As highlighted in Chapter 6, Kenya – like any other developing country – faces challenges, barriers and threats to water supply and conservation due to population pressure and industrialisation. The barriers were sourced from reviewing publicly available information and engaging with stakeholders active in the water sector in Kenya. Chapter 7 provides recommendations to the challenges identified and possible investment opportunities in the sector. Chapter 8 illustrates the Way Forward through capacity building and illustrates roadmaps of priority projects in the water sector**.** Chapters 9 and 10 conclude in identifying additional activities, such as capacity building topics, measures for effective stakeholder engagement and suggestions for incentives, regulations and enforcement as possible options for a "way forward" to support the successful implementation of Kenya's NDC and the National Climate Change Action Plan 2018-2022. The report was developed with the support of stakeholders from various government agencies, the private sector and NGOs, sharing expert knowledge and lessons learned to highlight tangible steps and support initiatives to progress in the water sector in Kenya.

Photo by Adobe Stock | Uhuru Park And Nairobi Skyline, Kenya

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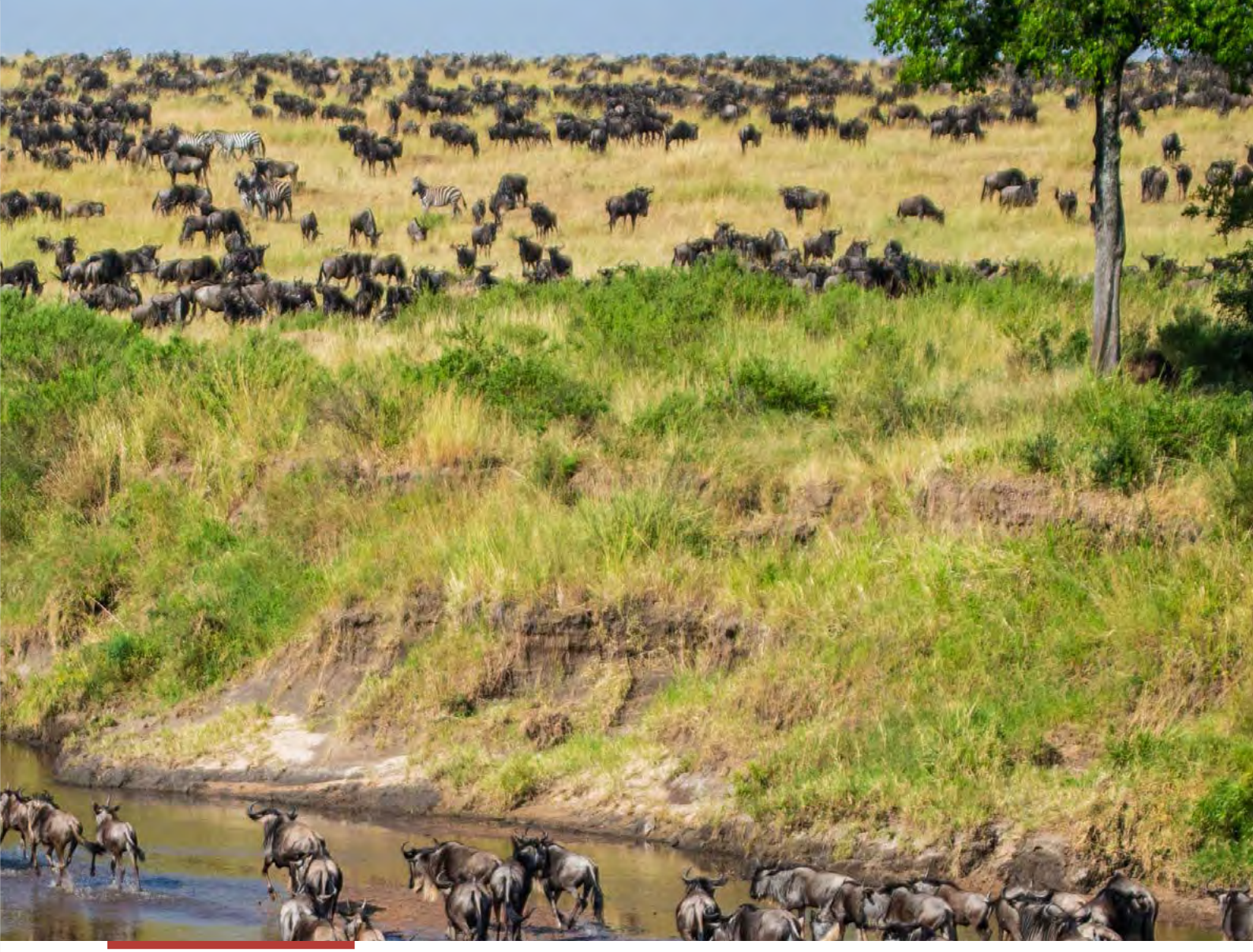
LIST OF ACRONYMS

AfDB	African Development Bank
AFIPEK	Kenya Fish Processors and Exporters Association
AISWAG	Agriculture and Irrigation Sector Working Group
ASAL	Arid and Semi-Arid Land
ASDS	Agricultural Sector Development Strategy
ATAR	Adaptation Technical Analysis Report
AWS	Alliance for Water Stewardship
BMZ	German Federal Ministry for Economic Cooperation and Development
CCCF	County Climate Change Fund
CCD	Climate Change Directorate
CDM	Clean Development Mechanism
CIDP	County Integrated Development Plan
CIS	Climate Information Service
CSO	Civil Society Organisation
Danida	Danish International Development Agency
DFI	Development Finance Institution
DFID	Department for International Development
EIA	Environmental Impact Assessment
ENNCA	Ewaso Ng'iro North Catchment Area
EU	European Union
FAO	Food and Agriculture Organisation of the United Nations
GCM	General Circular Model
GDP	Gross Domestic Produce
GEF	Global Environment Facility
GIZ	Gesellschaft für Internationale Zusammenarbeit
GoK	Government of Kenya
ICRAF	World Agroforestry Centre
IPCC	International Panel on Climate Change
IWaSP	International Water Stewardship Programme
IWRM	Integrated Water Resources Management
JICA	Japan International Cooperation Agency
KAM	Kenya Association of Manufacturers
KEWASNET	Kenya Water and Sanitation Network
KEWI	Kenya Water Institute
KFS	Kenya Forest Service
KIFFWA	Kenya Innovative Finance Facility for Water
KIWA	Kenya Industrial Water Alliance
KIWASCO	Kisumu Water and Sewerage Company
KIWASH	Kenya Integrated Water Sanitation and Hygiene
KNBS	Kenya National Bureau
KPA	Kenya Ports Authority
KPWF	Kenya Pooled Water Fund
KSH	Kenya Shilling
KTSWSSP	Kenya Towns Sustainable Water Supply and Sanitation Program
KWIA	Kenya Water Industry Association
KWSP	Kenya Water and Sanitation Programme
KWTA	Kenya Water Towers Agency
LVNCA	Lake Victoria North Catchment Area
LVSCA	Lake Victoria South Catchment Area
M&E	Monitoring and Evaluation
MCM	Million Cubic Metres
MENR	Ministry of Environment and Natural Resources
MoEF	Ministry of Environment and Forestry
MRV	Monitoring Reporting and Verification
MTP	Medium Term Plan
MWS&I	Ministry of Water Sanitation and Irrigation

NAP	National Adaptation Plan
NAWASSCO	Nakuru Water and Sewerage Services Company
NBI	Nile Basin Initiative
NCCAP	National Climate Change Action Plan
NDC	Nationally Determined Contribution
NDMA	National Drought Management Agency
NEMA	National Environmental Management Authority
NRW	Non-Revenue Water
NWMP	National Water Masterplan
RCGW	Regional Centre on Ground Water Resources
REDD	Reduce Emissions from Deforestations and Forest Degradation
RVCA	Rift Valley Catchment Area
SAGA	Semi-Autonomous Government Agency
SDG	Sustainable Development Goal
SEI	Stockholm Environment Institute
SIDA	Swedish International Development Cooperation
SNV	Netherlands Development Organisation
SWP	Sustainable Water Partnership
TCA	Tana Catchment Area
TNC	The Nature Conservancy
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
WARMA	Water Resources Management Authority
WASH	Water Sanitation and Hygiene
WASPA	Water Service Providers Association
WASREB	Water Service and Regulatory Board
WFN	Water Footprint Network
WRA	Water Resource Authority
WRUA	Water Resource Users Association
WSP	Water Service Provider
WSRB	Water Sector Regulatory Board
WSRP	Water Sector Reforms Programme
WSTF	Water Sector Trust Fund
WWDA	Water Works Development Agency

Photo by ADOBE STOCK | Herd of Wilderbeast and Zebra Savanna National Park Maasai Mara



1. Introduction

1. INTRODUCTION

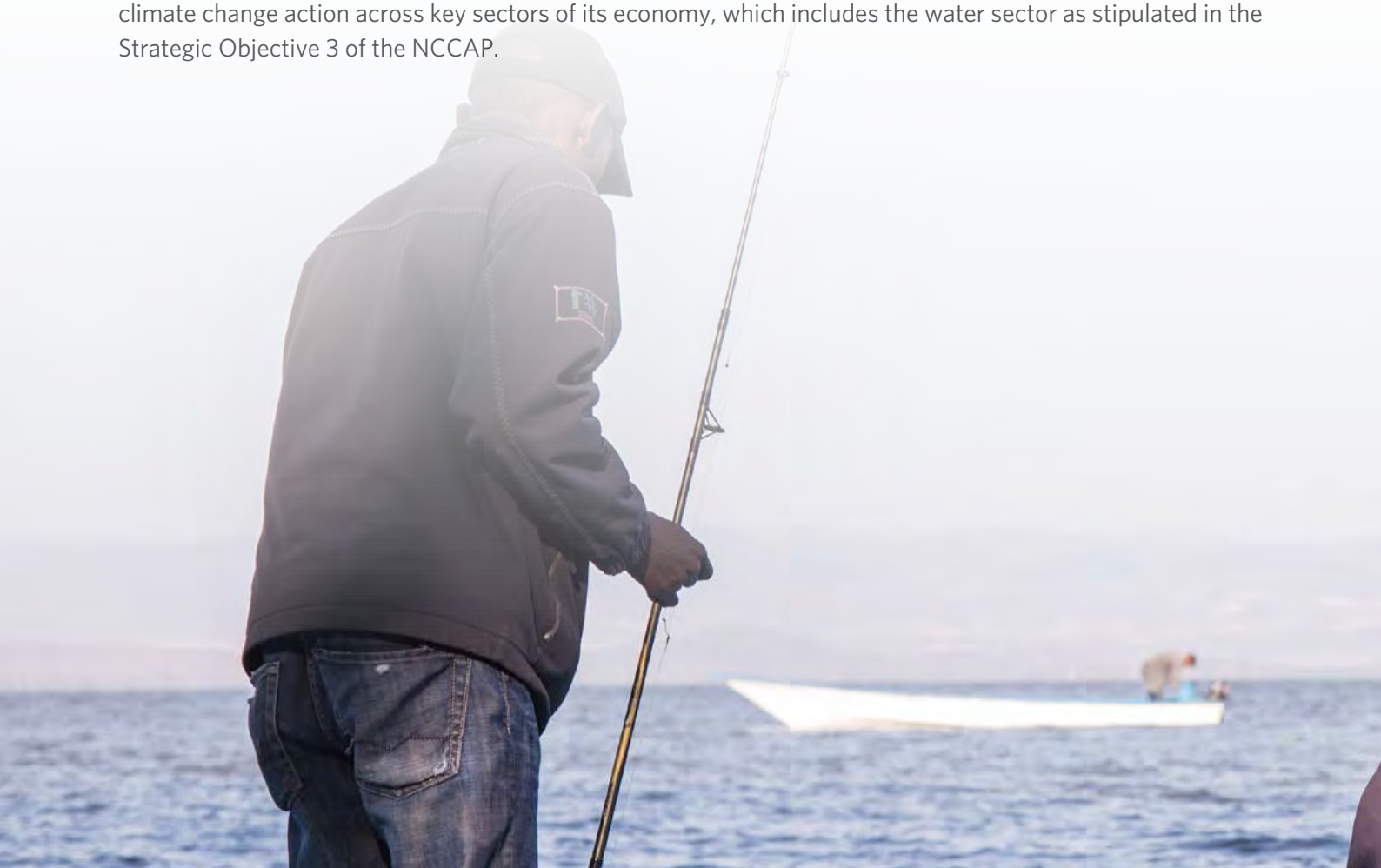
1.1. ABOUT THIS REPORT

Freshwater, in enough quantity and quality, is essential for all aspects of life and sustainable development. Water resources are embedded in all forms of development including food security, health and poverty reduction. Freshwater sustains economic growth through increased agriculture production, industry and energy generation and in maintaining healthy ecosystems. The adverse impacts of climate change on water resources experienced annually in Kenya, such as the severe floods and droughts in both rural and urban areas, necessitate urgent climate actions by all.

In 2015, the Government of Kenya signed the Paris Agreement which provides member states with a framework for reducing their greenhouse gas emissions to 1.5 degrees Celsius compared to pre-industrial levels. The Intended Nationally Determined Contribution became the Nationally Determined Contribution (NDC) when Kenya ratified the Paris Agreement in 2016. Kenya's updated NDC (2020) includes mitigation and adaptation contributions to the Paris Agreement. Water and sanitation are among the priority adaption actions, with the Government committing to:

- Conduct and implement recommendations on climate risk assessments on water, sanitation and irrigation.
- Build resilience infrastructure for the protection of dams, dykes and river lines.
- Promote water harvesting and storage at county and household levels.
- Mainstream climate change into water catchment management plans.

All the priority actions in the NDC are being implemented through the National Climate Change Action Plan (NCCAP). This is a five-year plan initiative and commitment by the Government of Kenya to steer the country's climate change action across key sectors of its economy, which includes the water sector as stipulated in the Strategic Objective 3 of the NCCAP.



The purpose of this report is to provide a status of the water sector in Kenya in light of climate change. It aims to help inform decision-making processes across the Kenyan Government ministries, departments, agencies, as well as non-governmental stakeholders and the private sector, who are responsible for delivering the NDC and associated climate change actions.[1] Given the broad nature of the water sector, this report aims to provide a high-level overview on a range of topics.

- The remainder of this chapter provides a high-level summary country background, highlighting the physical geography, climate conditions, and the political, social and economic background of Kenya.
- Chapter 2 summarises the past, present and future government actions in Kenya, including the development and introduction of policies, regulations, legislations and other initiatives towards the development and management of the water sector.
- Chapter 3 outlines the status of the water sector in Kenya in terms water supply and demand, sanitation, irrigation and storage.
- Chapter 4 then provides an overview of the key climate issues and drivers for climate action in the water sector, as well as the role of climate change in shaping the future of water resources availability and management in Kenya.
- Chapter 5 summarises Kenya's climate finance landscape – identifying the levels of public and private sector climate finance directed towards the sector.
- Chapter 6 reviews the main challenges, barriers and gaps in the water sector that hinder water conservation and management efforts as well as the achievement of universal water access in Kenya, including challenges impacting the irrigation as well as the sanitation sectors.

The report concludes in the final three chapters (Chapter 7, 8 and 9) identifying opportunities and recommendations for the sector, to overcome some of the challenges and barriers discussed previously. It also aims to identify additional activities, such as capacity building topics, measures for effective stakeholder engagement and suggestions for incentives, regulations and enforcement as possible options for a "way forward" to support the successful implementation of Kenya's NDC and the National Climate Change Action Plan 2018-2022.

The findings are based on information gathered through a desk-based review and workshops with relevant stakeholders working in the water sector in Kenya. The workshops took place in the months of April and May 2021.

1 Stakeholders includes: Industry, Water Utilities, Farmers / Individual Water Users, Local/International NGOs, Environmental NGOs, Groundwater Experts, Regional/Local Water Managers and National Water Policy Makers.

Photo by ADOBE STOCK | Boat Fishing, Mombasa Kenya

1.2. COUNTRY BACKGROUND

1.1.1 PHYSICAL GEOGRAPHY

Kenya is located along the equator on the east coast of Africa. It is bordered by Somalia, Ethiopia and South Sudan in the north, Uganda in the west, Tanzania in the South and the Indian Ocean in the east. The territorial area is 582,646 km^2, which is divided into a land area covering 571,416 km^2 (98% of the territorial area) and areas of water bodies totalling 11,230 km^2 (2% of the territorial area) (GOK, 2018a). Lake Victoria and Lake Turkana form the main portion of the inland water surface area (Figure 1-1). Kenya also shares more than half the rivers, lakes and aquifers with neighbouring countries. Water management and use with these countries is based on international principles of transboundary water management, which include: the promotion of cooperation; the establishment of public service institutions around transboundary water; and the adoption of relevant international water laws and principles (MWS&I, 2020a).

Kenya has six major surface water catchments as shown in Figure 1-1. Within these, there are 18 gazetted and 70 non-gazetted water towers[2] in Kenya (KWTA, 2020a). **The five main gazetted water towers provide approximately 75% of Kenya's freshwater resources;** thus, they are of great importance. They include: (KWTA, 2019).

- The Aberdare Ranges: This water tower slopes gradually to the east carrying water to the Tana river and is a catchment area for the Sasuma and Ndakaini dams, which provide most of the water for Nairobi. The Tana river is the largest river in Kenya, supplying water to the Seven Forks hydroelectric power complex, which generates over 55% of Kenya's total electricity output (KWTA, 2020a).
- Mt. Kenya water tower: Rivers which start on Mount Kenya are the tributaries of two large Kenyan rivers: the Tana and the Ewaso Ng'iro rivers. Several rivers flow into the Sagana River which itself is a tributary of the Tana River which joins at the Masinga Reservoir.
- The Cherangani Hills are largely covered by a series of indigenous forest reserves and is the major source of Kerio and Turkwel rivers that empty into Lake Turkana.
- Mt. Elgon water tower forms the upper catchment area for two major rivers, the Nzoia and Turkwel.
- The Mau Forest is the headwater for the Njoro river which drains from its eastern slopes into Lake Nakuru while the Southwest Mau is the primary source of the Sondu river, the river Nyando and the Mara river all which flow into Lake Victoria (UNEP, 2009) (Birdlife International, 2020).

These five water towers, along with the other gazetted and non-gazetted water towers in the country, are subject to various pressures and threats, including legal and illegal logging for both commercial and domestic use of wood and timber, over-grazing, poaching of wildlife, illegal water abstraction and over-abstraction, destruction of riparian area, marijuana and tobacco cultivation, the encroachment of forests for agriculture and inadequate documentation of the natural resources contained in the water catchment areas and climate change threats (KWTA, 2020a).

2 A water tower is an upland area with characteristics to support reception, infiltration, percolation and storage of rainfall and gradually releases it into a drainage basin. Gazetted water towers in Kenya are those that are under the Government's control and are managed by the Kenya Water Towers Agency.

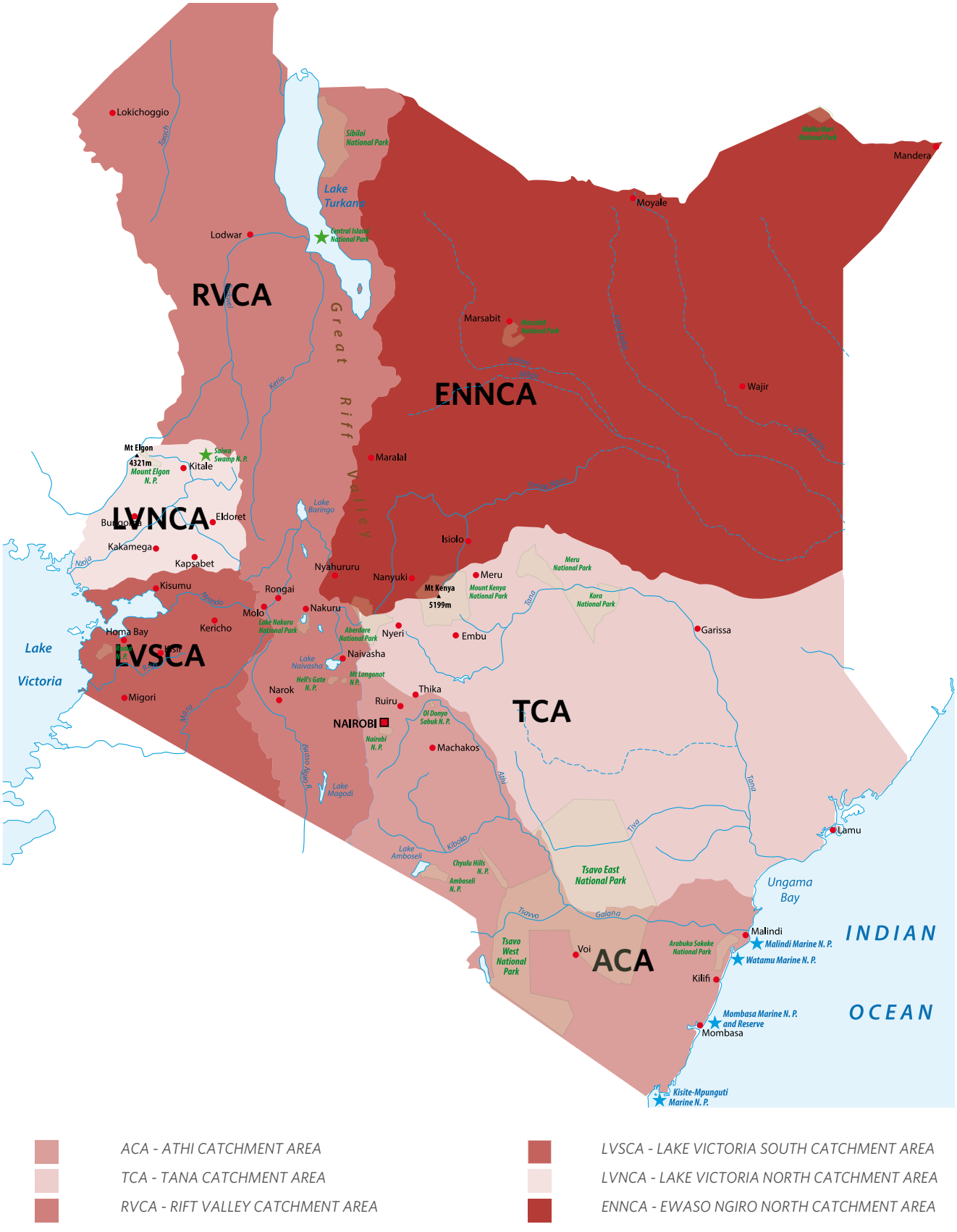
TABLE 1-1. MAJOR WATER CATCHMENT AREAS IN KENYA

Name of catchment area	Population living within the catchment area
Lake Victoria North Catchment Area	6.97 million
Lake Victoria South Catchment Area	7.37 million
Athi Catchment Area	9.20 million
Ewaso Ng'iro North Catchment Area	3.87 million
Rift Valley Catchment Area	4.86 million
Tana Catchment Area	5.73 million

Source: (WASREB, 2013a)

Photo by ADOBE STOCK | Elephants in Tsavo East National Park, Kenya

FIGURE 1-1. MAP OF KENYA OUTLINING THE INLAND WATER BODIES AND THE FIVE MAIN WATER DRAINAGE BASINS



Source: (KNBS, 2020b)

1.1.2 CLIMATIC CONDITIONS IN KENYA

The climate in Kenya is seasonal, controlled by the large-scale pressure systems of the western Indian Ocean and adjacent landmasses; it is typically hot and humid along the coast, temperate in the west and southwest with mountains and plateaus, and hot and dry in the north and east. Historically, Kenya has experienced two seasonal rainfall peaks of long rains in March to May and short rains in October to December. During the other months of the year, although rain may occur locally, they tend to be little. However, changes in rainfall patterns have been observed in recent years.

The climate and weather vary across Kenya depending on the geographic location and topographical features. Annual rainfall across Kenya is highly variable, with different eco-climatic zones (Box 1-1) receiving rainfall ranges of between 200 mm in the arid northern areas and 3,000 mm per year in highland areas (Bharwani , 2011) (DRSRS, 2010), as outlined in Figure 1-2.

BOX 1-1. KENYA ECO-CLIMATIC ZONES

- Kenya is made up of different eco-climatic zones which experience varying climate and weather patterns. In Kenya, the following are present (Ingham, 2020).
- In the very arid/arid areas of the country, the annual average rainfall is between 200 and 600mm and annual temperatures range from 23°C to 34°C.
- Semi-arid areas experience an average annual rainfall of 500 to 1000mm and are slightly cooler in temperature. Both arid and semi-arid areas experience erratic rainfall patterns
- The coastal climatic zone, a band approximately 16 kilometres wide, is humid all year round with an average annual temperature range of 22°C to 30°C and average rainfall level of between 1000 and 1250mm.
- The central and western highlands and parts of the central Rift Valley areas are Kenya's most temperate zones, with annual rainfall levels average between 950 and 3000mm and average annual temperatures ranging between 14°C to 28°C.

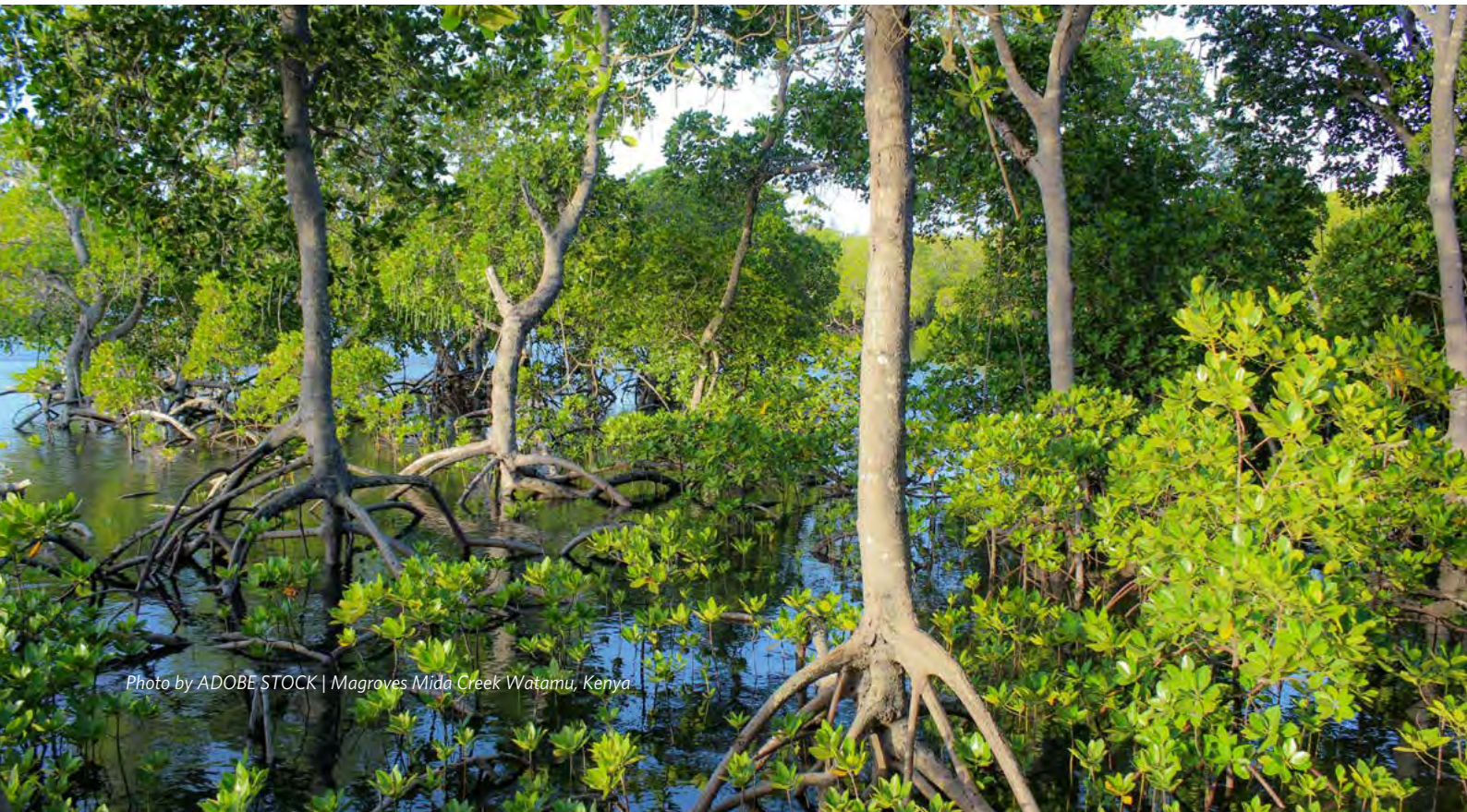
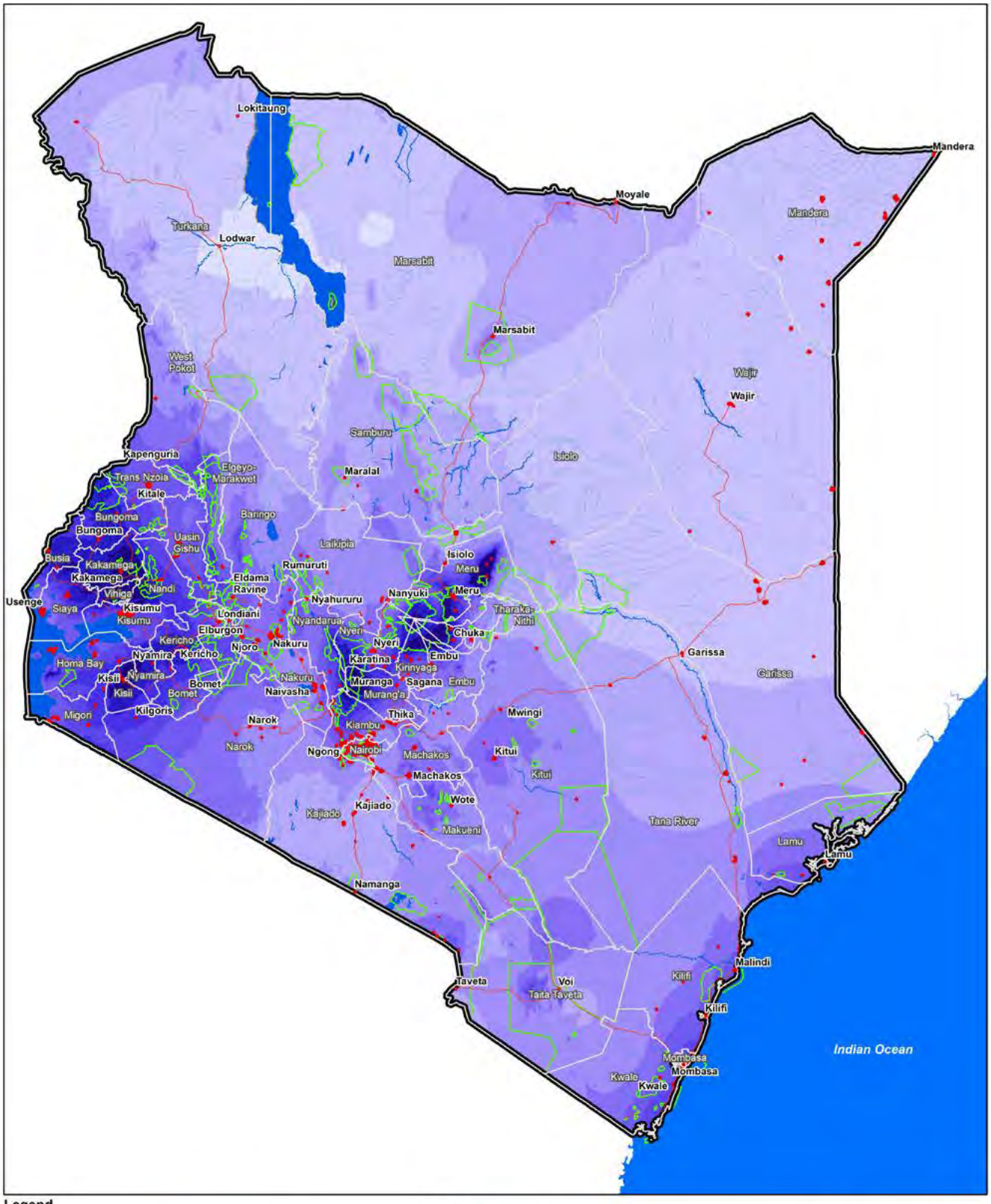


Photo by ADOBE STOCK | Magroves Mida Creek Watamu, Kenya

FIGURE 1-2. ANNUAL RAINFALL DISTRIBUTION IN KENYA



Source: (KNBS, 2020b)

1.1.3 POLITICAL BACKGROUND

The Republic of Kenya has a devolved system of governance and a multi-party-political system. It is run by the National Government and has 47 County Governments. The Parliament of Kenya is a bicameral house consisting of the National Assembly and the Senate. The President is the Head of State and Government and is also Head of the Cabinet and Commander-in-Chief of the Armed Forces. The President is also responsible for appointing the Cabinet Secretaries who are part of the executive branch of Government (GOK, 2010). The Cabinet Secretaries provide advice to the President and serve as the administrative head of their various ministries.

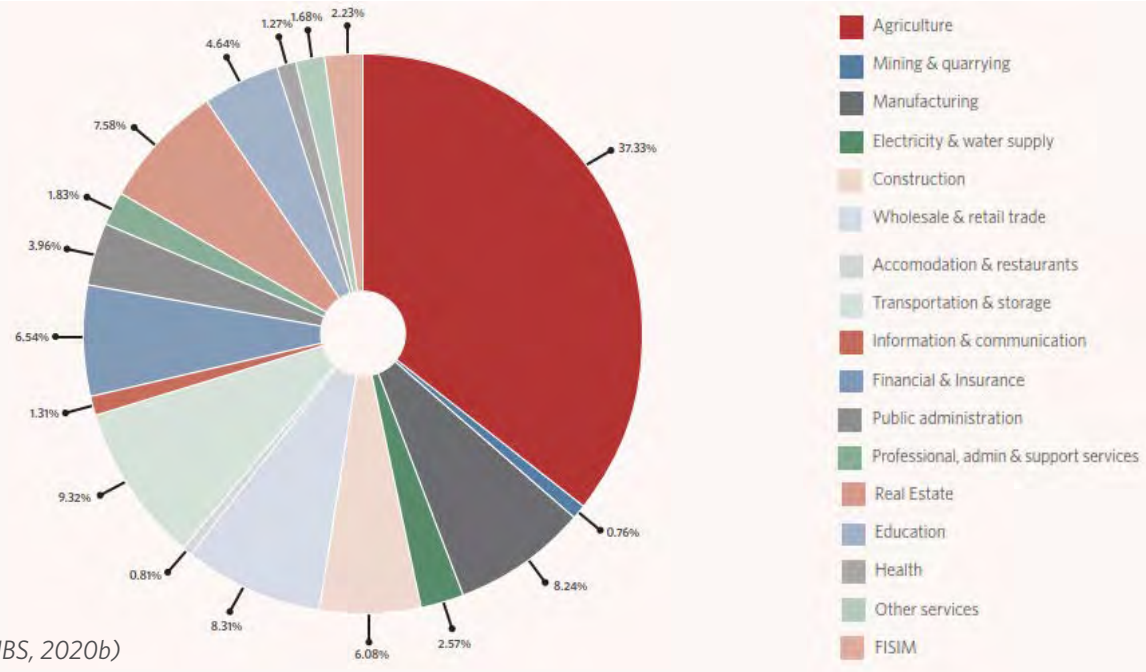
The 2010 Constitution of Kenya saw a devolved system of governance introduced in 2013, with the primary objective being decentralisation of government services, resources and representation down to the county level. It also outlines the roles and responsibilities of both Government functions (GOK, 2010). Further information on the national and county Government responsibilities in the water sector can be found in Section 2.2.

1.1.4 KENYA'S GROSS DOMESTIC PRODUCT AND PER CAPITA INCOME

The Gross Domestic Product (GDP) in Kenya in 2019 was USD95.5 billion, with an average annual growth of 5% over the past six years (World Bank, 2020a). In 2019, agriculture remained the main contributor to Kenya's GDP accounting for slightly over a third of the total value of the economy, as shown in Figure 1-3. The main area of growth recorded in 2019 was explained by service activities, while agriculture, forestry and fishing activities, as well as industry-related activities accounted for 14.1% and 16.3% of the growth, respectively (KNBS, 2020a). Kenya's main exports are coffee, tea, and horticultural crops. The GDP per capita in 2019 was USD 1,237 (Trading Economics, 2020).

However, the COVID-19 pandemic posed unprecedented shocks to the country's economy since cases were first reported in March 2020; the Kenyan economy contracted . The IMF estimated that Kenya grew by -0.1 percent in 2020 relative, to a growth of 5.4 percent in 2019. Key sectors of the economy in particular; tourism, manufacturing and trade were hardest hit, putting people's jobs and livelihoods at risk pushing an estimated two million Kenyans into poverty (World Bank, 2020b) (Onsomu, Munga, & Nyabaro, 2021). According to Onsomu et. al (2021) the ICT sector in Kenya remained resilient throughout the pandemic acting as an important enabler for continued operations across sectors; as did the horticulture and agriculture sector, enabling the Country to remain competitive in the global market.

FIGURE 1-3. GROSS DOMESTIC PRODUCT BY ACTIVITY, CURRENT PRICES IN 2019



Source: (KNBS, 2020b)

1.1.5 SOCIO-CULTURAL BACKGROUND

Kenya is a culturally diverse country; it has 42 tribes with different languages and unique cultures. In the 2019 Population and Housing Census, the total enumerated population was 47.6 million, a 21% increase since 2009, when the population was estimated at 37.7 million. The census showed that most of the population (69%) still reside in rural areas.

The overall national poverty headcount rate declined from 46.8% in 2005/06 to 36.1% in 2015/2016 according to the second Integrated Household Budget Survey released in 2016. The findings also showed that the total absolute population of poor individuals declined from 16.6 million to 16.4 million in 2015/2016. The 2019 census showed that the economically active population was 22.3 million, comprising of working (19.7 million) and those seeking work (2.6 million) (KNBS, 2016). Generally, poverty incidences in Kenya are among the lowest in East Africa and are lower than the Sub-Saharan regional average (World Bank, 2018a).

However, the COVID-19 pandemic severely impacted jobs and income; it is estimated that 42.3% of persons above age 18 lost their jobs by the first week of May 2020. This coincided with the most restrictive containment measures implemented across the county in March through to June 2020. After which, there was evidence of recovery as the number of employed persons increased as restrictions eased (Onsomu, Munga, & Nyabaro, 2021).

1.1.6 THE ECONOMIC VALUE OF WATER

Water provides goods (such as drinking water and irrigation water) and services (e.g. recreation, health and hydroelectricity generation) that are utilised by households, agriculture and industries. **All the key economic sectors in Kenya rely on water resources and related services such as proper sewerage systems to function effectively.** For instance, the agricultural sector, which is Kenya's economic backbone, relies on rainwater and irrigation to produce high yield crops. Water influences the productivity of the floriculture and horticulture industry in Lake Naivasha flower firms as well as coffee, tea, sugarcane and apparel production, all of which are major exports for Kenya. These key export products all require water for production, highlighting the importance of the resource on the country's economy (MoITED, 2020).

Approximately 2% of arable lands in Kenya uses irrigation schemes compared to an average 6% in Sub-Saharan Africa. The low usage of irrigation techniques means Kenya's agriculture is yet to be fully exploited as it is mostly rain-dependant and susceptible to drought shocks. Investing in irrigation and agricultural water management for smallholders can reduce productivity shocks and raise the sector's total factor productivity, potentially climate proofing the sector and increasing the GDP (World Bank, 2019a).

BOX 1-2. CASE STUDY HIGHLIGHTING THE ECONOMIC IMPORTANCE OF WATER – THE MARA RIVER

The Mara River basin, which originates from the south-western Mau Forest, supports some of the most profitable economic activities, including tourism and agriculture, which collectively contribute about 10-15% to the country's GDP (WWF, 2019a) all of which rely on water. If this ecosystem is impacted by reduced water availability, it could have significant impacts on the country's GDP.

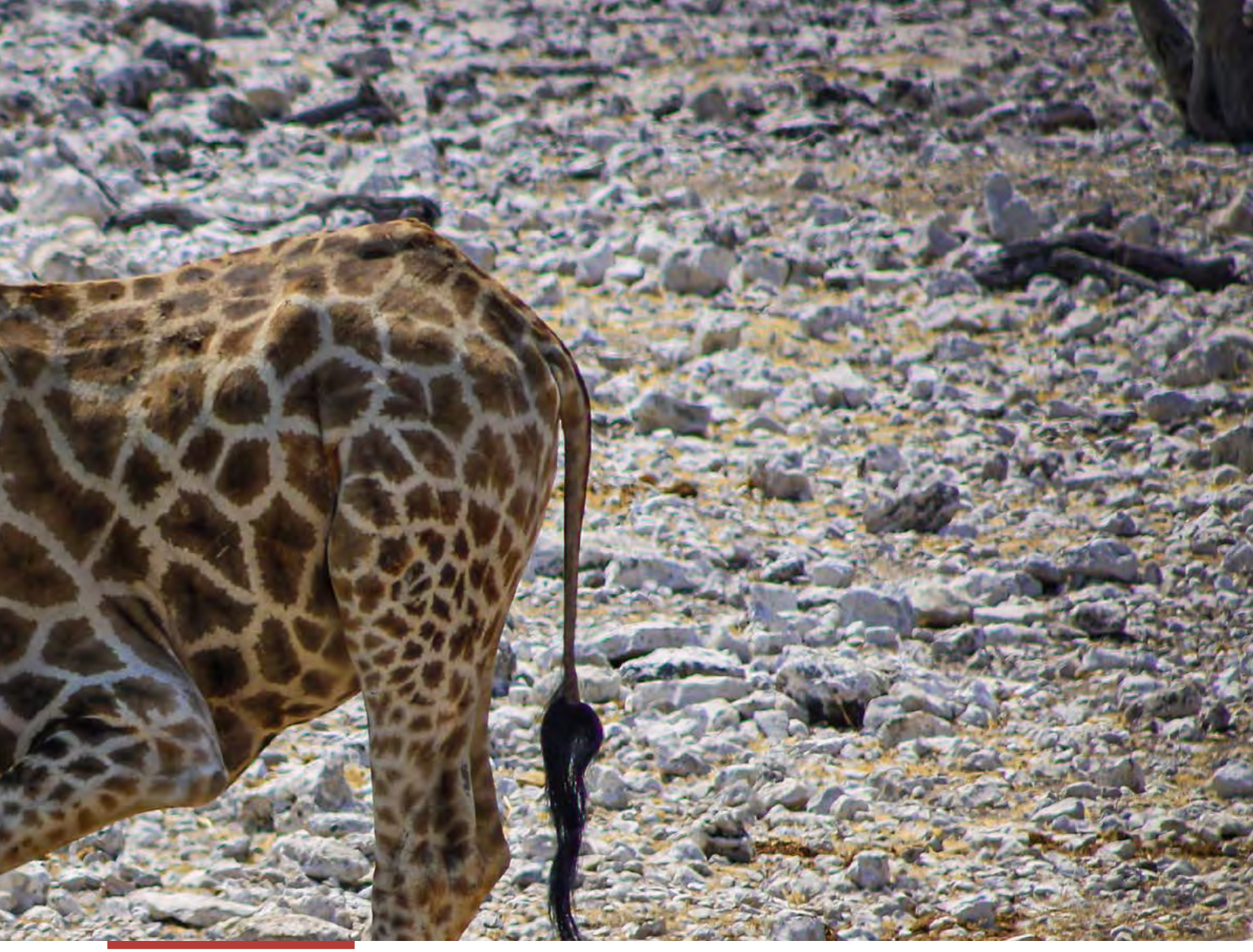
Kenya relies mostly on hydro-electric power supply to support its economy; in 2020, approximately 40% of the country's energy mix was from hydropower (MoE, 2020). The Tana river basin hosts the major hydro-electric power generation plants in Kenya, the Seven Fork Dams project with its five major operating plants: Masinga, Kamburu, Gitaru, Kindaruma and Kiambere. Hydropower is, however, vulnerable to climate change impacts such as severe drought, changes in rainfall and water availability, change in water quality due to pollution and eutrophication which may inhibit socio-economic development of the country. Integrating other renewable energy sources such as wind and solar will help to reduce the climate exposure of high- capacity hydropower schemes.

On the other hand, Kenya is among the top countries in the world and the first in Africa to harness geothermal energy. This clean energy presents a huge potential for the energy sector in Kenya and East Africa which is already being utilised.

FIGURE 1-4. OLKARIA II, GEOTHERMAL PLANT, KENYA

Photo by | Byelikova Oksana - Olkaria II geothermal power plant in Kenya

Photo by Adobe Stock Giraffe drinking at water whole



2. Legal and institutional framework in the water sector in Kenya

2. LEGAL AND INSTITUTIONAL FRAMEWORK IN THE WATER SECTOR IN KENYA

This chapter provides an overview of the legal framework impacting the water sector, summarising the key legislation, policies and strategies developed by the government with a climate change focus.

Providing universal access to water and sanitation for all is a priority of the Government of Kenya under Vision 2030 – the country's development programme from 2008 to 2030 which aims to help transform Kenya into a "newly industrialised, middle-income country providing a high quality of life to all its citizens by 2030 in a clean and secure environment" (GOK, 2007). Water and sanitation are considered one of the enablers of the social pillar of the Vision. Water availability is also key for the country to achieve its Big Four Agenda: Enhancing Manufacturing from 9.2% to 20% by 2022, Food security and nutrition, Universal Health Coverage and Affordable Housing (GoK, 2020b). However, it is recognised that climate change poses significant threats to these ambitions.

The Government of Kenya in its first (2015) and most recent (2020) Nationally Determined Contribution (NDC), places significant emphasis on the need to adapt to the effects of climate change – highlighting water as a key sector. This is further emphasised in the **National Climate Change Action Plan (NCCAP) 2018-2022, where the water and the blue economy are targeted as one of the seven priority areas for the government in terms of addressing climate change mitigation and adaptation issues** (see Appendix A for further information). Mainstreaming climate change into the water sector is also emphasised in the National Water Master Plan 2030 (GOK, 2015) .

2.1. EXISTING LEGISLATION AND POLICIES

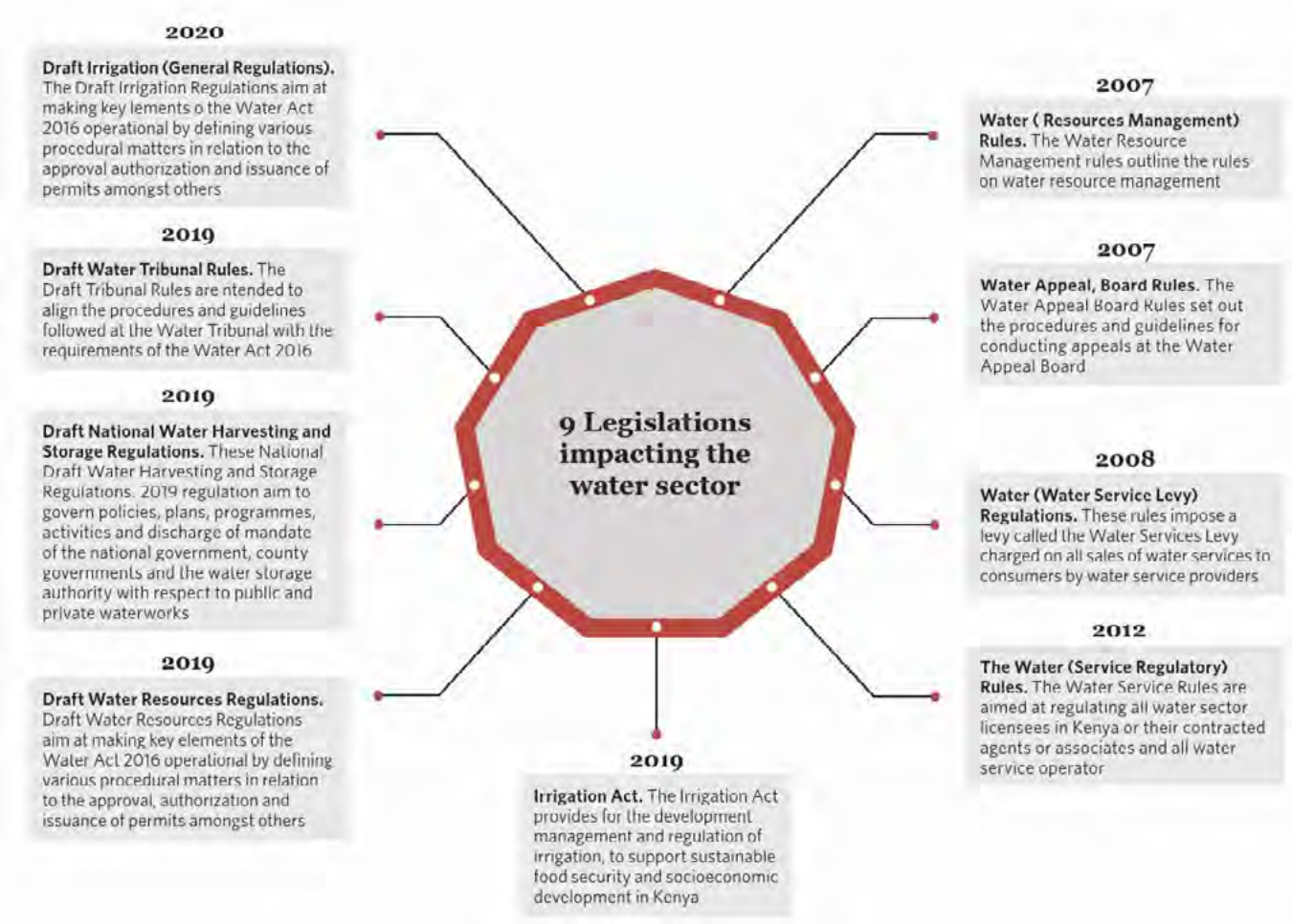
Kenya has had a vast number of laws and policies on water, with the onset of colonialism in 1920 marking the introduction of formal water laws in the country. Prior to this, local communities had customary rules governing water (Shurie, Mwaniki, & Kameri-Mbote, 2017). Since the introduction of formal legal provisions on water, developments in the water sector have been influenced by an evolving policy, legal and regulatory framework, with reforms instituted over time, aimed at managing water resources effectively and finding ways to deliver it to more and eventually all Kenyans.

Policies play a key role in water management and conservation. The focus of most of the development policies in Kenya including water is on urban water issues and not rural ones, as the approach has always been on centralised pipe systems. There is, therefore, a need to incorporate rural issues in water development policies alongside urban ones.

2.1.1 LEGISLATION

An evolving legislative landscape is a key feature of Kenya's water sector, driven by a widely held belief that enactment of new law is a necessary precondition for implementing fundamental reforms in the sector (Kameri-Mbote & Odote, 2019). The Ministry of Water, Sanitation and Irrigation (MWS&I) has been providing policy direction in the sector. The current overarching law is the Water Act of 2016 which replaced the Water Act of 2002. The Act seeks to align Kenya's water laws to the new Constitution promulgated in 2010. Subsidiary legislation in the form of regulations and orders also govern the water sector, altogether setting out requirements for the management of water resources as well as water supply development and operation. A summary of the legislation impacting the water sector is outlined in Figure 2-1 with a more detailed review of the legislation provided in Appendix B.2; whilst Appendix C summarises the monitoring and evaluation reporting requirements to international bodies, such as the UNFCCC.

FIGURE 2-1. LEGISLATIONS IN KENYA IMPACTING THE WATER SECTOR



Source: GNI[plus.]

2.1.2 POLICIES AND ACTION PLANS

There are a variety of policies and actions related to water in Kenya. These range from the overarching national strategies, such as Kenya's Vision 2030 that emphasises water as a critical component of enabling economic and social development, to more specific policies and guidelines focused on water users (such as businesses or rural users) or types of water use (such as sanitation services). These are summarised in Table 2-1 and Box 2-1. Whilst significant advances have been made through the establishment of these policies and action plans, there are still some barriers for implementing climate action projects; these are discussed in more detail in section 6.

TABLE 2-1. RELEVANT POLICIES AND ACTION PLANS THAT IMPACT THE WATER SECTOR

Legislation / policy	Overview
Water Act, 2016	The Water Act 2016 delineates roles of the various regulatory bodies, operationalizes devolution of water and sewerage services and the privatisation of water services.
Irrigation Act, 2019	The Irrigation Act provides for the development, management and regulation of irrigation, to support sustainable food security and socioeconomic development in Kenya. It regulates development, management, financing, provision of support services and regulation of the entire irrigation sector in Kenya.
Irrigation (General) Regulation, 2020 Draft	The regulation provides principles, guidelines and standards for promoting irrigation development within the context of the National Irrigation Master plan, Investment plan and respective Strategic plans through efficient utilization of irrigation water; promoting water harvesting and storage measures and use of recycled waste water for irrigation, streamlining organization of the irrigation sub-sector, professionalization of all irrigation services including feasibility studies design, construction and operation, compliance with all relevant statutory requirements; compliance to quality standards; effective monitoring and evaluation of irrigation schemes; construction and operation by the National irrigation Authority; and participatory and sustainable irrigation development.
Nationally Determined Contribution (NDC), 2020	The NDC sets out both adaptation and mitigation contribution based on conditional support. The mitigation contribution in Kenya is intended to abate greenhouse gas emission by 30% by 2030 relative to the business as usual (BAU) scenario. Several adaptation actions have been identified in the updated NDC which include actions in the water sector. These are: • Conduct and implement recommendations on climate risk assessments on water, sanitation and irrigation. • Build resilience infrastructure for the protection of dams, dykes and river lines. • Promote water harvesting and storage at county and household levels. • Mainstream climate change into water catchment management plans.
National Water Master Plan 2030, 2014	Launched on 26th March 2014, the National Water Master Plan was developed with the aim of ensuring proper development and management of water resources in the country. It assesses and evaluates the availability and vulnerability of country's water resources up to around 2050 taking climate change into consideration, formulates the National Water Master Plan towards the year 2030 for sustainable water resources development and management for six catchment areas, prepares an action plan for activities of Water Resources Management Authority's (now WRA) regional offices up to the year 2022 to strengthen their water resource management capability, and enables transfer of technology on water resources development and management. The water master plan contains a plan for all of Kenya's catchment areas
The National Water Services Strategy 2007 – 2015, 2007	Section 64 of the Water Act 2016 requires the Cabinet Secretary responsible for water to formulate a Water Services Strategy within one year of commencement of the Act and every five years thereafter, and to review it every three years. The National Water Services Strategy has several aims which always include having capable providers in every area of Kenya providing water and sanitation services, arrange for investments and implementation plans and to provide for national monitoring and information systems on water services. Each water strategy is required to contain, among other things, details of (a) existing water services, (b) the number and location of persons who are not provided with basic water supply and basic sewerage services, (c) standards for the progressive realisation of the right to water and (d) a resource mobilisation strategy for the implementation of the plans. The requirement in the Water Act 2016 has not been met and the latest version of the Water Services Strategy available for public access is for 2007 – 2015.
Standards for Non-Revenue Water Management in Kenya, 2014	The Standards for Non-Revenue Water Management in Kenya were developed in order to avail more water to consumers that would otherwise have been lost while cutting down on water service operation and maintenance costs. Non-revenue water is defined as the amount of water that is not billed and does not earn revenue. The National Water Services Strategy goal is to reduce NRW to under 30%, and the Vision 2030 goal is to reduce this to under 25%.
Corporate Governance Guideline for the Water Services Sector, 2018	The Corporate Governance Guideline for the Water Services Sector has the objective of improving how water service institutions especially water service providers are led and managed, enhance the understanding of apt governance, clarifying autonomy and oversight and the structures and systems that are needed to have economical and efficient provision of water services. it provides information on why, where and how public participation is mandatory in improving the water services they obtain from the water service providers as water and sanitation are rights due to them under the Constitution.

Legislation / policy	Overview
Guideline for Provision of Water and Sanitation Services in Rural and Underserved Areas, 2019	The Guideline for Provision of Water and Sanitation Services in Rural and Underserved Areas was drafted with the aim of (a) ensuring that water service standards are adhered to in terms of quality, cost and customer service in order to guarantee health and safety of consumers (b) regularise rural water service in order to streamline, professionalise and formalise operations (c) update the databank in WASREB as part of monitoring the progressive realisation of the right to water, and (d) enable county governments to operationalise section 94 of the water act 2016 that requires the devolved governments to focus on areas that are not commercially viable under the guiding principle of leaving no one behind. The Guidelines are established pursuant to section 72 (1)(a) and (p) as read together with section 94(3) of the Water Act which requires the sector regulator to determine and prescribe national standards and make recommendations on how to provide basic water services to marginalised areas.
Water Vending Guidelines, 2019	The Guideline on Water Vending aims at bringing order to the water vending sub-sector in the context of water safety, planning and value chain. It regulates the quality of water supplied to citizens by all actors beyond the utilities directly regulated by WASREB and outlines different water vending systems, their risks assessment and the appropriate control measures to be observed.
Water Safety Planning Guideline, 2018	The Water Safety Planning Guideline aims at ensuring all water utilities develop and implement water safety plans to ensure that drinking water that gets to the consumers is not only of the good quality, but it is also safe for consumption. It gives a step by step approach on how to identify risks and contaminant pathways within water supply systems and how to put in place monitoring and control measures to ensure water safety.
Consumer Engagement Guideline, 2018	The Consumer Engagement Guideline was developed to facilitate the engagement process between consumers and sector institutions. It defines the roles and responsibilities of various players in consumer engagement and complaints handling.
Guidelines on Drinking Water Quality and Effluent Monitoring, 2008	The purpose of the Guidelines on Drinking Water Quality and Effluent Monitoring is to (a) promote transparency in the methods of water quality monitoring employed by Water Service Providers and build public confidence in service provision; (b) ensure through regular monitoring that the quality of water provided meets the standards set by the Kenya Bureau of Standards; (c) create awareness among the Water Services Boards and Water Service Providers on the water quality monitoring requirements; (d) ensure that all Water Services Boards and Water Service Providers follow a systematic way of water quality monitoring so as to have uniformity of the process; (e) ensure a minimum standard of water quality monitoring at acceptable costs; and (f) create awareness among consumers that information regarding water quality will be made available by the Water Service Providers. The guidelines recognise that for effective monitoring of water quality, both internal self-monitoring by the Water Service Providers and an independent monitoring by the Water Services Boards and WASREB is necessary.
Draft Water Harvesting and Storage Policy, 2019	The Draft Water Harvesting and Storage Policy is aimed at regulating all public and private waterworks, whether initiated before or after commencement of the Regulations. The Regulations will govern water harvesting and storage, reservoirs for impounding surface run-off and for regulating stream flows to synchronise them with water demand patterns and structures and devices for flood control and management.
The Water Resources Regulations, 2019	The Water Resources Regulations recognise the need for private sector participation through public private partnerships with water service providers for the development of water services infrastructure and the provision of water and or sewerage services. The regulations also provide for the operation of community projects where the County Executive Committee member shall facilitate the development and operation of community water service providers in rural areas within which the county water service providers do not provide adequate water services.
Draft National Irrigation Services Strategy	The Draft National Irrigation Services Strategy sets the Vision, Mission, Objectives and Strategic interventions that will be pursued in the next five years (2021-2025) in order to facilitate sustainable growth of the irrigation sector. The Strategy forms a basis for the formulation of medium-term development plans at the National and County government levels.

Note: The policies named in the left column of the table contain hyperlinks to the original sources, for futher information.
Source: Analysis by GNI[plus]

BOX 2-1. NATIONAL STRATEGIES THAT HAVE A FOCUS ON WATER IN KENYA

The Kenya Vision 2030	The Kenya Vision 2030 defines water as an essential resource to support the development activities planned under Vision 2030. The Vision 2030 acknowledges the pivotal role of water in the growth of economic and social sectors as the country gets industrialised and more urbanised. In that regard the plan anticipates a universal access to water by 2030, which is in line with the UN's 2030 Sustainable Development Goals on water and sanitation. Vision 2030 is implemented through Medium Term Plans (MTPs). Under its third medium-term plan (2018-2022), the government aims to rehabilitate and protect the five (5) water towers, complete on-going water projects in urban and rural areas and increase the number of people connected to safe piped water from 3.6 million to 9 million. Under the Vision, the Government further sets out an intention to partner with investors to expand irrigation to reduce the country's dependence on rain fed agriculture.
Big Four Agenda	The current government set out the Big Four Development Agenda to cover the period 2018-2022. The Agenda areas focus on food security, affordable housing, manufacturing, and affordable healthcare for all. The provision of water is recognised as an underlying enabler for the attainment of the current National Government's Big Four development agenda. Irrigation is explicitly provided for to meet the food and nutrition security goals, with the goal being to increase the land under irrigation. The Big Four Agenda requires the formation of an Agriculture and Irrigation Sector Working Group (AISWAG) to provide coordination for irrigated agriculture.
National Climate Change Action Plan (NCCAP) (2018-2022)	The NCCAP recognises that access to and quality of water is expected to decline because of climate change (such as drought and reduction of glaciers). It highlights "water and the blue economy" as a priority action area and the objective is to enhance resilience of the water sector by ensuring access to and efficient use of water for agriculture, manufacturing, domestic, wildlife and other uses. Action to be taken includes: • Increase annual per capita water availability through the development of water infrastructure • Climate proof water harvesting and water storage infrastructure and improve flood control • Promote water efficiency (monitor, reduce, re-use, and recycle) • Develop green infrastructure • Improve climate resilience of coastal communities
National Climate Change Act, 2016	The Climate Change Act provides a regulatory framework for enhanced response to climate change and provides mechanisms and measures to achieve low carbon climate development.
National Climate Change Response Strategy, 2010	The National Climate Change Response Strategy identifies the water sector as one of the most important sectors to support the development of the country. The strategy notes that the water sector is threatened by climate change and there is need to take certain adaptation measures such as prevention, tolerance, changes in land use or activities, changes of location, and restoration to protect water resources.
National Policy on Climate Finance, 2018	The purpose of this National Policy on Climate Finance is to improve Kenya's ability to mobilise and effectively manage and track adequate and predictable climate change finance. The policy is Kenya's initial step towards a coordinated effort to identify, attract and use climate finance to further climate change and national sustainable development goals. Priority actions under the policy which relate to the water sector include conservation of the five water towers (Mau forest complex, Aberdares, Mt. Kenya, Cherangani Hills and Mt. Elgon), integration of climate change information in water modelling and forecasting, enhanced water storage capacity to facilitate an increase in irrigated land, promotion of energy efficient technologies in water supply projects, improved water management and water conservation, including rainwater harvesting, recycling and reuse of water, water conservation awareness campaigns, technology for water conservation in water services and supply, and improved watershed management.
Guideline on Business Planning 2019	The Guideline on Business Planning is aimed at supporting Water Service Providers to fulfil their obligations of establishing and regularly updating business and investment plans and to set minimum requirements in the water sector. The Guideline is intended to be a useful tool for Water Service Providers' management and for stakeholders to monitor and review the company's plans and commercial models, identify market, operational, and financing opportunities and gaps, and evaluate progress and results against objectives.
Disaster Preparedness and Mitigation Guidelines 2013	The Disaster Preparedness and Mitigation Guidelines are aimed at identifying the risks that drinking water supplies are exposed to and to prioritise proper mitigation and preparedness measures.
Agriculture Sector Development Strategy (ASDS) 2009-2020	The Agricultural Sector Development Strategy (ASDS) is intended to provide a guide for public and private sectors' efforts in overcoming the outstanding challenges facing the agricultural sector in Kenya, ensuring food and nutritional security for all Kenyans, generating higher incomes as well as employment, especially in the rural areas and to position the agricultural sector as a key driver in achieving the 10 per cent annual economic growth rate envisaged under the economic pillar of Vision 2030. The strategy underscores the need to develop and prudently manage factors of production including water.
Environmental Management and Coordination Act, (EMCA) 1999	EMCA 1999 provides for the establishment and functions of the National Environment Management Authority, makes Environmental Impact Assessments (EIA) mandatory for projects and sets penalties for water pollution. The EMCA 2006, Regulations seek to prevent water pollution, set quality standards for sources of domestic water, maintain water quality monitoring for sources of domestic water and provide for the issuance of effluent discharge licenses. The EMCA Regulations, 2009 provide for the conservation and sustainable use of wetlands and their resources in Kenya.

Sustainable Development Goals

Many of the United Nations SDGs directly relate to water, including water quality and quantity (goals 6, 14 and 15); water efficiency (goals 7 and 12); and resilience and climate change (goal 13): see Error! Reference source not found. below . Goal 6 'ensure availability and sustainable management of water and sanitation for all', reflects the increased global attention on water and sanitation issues. SDG 6 includes eight, universally applicable, global targets: (UN, 2018).

- Sanitation and hygiene services
- Treatment and reuse of wastewater
- Water-use efficiency and scarcity
- International water resource management including through transboundary cooperation
- Protecting and restoring water-related ecosystems
- International cooperation
- Capacity building and participation in water and sanitation management.

FIGURE 2-2. WATER AND THE UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS

Source: (UNDP, 2015)

NCCAP 2018-2022 PRIORITY ADAPTATION ACTIONS IN THE WATER SECTOR

The NCCAP is derived from the Climate Change Act, 2016 and is a five-year plan that steers climate change actions in the country and helps to guide mainstreaming of climate change into sector functions. It also aligns sectors in Kenya to meet the NDC goals of abating greenhouse gas emissions by 30% by 2030 (GOK, 2018c). The updated NCCAP identifies water scarcity as a key issue for the country, along with water management, and access to water as a priority action. Water and the blue economy are one of the seven strategic priority actions in the NCCAP, as outlined in Figure 2-3.

The climate change adaptation actions under the NCCAP 2018-2022 in this sector are expected to result in:

- Increased water availability through water harvesting and storage.
- Progress towards the achievement of food and nutrition security through the development of climate resilient water management systems.
- Reduction in water scarcity through improved water harvesting and greater water efficiency, improved human health and well-being, protection of marine and coastal ecosystems.

Appendix A provides further information on the adaptation actions in the water sector, as well as details on the mitigation actions in the industrial sector (some of which capture water) as published in the NCCAP 2018-2022.

FIGURE 2-3. CLIMATE CHANGE PRIORITY ACTIONS UNDER THE NCCAP 2018-2022

Source: adapted from (GOK, 2018b)

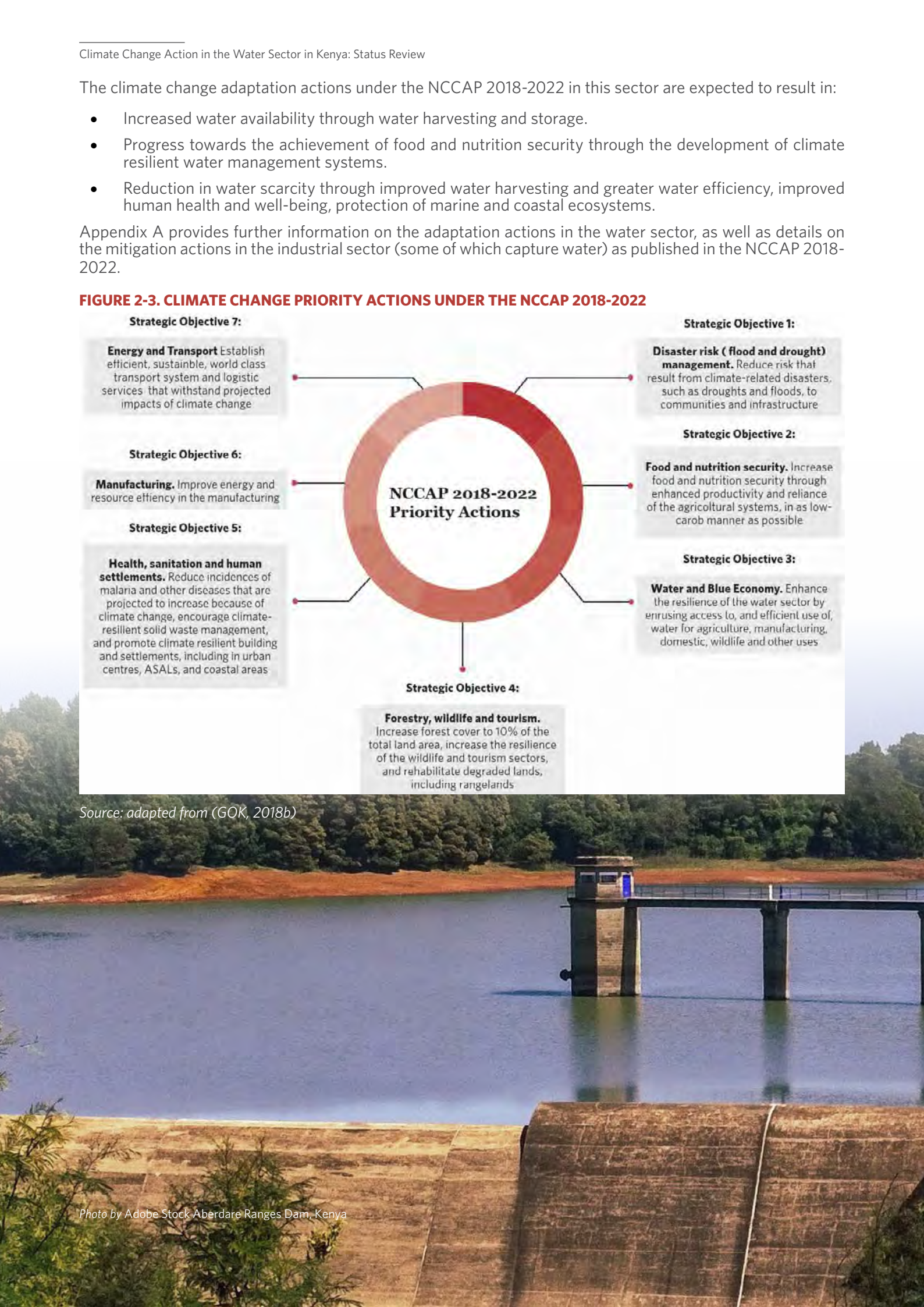


Photo by Adobe Stock Aberdare Ranges Dam, Kenya

2.1.3 INSTITUTIONAL FRAMEWORK AND GOVERNMENT ACTIONS IN THE WATER SECTOR

This section provides information on the management of the water sector, highlighting the government bodies managing the resource as well as links for reference and information.

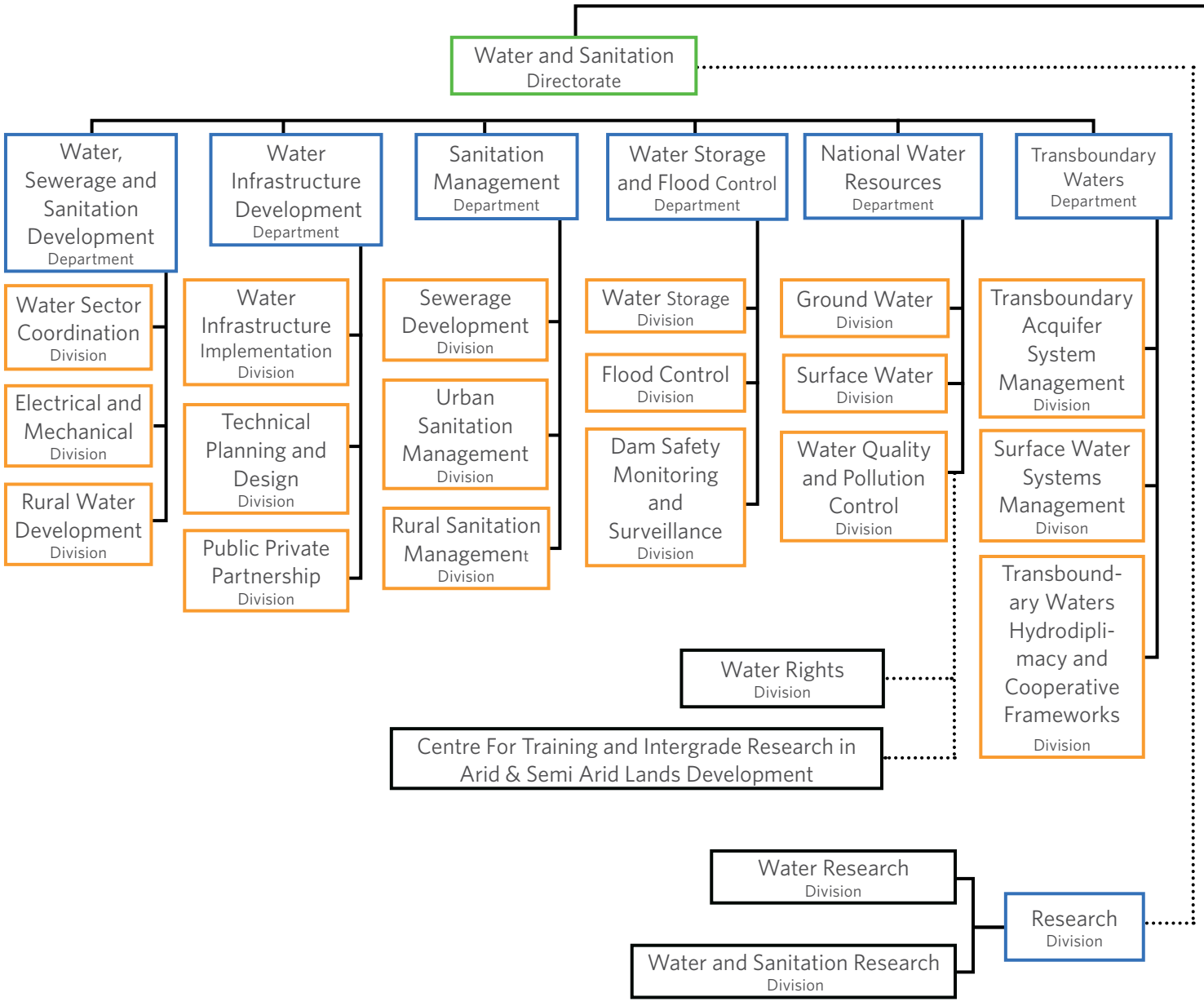
The management of water resources in the country is under the Ministry of Water, Sanitation and Irrigation (MWS&I); it has a mandate of developing and managing water resources, transboundary waters, water harvesting and storage, water services and sanitation regulations, dams and sanitation management. The mission of the Ministry is: "to contribute to national development by promoting and supporting integrated water resource management to enhance water availability and accessibility" (MWS&I, 2020b). There are also several ministries, departments and authorities outside of the MWS&I that have responsibilities within the water sector, as outlined in Appendix B.

It is also the MWS&I's responsibility to "formulate policies, legal and regulatory frameworks for promoting sustainability in water management, improvement of water and sanitation services while at the same time developing mitigation actions and adapting to the impacts of climate change" (MWS&I, 2020b). There are several government departments and agencies with the responsibility of managing the water sector under the MWS&I's umbrella structure; Figure 2-4 summarises the organisational structure of the Ministry, outlining the different departments and divisions, whereas Figure 2-5 highlights the management model of water services in Kenya. Table 2-2 provides further information on the various agencies established that deal with water in Kenya, outlining their mandates and jurisdictions. Further information on the MWS&I be can found on the MWS&I's website.

There are also a wide range of other non-governmental actors, organisations and institutions involved in the sector. Details of these are discussed in Appendix D.

FIGURE 2-4. ORGANISATIONAL STRUCTURE OF THE MINISTRY OF WATER, SANITATION AND IRRIGATION

Note: this organisation structure was provided by the MWS&I, stating it was the proposed structure at the time of writing (2021).



Source: MWS&I (2021)

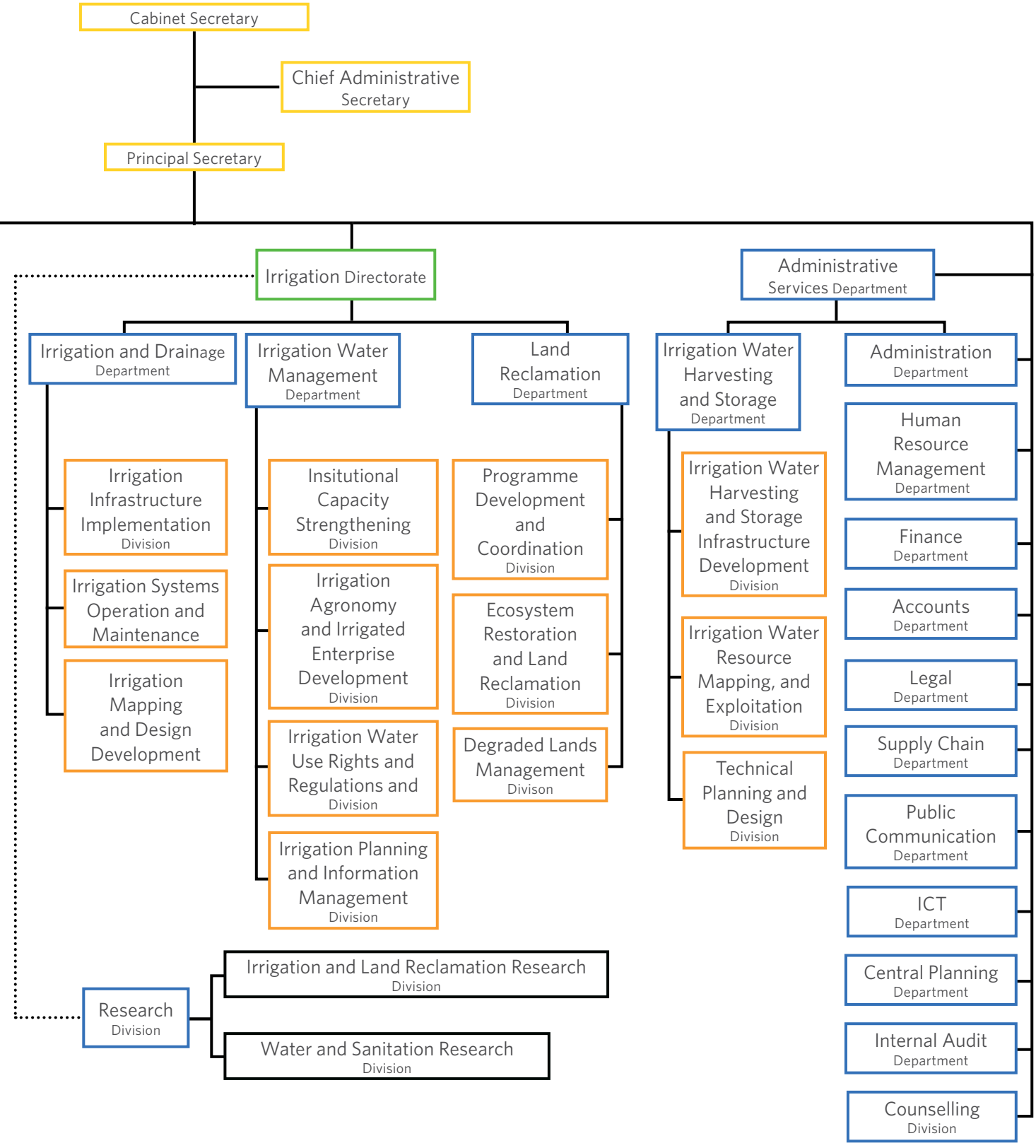
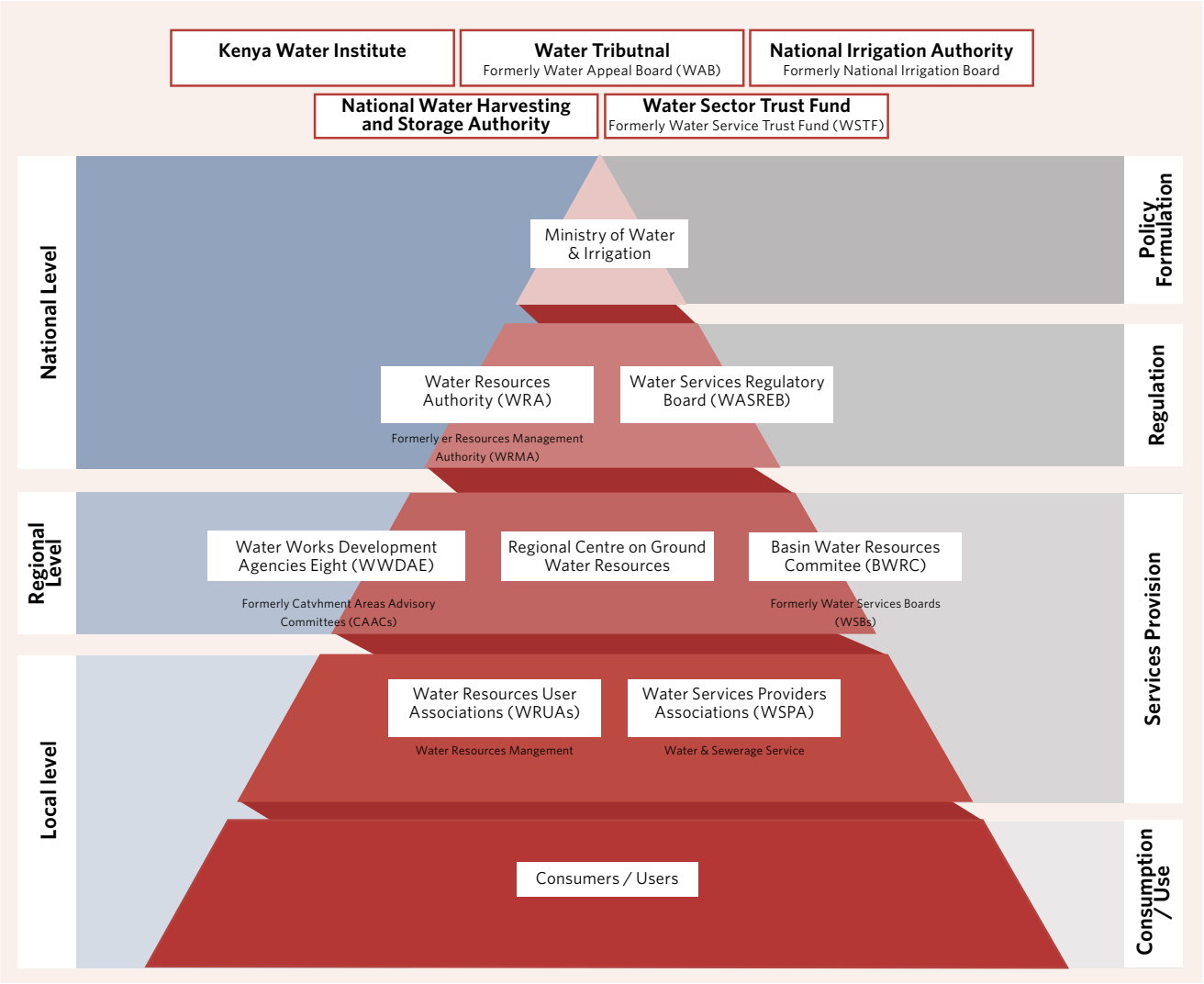

Cabinet Secretary
Chief Administrative Secretary
Principal Secretary
Irrigation Directorate
Administrative Services Department
Irrigation and Drainage Department
Irrigation Water Management Department
Land Reclamation Department
Irrigation Water Harvesting and Storage Department
Administration Department
Irrigation Infrastructure Implementation Division
Irrigation Systems Operation and Maintenance
Irrigation Mapping and Design Development
Insitutional Capacity Strengthening Division
Irrigation Agronomy and Irrigated Enterprise Development Division
Irrigation Water Use Rights and Regulations and Division
Irrigation Planning and Information Management Division
Programme Development and Coordination Division
Ecosystem Restoration and Land Reclamation Division
Degraded Lands Management Divison
Irrigation Water Harvesting and Storage Infrastructure Development Division
Irrigation Water Resource Mapping, and Exploitation Division
Technical Planning and Design Division
Human Resource Management Department
Finance Department
Accounts Department
Legal Department
Supply Chain Department
Public Communication Department
ICT Department
Central Planning Department
Internal Audit Department
Counselling Division
Research Division
Irrigation and Land Reclamation Research Division
Water and Sanitation Research Division

FIGURE 2-5. CURRENT MANAGEMENT MODEL OF WATER SERVICES IN KENYA



Source: (2030 WRG, 2020)

TABLE 2-2. GOVERNMENT AGENCIES UNDER MWS&I AND THEIR RESPONSIBILITIES

Institution / sub-department name	Overview of the mandates and responsibilities of the body
Water Resources Authority (WRA)	The WRA is a state corporation, established under the 2016 Water Act. It is mandated to safeguard the right to clean water through regulation, water management and proper use of water resources in order to guarantee that it is enough for everyone now and in the future. Other functions of the institution include: • Enforcing regulations under the Water Act 2016. • Formulating and enforcing standards, procedures and regulations for the management and use of water resources and flood mitigation. • Planning, issuing, setting and collecting water permit fees, and water use charges. • Advices the Cabinet Secretary generally on the management and use of water resources. • Receiving water permit applications for water abstraction, water use recharge and enforces the conditions under the permits. • WRA also collects, analyses and disseminates all information on water resources. The Authority undertakes climate change actions including adaptation for Kenya's water resources. These includes hydrological monitoring, maintenance of reserve flows, and sand dams and weirs construction. WRA was established in 2002 through the Water Act 2002. Prior to 2016, it was known as Water Resource Management Authority (WARMA) (WRA, 2020). More information on WRA can be found on the WRA's website.

Institution / sub-department name	Overview of the mandates and responsibilities of the body
Water Resource Users Associations (WRUAs)	The establishment of WRUAs was outlined under the new Water Act 2016. A WRUA is a community-based association formed for the purpose of collaborative management of water resources and resolution of conflicts concerning the use of water. The objectives of WRUAs include (MoEF, 2016a): • conserving water catchments • managing water resources effectively • increasing the water availability • developing sustainable and responsive water institutions. The number of established and functional WRUAs in Kenya is estimated to be 599 out of the potential 1,237 according to WRMA's 2016 report. The number of operationalised WRUAs with sub-catchment management plans were only 364. (WRMA, 2016)
Water Works Development Agency (WWDA)	There are nine (9) WWDAs in Kenya established under the Ministry of Water, Sanitation & Irrigation. The agencies were established under the Water Act 2016 vide Legal Notice No. 28 of 26th April 2019. The Agencies are responsible for the development, maintenance and management of water and sewerage infrastructure in the counties.
Water Service Regulatory Board (WASREB)	WASREB is a state regulatory corporation established by the Water Act 2016. Its main objective is to protect consumer interests and rights in the provision of water services, whilst safeguarding other stakeholder interests. Other key functions of WASREB include (WASREB, 2020b): • determining and prescribing national standards for the provision of water services • developing assets for water services providers • setting license conditions, and • accrediting WSPs. More information on WASREB can be found on their website.
National Water Harvesting and Storage Authority	The institution was established under the Water Act 2016 to develop national public water works for water storage and flood control. Dams constructed by the authority include Chemususu Dam, Kiserian Dam and Maruba Dam among others. Other planned dams to be constructed by the institution include Soin-Koru Dam and Muruny Dam (NWHSA, 2019). More information can be found on the NWHSA's website.
Water Sector Trust Fund (WSTF)	The WSTF is a state, established under the 2016 Water Act to provide conditional and unconditional grants to Counties and assist with financing the development and management of water services in marginalised or underserved areas. The objective of the Fund is to provide conditional and unconditional grants to the Counties and to assist in financing the development of and management of water services in the marginalized and underserved areas. These includes financing community initiatives for sustainable water management, developing water services in rural and urban areas, and researching activities surrounding water and sanitation (WSTF, 2020a). More information can be found on the WSTF's website.
National Irrigation Authority	The Irrigation Act establishes the National Irrigation Authority whose functions include developing and improving infrastructure for national or public schemes (in consultation with county Governments), facilitating the formation and strengthening of irrigation water user associations. The board also provides technical advisory services on a commercial basis on irrigation management, including water harvesting and storage, and wastewater recycling for agricultural use (National Irrigation Board, 2020). More information can be found on the authority's website.
Kenya Water Institute	The institute is a semi-autonomous Government agency and has a mandate to offer training, research and consultancy services in the wider water sector. It also offers collaboration between the public and private sectors and other interested parties for the development of the water and sanitation sectors (KEWI, 2020). More information can be found on KEWI's website.

Institution / sub-department name	Overview of the mandates and responsibilities of the body
Water Tribunal	The Tribunal was established under the Water Act, 2016 to hear and determine any disputes concerning water resources and services. The Water Tribunal hears and determines appeals at the decision or order of the Cabinet Secretary, WRA, WASREB or of any person acting under the Cabinet Secretary (MoEF, 2016a). More information can be found on the Water Tribunal can be found in the Water Act 2016.
Water Services Providers Association	The enactment of the Water Act 2002 created new institutions (water companies) to manage water resource in Kenya. The Companies took over the provision of water and sewerage services from their respective municipal councils. This therefore placed the water companies at the leading edge to consolidate the knowledge and share experiences. Water services providers formed WASPA to provide a forum for the various companies to learn from each other. More information can be found on WASPA's website.
Regional Centre on Groundwater Resources	The aim of the Regional Centre on Groundwater(RCGW) Resources is to promote regional cooperation on the management of groundwater systems to train water professionals, support Member states in addressing regional needs, and contribute to the achievement of Millennium Development Goals (MDGs) now SDGs. More information can be on the RCGW's website.

Photo by Adobe Stock Mothert hippopotamus with her baby in Masai Mara National Park, Kenya

Photo by Adobe Stock

3. Situational analysis of the water sector in Kenya

3. SITUATIONAL ANALYSIS OF THE WATER SECTOR IN KENYA

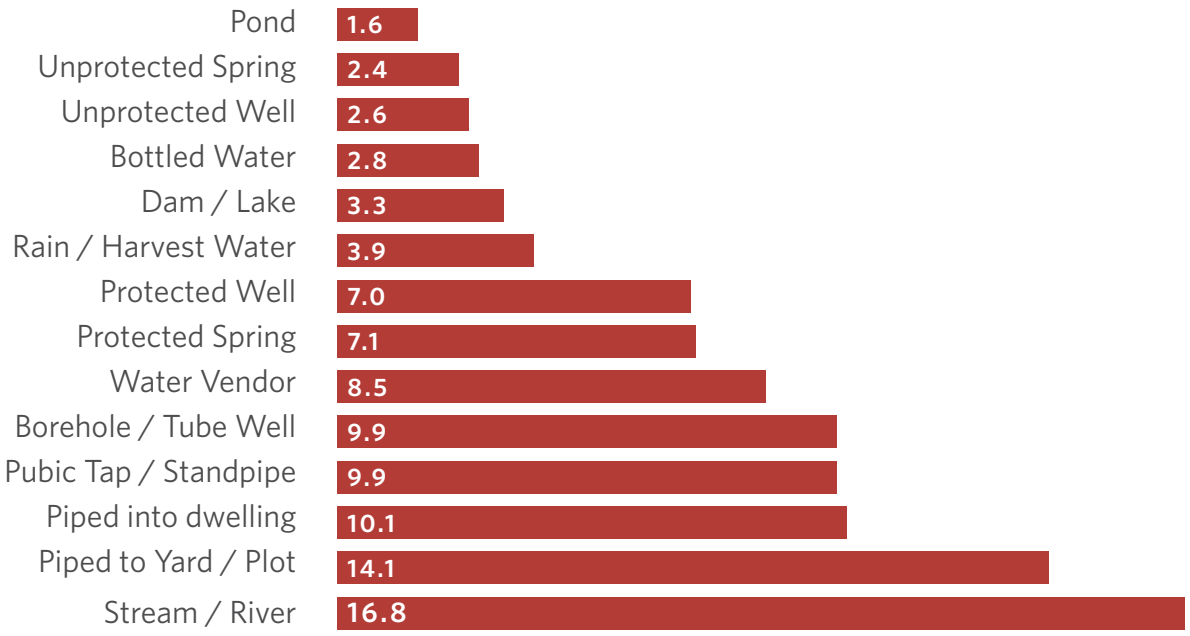
This chapter provides information of the sources of water in Kenya by describing the surface and groundwater resources. It also gives a description of the sanitation, irrigation and water storage in the country and summarises the water supply and demand situation.

3.1. WATER RESOURCES SUPPLY

The Kenyan population relies on both its surface water resources from rivers, lakes, reservoirs, and on groundwater, accessed via boreholes and wells (Barasa, 2018). During the 2019 Population and Housing Census, where approximately 47.6 million people were surveyed[3], it was identified that **only 34% of the households in the country rely on piped water as a source of drinking water**. This compares to 57% of the world's population that has access to drinking water from piped connections (WHO, 2020). The remaining 66% of Kenyans rely on other water sources such as rivers, dams, protected springs[4], boreholes, wells, rainwater, ponds, bottled water and water vendors (KNBS, 2019a).

It is important to note that approximately 27% of the population resides in urban areas and the remainder in rural areas where water infrastructure is not as enhanced (or in most areas, not present at all). The distribution of households by main source of drinking water is shown in Figure 3-1 (KNBS, 2019a).

FIGURE 3-1. DISTRIBUTION OF HOUSEHOLDS BY MAIN SOURCE OF DRINKING WATER



Source: (KNBS, 2019b)

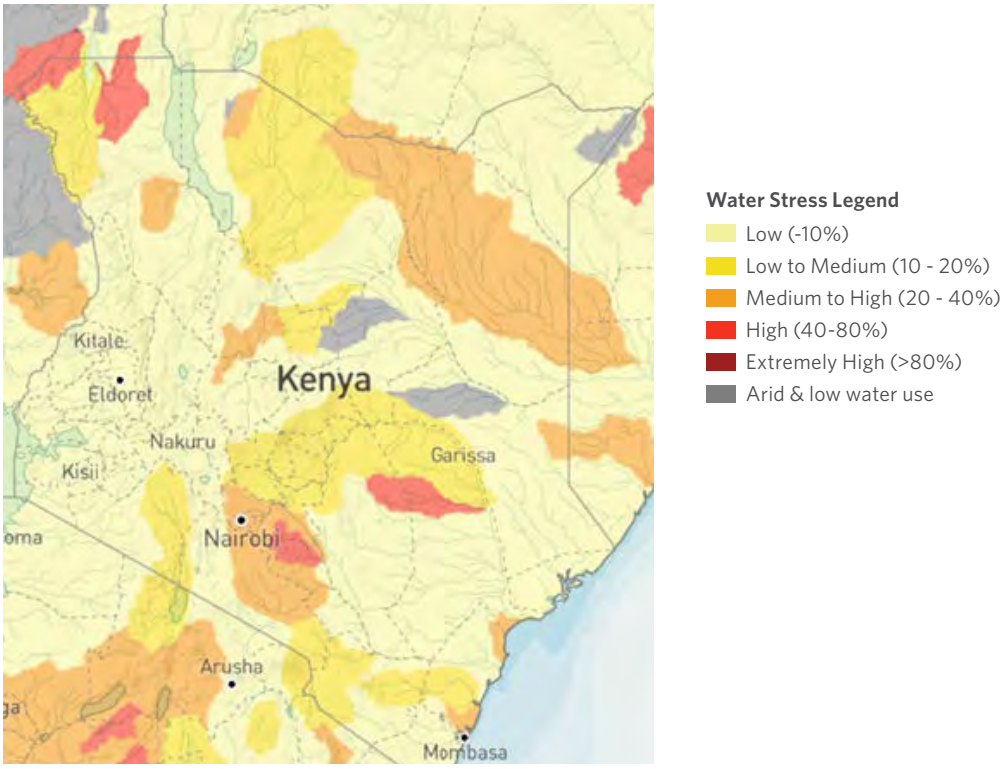
Kenya currently experiences a tight water balance. **It is considered a water-scarce[5] country** with its freshwater resources under stress due to low rates of replenishment and higher rates of abstraction in parts of the country (Figure 3-2). **Water availability in Kenya is estimated at approximately 620m³ per capita per year, which is significantly lower than the UN's global benchmark of 1,000m³ per capita per year** (GOK, 2018b) (FAO, 2020).

3 Note that the total national population was 51.39 million in 2018 (World Bank, 2018).
4 Protected springs are safer water sources compared to unprotected springs.
5 Water scarcity can be defined as lack of water in terms of in availability due to physical shortage, or scarcity in access due to the failure of institutions to ensure a regular supply or due to a lack of adequate infrastructure (UN Water, 2020). "Absolute" water scarcity is defined as fresh water availability of less than 500 m³ per year per capita, areas under water "stress" conditions are defined as the availability of between 500 and 1,000 m³ per year per capita (FAO, 2020).

Climate change impacts have been observed to have increased this stress, which has led to severe drought periods in the past 20 years[6] (Mbogo I. &., 2014); further detail on the impacts of climate change are discussed in Chapter 4. Water scarcity in Kenya is also known to be a cause of conflict between pastoralist communities living in water-scarce areas such as in arid and semi-arid areas (Martinon, 2010).

Although there are areas of the country that receive significant amounts of rainfall, redistribution of water to areas of low rainfall is currently not possible due to insufficient water infrastructure and adverse topography (Owuor, 2019).

FIGURE 3-2. WATER STRESS IN KENYA (2021



Source: (WRI, 2021)

3.1.1 SURFACE WATER RESOURCES

Surface water constitutes the main source of water supply in Kenya; it is used for domestic, agricultural and industrial uses. Kenya's surface water resources are distributed within six drainage basins (Reference source not found. in Section 1.2) which provide most of the country's water resource supply. Most irrigation in Kenya is supplied by surface water, but groundwater also supplies a small proportion of irrigation water. More details of the surface water supply and availability in terms of forecast planning is discussed further in Section 3.3.

The water quality in the surface water systems in Kenya are subject to pollution from anthropogenic[7] activities. Rapid population growth and urbanisation across the country has led to a decline in water quality, with sanitation being one of the biggest problems (especially in informal settlements) (Kaluli , Wangechi, & Home, 2011). Surface water is also more vulnerable to the impacts of climate change, given its direct exposure to temperature and precipitation fluctuations.

6 Severe droughts in Kenya were experienced in 1997, 2000, 2004, 2005, 2010 and 2011 (Mbogo I. &., 2014)
7 Anthropogenic activities, meaning those originating from human activities.

The Ministry of Water, Sanitation and Irrigation has played a big role in enhancing surface water availability through developing water harvesting and storage policies and coordinating the water harvesting and storage subsector. The National Water Harvesting and Storage Authority has the mandate of the construction of large, medium and small dams in different parts of the country to store surface water.

Individual rainwater harvesting, storage and efficient use would help solve the problem of over-reliance on piped and underground water. Financial and tax incentives could be provided by the Government to enable people to afford water-saving equipment and technologies such as gutters, sprinklers, drip irrigation technologies and water storage tanks.

3.1.2 GROUNDWATER RESOURCES

The **annual quantity of renewable groundwater is only about 10% of the total renewable surface water resources** (NEMA, 2010). Groundwater contributes (although to a lesser extent than surface water) to the overall supply of water in Kenya, particularly in areas that receive low rainfall and runoff such as the Ewaso Ng'iro basin that is mainly dependent on groundwater as a reliable source of water supply. Groundwater is also an important supplementary source in urban centres such as Nairobi, Mombasa and Nakuru (NEMA, 2010).

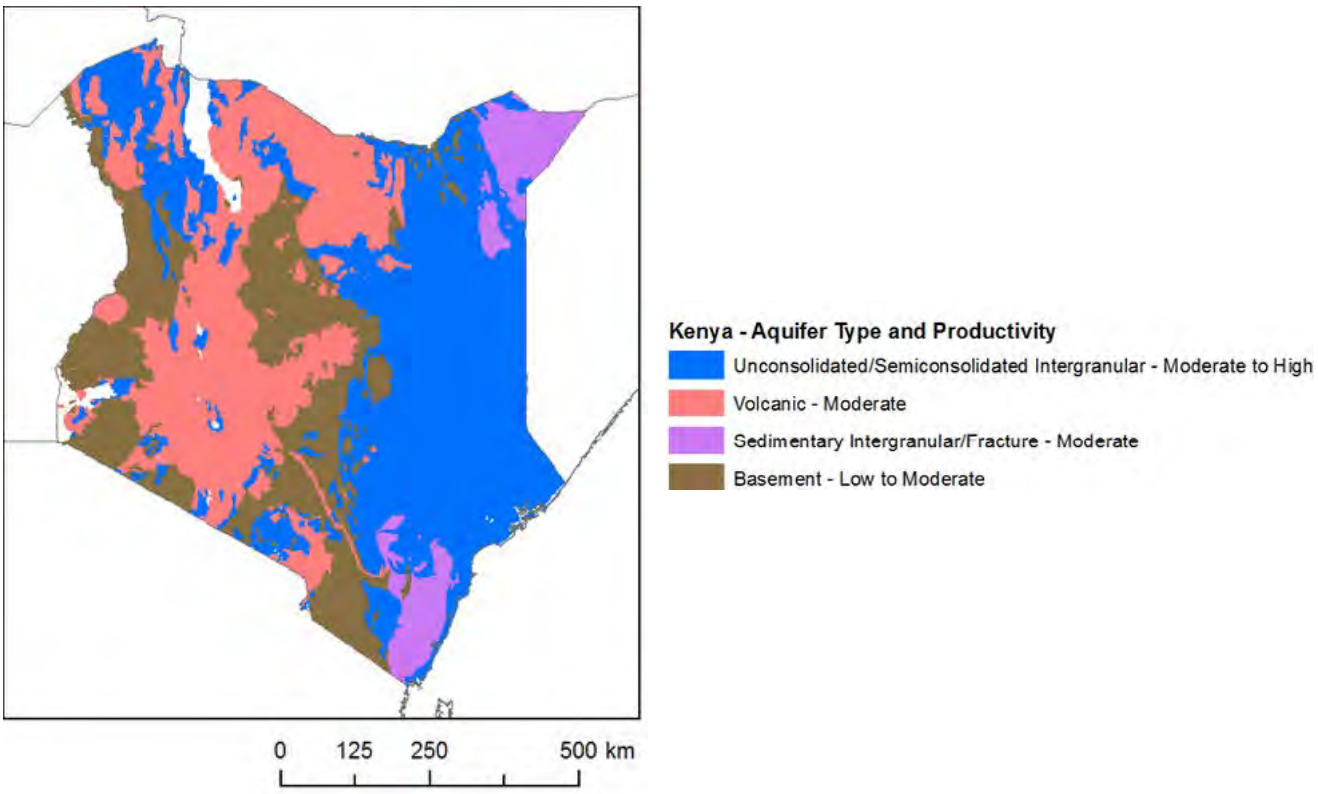
According to the National Environment Management Authority's (NEMA) Strategic Environmental Outlook (2010), Kenya's groundwater potential is extremely variable, both spatially and temporally, in quality and quantity and in terms of the level of the water table and depth. There are **large ranges in recharge rates across the country, from less than 5% in the arid and semi-arid lands where evapotranspiration losses are high, to 30% in areas of deep sandy soils, coral limestones and unconsolidated rocks where evapotranspiration losses are low. In humid and semi-humid regions, recharge rates may be higher** (NEMA, 2010).

It is reported that, **although groundwater exploitation has considerable potential for boosting water supplies in Kenya, its use is limited by poor water quality due to: pollution caused by untreated water, over-exploitation of the resource, and saline intrusion in coastal areas. In some areas, there is also inadequate knowledge/understanding of the levels of the groundwater resource available to inform efficient abstraction** (Mumma, Lane, Kairu, Tuinhof, & Hirji, 2011). Nevertheless, many areas of Kenya are reliant on groundwater sources for domestic, commercial and industrial needs, including the coastal zone which is almost entirely dependent on groundwater: Mombasa and Malindi (depend on the Baricho wellfield); Kwale (dependent on the Tiwi wellfield); and Wajir (dependent on the Merti aquifer); as well as Naivasha, Nakuru, Mandera, and Lodwar (Mumma et al. 2011).

Groundwater is also important in harnessing geothermal energy, particularly at Olkaria Geothermal Plants. Waterwells are drilled to tap steam and water at high temperatures. The steam is then piped to a turbine, which rotates a generator to produce electricity (KenGen, 2020).

The main aquifers in Kenya are closely linked with four major rock systems (i.e. volcanic rocks; basement metamorphic rocks; intrusive igneous rocks; and quaternary sedimentary rocks) which governs the occurrence and characterisation of the groundwater resources in the country (NEMA, 2010). A summary of the aquifer type and the hydrological productivity is shown in Figure 3-3. The volcanic and quaternary geological formations are particularly rich in groundwater (NEMA, 2010) (BGS, 2011)

FIGURE 3-3. KENYA AQUIFER TYPE AND PRODUCTIVITY



Source: (BGS, 2011)

The Water Resources Authority (WRA) classifies the various aquifers in the country into broad categories with respect to their perceived importance (Table 3-1). The classification was developed to help in determining the quality and quantity of each aquifer considering its value and vulnerability to different management practices (NEMA, 2010).

TABLE 3-1. THE WATER RESOURCES AUTHORITY'S CLASSIFICATION OF KENYA'S AQUIFERS

Class	Description	Examples
Strategic aquifer	Aquifer used to supply significant amounts/proportions of water in each area and for which there are no available alternative resources, or where such resources would take time and money to develop.	Tiwi, Nakuru, Nairobi, Sabaki, Lake Naivasha and Lamu Island
Major aquifer	High-yield aquifer systems with good water quality	Daua and Mt. Elgon volcanic rock aquifers
Minor aquifer	Moderate-yield aquifer with variable water quality	Mandera- Jurassic (Mesozoic Palaeozoic)
Poor aquifer	Low-to negligible-yield aquifer system with moderate to poor water quality	Basement system
Special aquifer	Aquifer system designated as such by the Authority	Isinya

Source: (NEMA, 2010)

Apart from the strategic and major named aquifers, it is worth noting that some of the minor aquifers form vital local resources. Some aquifers, mostly those with hydraulic connection and recharge from fresh water rivers, are excellent groundwater sources such as the Lodwar aquifer that is recharged by the Turkwel river; the Merti aquifer that is recharged by the Ewaso river; the Gongoni aquifer that is recharged by the Mkurumudzi river and the Baricho aquifer that is recharged by the Galana river.

Many of Kenya's aquifers have groundwater quality issues. For example, the Nairobi aquifer has high fluoride concentrations, which mostly exceed WHO standards, especially towards the Embakasi area. The Lotikipi aquifer is very saline with conductivity exceeding 8,000 µS/cm (Barasa, 2018). The Mombasa island Pleistocene sands and limestones and related aquifers are impacted by pollution and saline intrusion. The Mumias granite aquifer is impacted by mostly anthropogenic pollution and salinisation (Barasa, 2018).

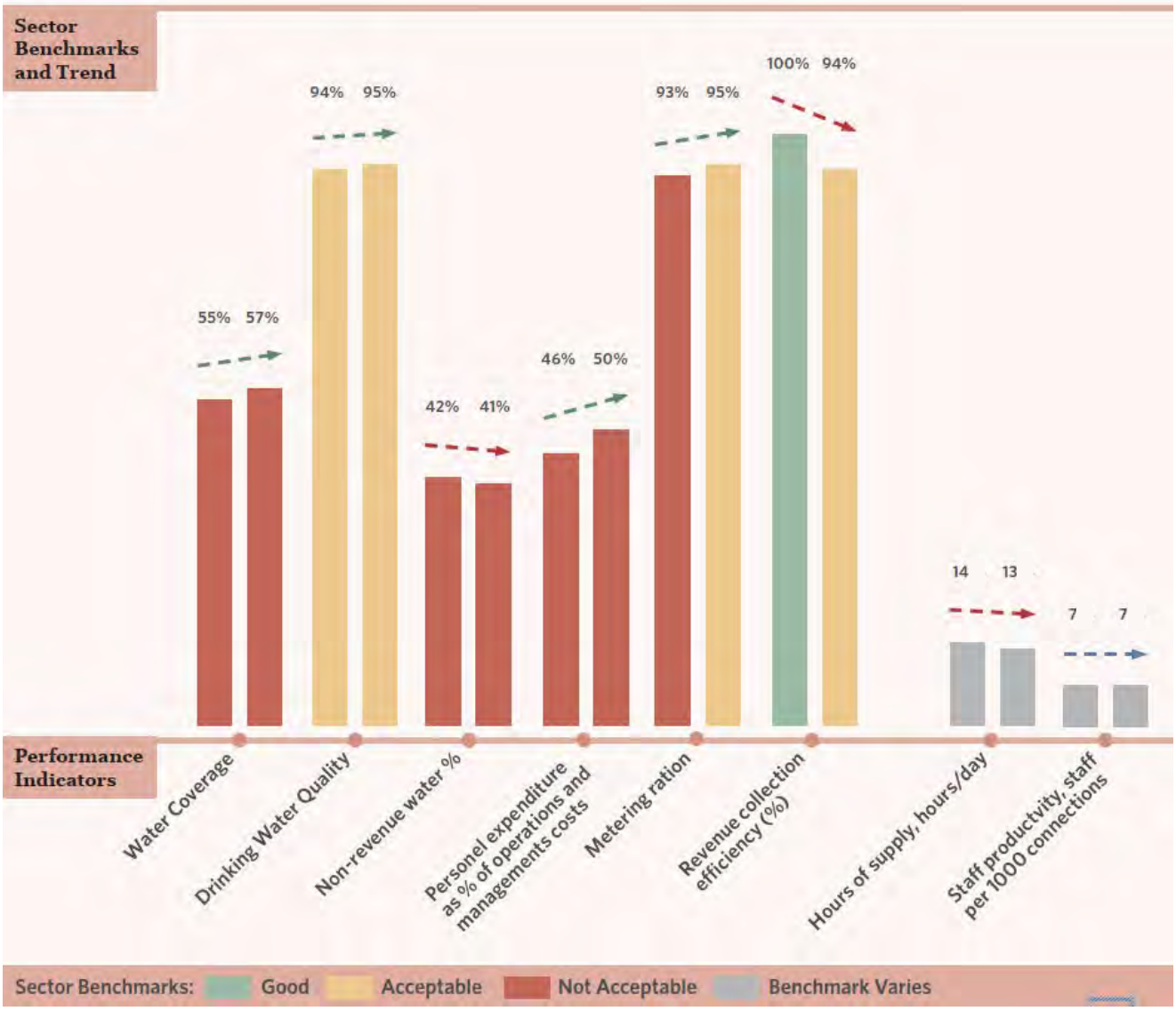
The connectivity between surface water and groundwater systems commonly gives rise to contamination problems. For example, poor sewerage and drainage systems, pit latrines and soakaways, industrial discharges to rivers, agricultural practices and mining-related activities can all result in groundwater contamination.

3.1.3 WATER DISTRIBUTION

There are currently 88 devolved water service providers (WSPs) which are either publicly owned by the County Governments or privately owned. The function of WSPs is to distribute water to the public. These 88 WSPs are regulated and licensed by Water Service Regulatory Board (WASREB). Public utilities serve a wide range of customers across all income demographics, whereas privately-owned utilities have a more homogenous medium-to-high-income customer base, only covering a small population. There are only two privately-owned utilities regulated by WASREB: Runda Water Company and Kiamumbi Water Project.

It is worth noting that there are many other privately-owned community water schemes especially in the rural area which are not regulated by WASREB. Annual performance analysis for all the water utilities is undertaken by WASREB using a set of performance indicators, as outlined in the National Water Services Strategy. Figure 3-4 highlights these indicators as well as the performance in the financial year[8] periods of 2016/17 and 2017/18 (WASREB, 2019). In the figure, the bars are in pairs and each show the two financial year periods.

FIGURE 3-4. WATER UTILITIES PERFORMANCE INDICATORS BETWEEN 2016/17 AND 2017/18



Source: adapted from (WASREB, 2019)

8 WASREB's reporting period runs from the July to June

The indicators monitored by WASREB include (WASREB, 2019):

- Water coverage refers to the number of people served with drinking water expressed as a percentage of the total population within the service area of the utility. During WASREB's 2019 review, the population area of the 88 utilities was 22.85 million and out of this, the utilities were able to serve 12.93 million people, representing 3.23 million households (WASREB, 2019). The water coverage under the year of review was 57%.
- 'Metering ratio' is the number of connections with functional meters expressed as a percentage of the total number of active water connections. In 2017/2018, the metering ratio increased by 2%. Mombasa County is among the water utilities with high levels of dormant connections at 59% (WASREB, 2020a).
- 'Drinking water quality' measures the portability of water supplied by a utility. This indicator measures compliance with residual chlorine standards (40%) and bacterial standards (60%). Improved performance in the indicator was a result of compliance levels in respect to residual chlorine, a situation attributed to an improvement in compliance levels from 93% to 99%. Bacterial compliance remained unchanged for both compliance with several samples taken as well as compliance with samples to set standards.
- Hours of supply refers to the average number of hours per day that a utility provides water to its customers. It measures the continuity of services of a utility and thus the availability of water to the customer.
- Non-Revenue Water is the difference between the amount of water put into the distribution system and the amount of water billed as authorized consumption. It comprises both commercial (apparent) losses and physical (real) losses.

3.2. WATER DEMAND

Based on the 2019 census data, the projected population for the year 2030 was estimated to increase to 63.8 million (KNBS, 2017); a 34% growth from the 2019 population of 47.6 million. The **implication of the estimated increase in population will result in a significant increase in water supply demand and associated issues, including water and sanitation services as well as finance needs. Water and sanitation service provision has been devolved to the county governments by Kenya's constitution. However, the counties continue to face challenges such as insufficient investment (across the water infrastructure system in general and at a community level), as well as the efficient use of funds available for the sector** (WASREB, 2019).

Given that water security is expected to deteriorate with future climate change, adaptation and improved resilience actions in this sector are particularly important (IPCC, 2011). Additionally, due to Kenya's growing population, higher water efficiency will be required to increase food production. Adaptation measures that could be easily adopted include investing in water storage facilities such as dams at a national and county level, as well as storage tanks at the household level could help to reduce water scarcity and make water available for other uses such as irrigation and industrial use. Encouraging farmers to apply water-saving techniques such as drip and sprinkler irrigation methods is important in reducing the quantity of water used to produce crops.

The country faces water shortages in nearly all areas; in particular, Arid and Semi-Arid Lands[9] (ASAL) regions and in urban areas. Vulnerable people are disproportionately affected by water shortages – which is further aggravated during droughts, particularly women and children as they are generally tasked with sourcing water for domestic use (KCIC, n.d).

9 Arid environments are extremely diverse in terms of their landforms, soils, fauna, flora, water balances, and human activities. Because of this diversity, no practical definition of arid environments can be derived. However, the one binding element to all arid regions is aridity. Aridity is usually expressed as a function of rainfall and temperature. Annual rainfall in arid areas ranges between 150mm and 550mm per year, and in semi-arid areas between 550mm and 850mm per year. Temperatures in arid areas are high throughout the year, with high rates of evapo-transpiration. In Kenya, ASAL's occupy 89% of the country (David & Katua, 2013).

3.3. WATER RESOURCES SUPPLY AND DEMAND FOR FORECAST PLANNING

In the development of the Government of Kenya's National Water Masterplan 2030, water demand for domestic use, irrigation, livestock, wildlife and inland fisheries was estimated for 2030 and 2050 (using a baseline of 2010 data). Table 3-2 shows that **predicted water demand is expected to increase by 619% by 2050 compared to a 2010 baseline, with the irrigation sector showing the highest percentage increase across all sectors (1,127%). This increase is of importance given the sensitivity of the agricultural sector to the potential adverse impacts of climate change and its role for food security and the economy.**

The water balance study also included possible planned irrigation areas by the government which would increase the water demand for irrigation in the future. Urbanisation and projected population growth are also expected to increase water demand in the domestic, industrial and irrigation sectors. All the other sectors assessed by WASREB show an increase in demand from 2010 to 2050, except for the wildlife sector, where the demand remains constant.

Agriculture is the backbone of Kenya's economy contributing to 33% of its GDP, more than 40% of employment and an additional 27% to GDP through linkage to other sectors such as manufacturing, distribution and services (MoAL&F, 2019). Vision 2030 has set a national goal of increasing the total irrigated area to 1.2 million ha by 2030 from 141,900 ha in 2010 (public, small-holder and private irrigation schemes are included in the plan). The criteria for determining the future irrigation areas consider the four types of irrigation methods: weir, dam, groundwater and water harvesting irrigation (small dam or water pan). Therefore, the water demand for irrigation purposes as shown in Table 3-2 will significantly increase by 2030 and even more so by 2050.

TABLE 3-2. SUMMARY OF PRESENT AND FUTURE WATER DEMAND IN KENYA BY SECTOR

Sector	2010 water usage (MCM[10]/year)	Predicted 2030 water demand (MCM/year)	Demand growth between 2010 and 2030 (%)	Predicted 2050 water demand (MCM/year)	Demand growth between 2010 and 2050 (%)
Domestic	1,186	2,561	116%	3,657	208%
Industrial	125	280	124%	613	390%
Irrigation	1,602	18,048	1,127%	18,048	1,127%
Livestock	255	497	95%	710	178%
Fisheries	42	74	76%	105	150%
Wildlife	8	8	0%	8	0%
Total	3,218	21,468	567%	23,141	619%

Source: Adapted from (WASREB, 2013a)

The available water resources versus demand for the six main drainage basins in Kenya is outlined in Table 3-3 for the year 2010, including estimates for years 2030 and 2050; for **the base year (2010) this was 22,564 MCM/Year, which is expected to increase by 18% and 26% by 2030 and 2050, respectively** (WASREB, 2013b). Even though water resource is expected to increase in all the sub-basins[11] in the future, as does the demand for water at an increasing rate. The findings in Table 3-3 therefore **emphasises the tight water balance for all catchments across the country.**

10 MCM - million cubic metres

11 Note, water resource availability in Ewaso Ng'iro in 2050 is the exemption to this; based on the findings in the National Water Master Plan 2030, this catchment is expected to have less water resource availability in 2050 compared to 2010. No explanation was provided in this report for the decline.

BOX 3-1. EWASO NG'IRO NORTH CATCHMENT FUTURE WATER BALANCE

The National Water Master Plan 2030 outlined the 2010 water demand in Ewaso Ng'iro North catchment area to be 212 MCM compared to water resource availability of 2,559 MCM. However, by 2030, the predicted demand is expected to be 2,857 MCM, whereas availability will be 3,011 MCM (a water balance ratio of 95%).

This increase in demand is as a result of an estimated population rise from 3.87 million to 4.40 million and irrigation area expansion from 7,896 ha to 150,561 ha (an area approximately 19 times larger).

Whilst all the sub-basins show water surpluses in 2010, by 2030 and 2050, water deficits are predicted for some of the sub-basins, most notably in the Athi and Tana sub-basins. Water requirement to water availability ratios of greater than 40% highlight stressed catchments; the projected 2030 and 2050 scenarios show catchments (excluding the Lake Victoria North) with very stressed outlooks (WASREB, 2013a). This is mainly attributed to planned large scale irrigation projects as well as population increases in the catchment areas. For example, Box 3-1 provide an example for the Ewaso Ng'iro North catchment. An integrated water resources management approach with consideration of the water requirement and availability is required to maintain a sustainable water balance.

In the revisions to the Water Act in 2016, the sector was reformed with the establishment of the WRA, as well as a change in the management system which moved to a catchment-based approach. This improved the management ability to address basin-specific climate change related challenges. The Master Plan acknowledges the challenges of floods and droughts and the development of the Government's National Climate Change Response Strategy. This Water Sector review has assessed how the Master Plan has incorporated risk quantification and management of climate variability and change into the water balances and water management plans. A summary and review of the water balances, water development and management plans as per the Water Masterplan report are presented below:

Water requirements:

- Water requirements have been developed in line with planned economic growth, but without adequate consideration of the water resources available to drive the growth. The water balances have subsequently been utilised to revise the projected development plans, particularly for irrigation (WASREB, 2013b).
- Supply criteria of 1 in 10 have been selected for domestic and industrial supply and 1 in 5 for irrigation. This is assumed to be a failure of supply once in 10 years and once in 5 years respectively.
- The reserve, which is for ecological sustainability and basic human needs, has been determined and considered. The reserve amount was set at a 95% value of the naturalised daily flow duration curve for each river in accordance with WRMA Guidelines for Water Allocation and the probability applied is 1 in 10 years which was determined based on the discussion with WRMA.
- The master plan has also identified the prioritisation of water allocation. This is assumed to be applicable both for periods when there is insufficient water over the short term due to drought, and for the prioritisation of water resources allocation over the long term as water resources become stressed. This prioritisation is in line with general international good practices.
- The National Masterplan has not addressed the national irrigation potential and its water requirements adequately (WASREB, 2013b).

Water Resources:

While water resources and associated balances are presented at the basin scale in the summary of the master plan in Table 3-3, they have been quantified in the following more detailed manner:

- A monthly water balance of 20 years for two different development levels: 2010 and a projection for 2030. This balance was calculated using a monthly time step model using naturalised monthly average hydrology and water requirements.
- The calculated balance deficits in supply for all main users on surface water is based on current infrastructure and then tested against potential development options, where available, to meet projected water requirements. This again considered a 1/10 reliability for domestic and industrial supplies and 1/5 for irrigation.
- Groundwater was handled in a separate balance to surface water after an initial process of allocation portions of the total water requirements to groundwater and surface water resources.

The available water resource is defined as the total of annual surface water runoff and a suitable yield of groundwater resources. In a study undertaken by JICA during the development of the National Water Masterplan, a Similar Hydrologic Element Response model was used which simulates basin-scale hydrological cycle, including groundwater recharge and estimating future renewable water resources.

The water balances in the Masterplan have considered the following:

- Continuous monthly modelling of water resources with upstream and downstream impacts of developments and increased abstractions within a river system considered.
- Risk associated with climate variability being considered and quantified to achieve reliability of 1/10 and 1/5 for the domestic and industry, and irrigation users, respectively.
- The provision for the reserve and the prioritised allocation of water to users of greatest socio-economic importance.
- The inclusion of climate impacted hydrology and thus water availability for future scenarios. In the case of Kenya, this results in an increase in availability in many catchments.
- The above practices are sound and reduce the risk associated with long-term water availability if the plans are followed. There are, however, some matters that can be improved and aligned with best practice as follows:
- The inclusion of only 20 years hydrological record is relatively short but is in line with the reliability criteria set of 1/10 and 1/5 for the various users. Ideally, a longer record should be utilised that captures a greater range of climatic variability and droughts and floods. It should be acknowledged that a record of greater than 50 years is typically desirable, particularly for establishing higher reliability of supply and when considering the impacts of climate change to correctly take into account the rate of change.
- A reliability of supply for domestic and industrial users of 1/10 is assumed to be a failure of once every ten years. This is a low reliability for such users, as a target of 1/50 is used in some other African Countries (e.g. South Africa) (RSA, 2013). Furthermore, a single reliability target does not clearly define how much water should be achieved during times of failure, e.g. the one year in ten, and ideally, a portion of the water requirements associated with the highest socio-economic needs (e.g. to maintain basic services and business function) should be assigned a higher priority, so that this supply should be maintained and protected during drought periods.
- The above two points are discussed further in Chapter 7 around opportunities and future developments, and recommendations are suggested on some possible assessments to check the impacts of the current approach versus the best practice.

Table 3-3. Available water resources and demands by catchment area in Kenya for the period 2010-2050

Catchment Area	2010 unit: MCM/year			2030 unit: MCM/year			2050 unit: MCM/year		
	Water Resources	Water Demand	Water balance (%)	Water Resources	Water Demand	Water balance (%)	Water Resources	Water Demand	Water balance[12] (%)
Lake Victoria North	4,742	228	5%	5,077	1,337	26%	5,595	1,573	28%
Lake Victoria South	4,976	385	8%	5,937	2,953	50%	7,195	3,251	45%
Rift Valley	2,259	357	14%	3,147	1,494	47%	3,903	1,689	43%
Athi	1,503	1,145	76%	1,634	4,586	281%	2,043	5,202	255%
Tana	6,533	891	14%	7,828	8,241	105%	7,891	8,476	107%
Ewaso Ng'iro North	2,559	212	9%	3,011	2,857	95%	1,810	2,950	163%
Total	22,564	3,218	14%	26,634	21,468	81%	28,437	23,141	81%

Source: Adapted from (WASREB, 2013a)

3.4. SANITATION SERVICES AND MANAGEMENT IN KENYA

In 2010, the United Nations General Assembly recognised access to safe and clean drinking water and sanitation as a human right and called for international efforts to help countries to provide safe, clean, accessible and affordable drinking water and sanitation. While substantial progress has been made in increasing access to clean drinking water and sanitation, billions of people, mostly in rural areas still lack these basic services. Worldwide, one in three people do not have access to safe drinking water, two out of five people do not have a basic hand-washing facility with soap and water and more than 673 million people still practise open defecation (UN, 2020b).

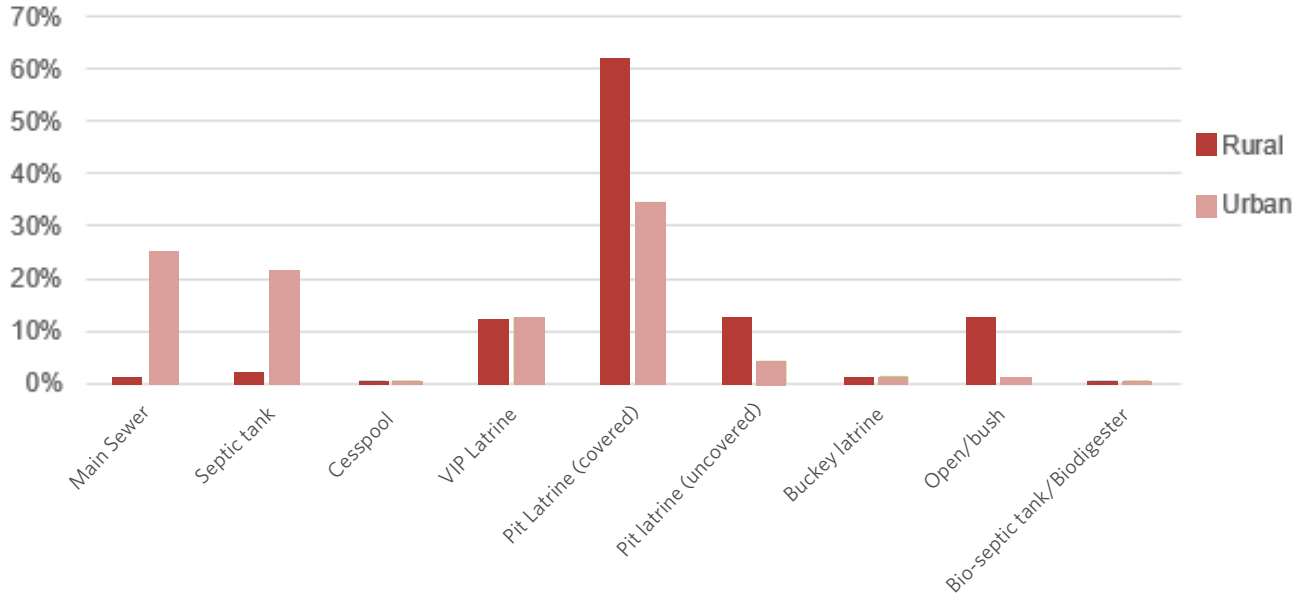
The MWS&I is responsible for the sewer and non-sewer sanitation services sub-sector; it deals with policy formulation, regulation, development of public sewer infrastructure and frontline provision of sewerage services and technologies. It focusses on the provision of reasonable standards of sanitation in line with the Constitution. The Ministry's role is also to provide sector coordination, oversight and technical quality assurance for sanitation investments (MWS&I, 2021). The Water Works Development Agencies (WWDAs), have the responsibility of development, maintenance and management of water and sewerage infrastructure (MWS&I, 2021).

In the 2019 Census, it was identified that more than half (51.2%) of the households in Kenya were reliant on covered pit latrine as their sanitation facility; the breakdown of this figure by urban and rural households was 34.4% and 61.7%, respectively. The other modes of human waste disposal are outlined in Figure 3-5. It was also identified that across the country, 7.3% of households in Kenya lack sanitation facilities equating to roughly 4.7 million people, whose method of human waste disposal is via open/bush disposal. This is higher in rural areas (11.5%) than in urban areas (0.8%) (KNBS, 2019b). Compared to the data from the previous census, a slight reduction on open/bush disposal was recorded which previously stood at 8.4% at a national level, and 13.9% in rural areas and 1.4% in urban areas (KEWASNET, 2019).

The same census also found that the most common mode of solid waste disposal was burning in the open, used by 27.1% of households in Kenya (KNBS, 2019b).

12 This is the water demand/water resource ratios.

FIGURE 3-5. PERCENTAGE DISTRIBUTION OF HUMAN WASTE DISPOSAL IN KENYA BY RURAL AND URBAN POPULATIONS, BY HOUSEHOLD, 2018



Source: (KNBS, 2019b).

In urban areas, sanitation is further compounded by the inter-linkages with other services including storm water drainage, solid waste and water supply. For example, a World Bank study found that there were areas of the country that had a high groundwater table and shallow water wells which were the main source of water for domestic and livestock use. In these situations, it makes the use of simple pit latrines unfeasible as this would lead to ground water contamination. In Wanji, as an example, the study found that instead of these types of latrines, approximately 68% of the 100,000 residents use bucket latrines. However, during the rainy seasons where instances of storm water and flooding is common, bucket latrine overflow resulting in the contamination of the shallow wells; this often leads to outbreaks of waterborne diseases in the area, in particular cholera (World Bank, 2018b).

A 2019 study, undertaken by the Kenya Water and Sanitation Civil Society Network (KEWASNET), that assessed the types of projects supported in the sanitation sub-sector in the 2018/19 financial year, found that the majority of the projects supported by both government and non-governmental organisations included those improving basic handwashing facilities and sanitation facilities. This latter initiative included improvements to and the incorporation of ventilation into latrines. More advanced sanitation technologies such as flush toilets (pour-flush and cistern flush) and biogas digesters were also being promoted in Kenya to varying degrees (KEWASNET, 2019).

Government partners such as UNICEF Kenya have been working on increasing children and families' access to safe water and basic hygiene especially in the arid and semi-arid areas where these services are lowest.

3.5. IRRIGATION SECTOR IN KENYA

Irrigation is one of the methods used in the agriculture sector to boost crop production in order to cater for the growing population in Kenya. Irrigation can assist in agricultural diversification, enhance food self-sufficiency and provide employment opportunities where water is a constraint. Kenya has only developed approximately 180,503 ha of irrigation land which is about 13.5% of the potential land under irrigation. This is attributed to the development challenges and constraints in the sub-sector such as inadequate water for irrigation, inadequate development of water infrastructure and inadequate funding for irrigation development.

The economic pillar of Kenya's Vision 2030 recognises the contribution of irrigated agriculture to the achievement of the 10% annual growth of the economy by increasing food production. Food security which is among the Big Four agendas relies on rainfed and irrigated agriculture to achieve the 100% food and nutrition security.

Photo by Adobe Stock | River in Kibera, Nairobi, Kenya

Various policies, legislations, strategies and guidelines have been developed to increase irrigation capacity in the country. This include the Irrigation Act, 2019, the Draft Irrigation (General) Regulations, 2020, Guidelines for Promotion, Development and Management of Irrigation in Kenya and the draft National Irrigation Services Strategy, 2021. The National Irrigation Authority was established under the Irrigation Act, 2019 to improve irrigation infrastructure for national or public schemes.

Irrigation schemes in Kenya are categorised into public irrigation schemes, smallholder irrigation schemes and private commercial farms. There are several public and private irrigation schemes in different parts of country. In the Nile basin, these include Bunyala Irrigation Scheme, Ahero and West Kano. Irrigation schemes in this area are achieved through run-off river water, water pans and small dams (NBI, 2017). In the ASAL regions, irrigation has been used in some areas to enhance food production. Private commercial farms or estates produce high-value crops, such as floriculture and horticulture crops mainly for export. The irrigation technologies used by the private commercial farms include centre pivots, sprinklers and drip irrigation (Ngugi, n.d).

WATER FOOTPRINTS OF MAJOR CROPS GROWN IN KENYA

Water footprint is a flexible indicator used to understand the water consumed and polluted in producing goods and services, the impact of that water use in maintaining environmental water requirements and water quality standards, and the opportunities for improving water efficiency and land productivity (WFN, 2016). The footprint refers to green water[13] (rain) and blue water[14] (surface water and groundwater). This chapter provides an overview of water use in Kenya, from the perspective of the goods produced within the country, the consumption of goods in particular agricultural crops, by Kenyans and whether these goods are produced domestically or imported from other countries. The analysis in this chapter was sourced from Water Footprint Network's publication productivity (WFN, 2016).

Approximately 76% of the annual blue water footprint of production is used for products used within Kenya while 24% is used in producing products for export; whereas 85% of the annual green water footprint of production is for products used within Kenya and 15% is used in producing products for export (WFN, 2016).

In Kenya, different crops have different water footprints when considered in the context of global production. Tea and coffee are the two most valuable export crops from Kenya. Tea produced in Kenya has a comparative advantage globally in terms of the efficiency of land and water resources used in its production. Tea is primarily dependent upon green water resources. The comparison with the global benchmark indicates that tea production is water-efficient, i.e., the water consumed in producing tea has a high-water productivity[15].

Coffee production in Kenya has an average green and blue water footprint, higher than the global average, indicating that there is significant room for improvement. If coffee is to remain an important export crop, agricultural practices to increase the water productivity per hectare need to be implemented.

Rice grown in Kenya has the largest proportional blue water footprint of all major crops. Its green+blue water footprint exceeds the global benchmark both for the 25th percentile and the average (WFN, 2016). While rice production quantities are moderate, improving the productivity of land and water resources used in rice production will increase the sustainability of its production while promoting other more water-efficient starches.

Sugar cane is the crop with the largest production volumes in Kenya and has a green+blue water footprint better than the global benchmark. The Water Footprint Network report indicates that the land and water resources used in sugar cane production have a high productivity and sugar cane grown in Kenya has a comparative advantage globally (WFN, 2016). Maize uses most of green water in Kenya with 36% of the total crop green water consumed in its production. In comparison with the global benchmark there are significant opportunities for increasing water use and land efficiency through improving yields per unit of water consumed in maize production.

13 Green water is water from precipitation that is stored in the roots and evaporated or transpired by plants.
14 Blue water is water sourced from surface or ground water resources and is either evaporated or incorporated into a product.
15 Water productivity is capacity to produce more food (in the case more tea) from each unit of water.

The water footprint related to horticulture (cut flowers, vegetables and fodder) production in Lake Naivasha summed up to 102Mm^3/year in 2010, in a report published by UNESCO-IHE Institute for Water Education. Cut flowers accounted for about 43% of the irrigated area, followed by vegetables at 41% and fodder at 15%. Cut flowers take a large share of the water footprint related to crop production in Lake Naivasha contributing to 98% and 41% of the total blue and total water footprint, respectively. Water is extracted directly from the lake, groundwater and the rivers feeding the lake for irrigation purposes. Commercial farms have been blamed for putting the lake's biodiversity at risk due to decline in the water levels through abstraction and pollution (Mekonnen & Hoekstra, 2010).

3.6. WATER HARVESTING AND STORAGE

There is limited water storage infrastructure in Kenya, hence surface water run-off during long rains seasons is wasted. Investing in additional water storage facilities such as tanks and distributing dams evenly in the counties is necessary to tap and store run-off water. Policies should encourage water storage at the household level and the government could provide incentives to enable people to afford water harvesting equipment such as gutters and water tanks.

There are several completed and ongoing dams and water pans by the National Water Harvesting and Storage Authority. The dams in the country are used to store water, control flooding and generate electricity. Some of the major dams in Kenya are shown in Table 3-4.

Photo by Adobe Stock | Irrigation scheme, Mount Suswa, Kenya

TABLE 3-4. STATUS OF SELECT MAJOR DAMS IN KENYA

Dam	Location	Installed Capacity	Purpose	Status
Umaa Dam	Kitui County	870,000m^3	Household and irrigation use	Ongoing construction
Chemususu Dam	Nakuru County	15 million m^3	Household and irrigation use	Proposed
Soin-Koru Dam	Muhoroni	Unknown	Household and irrigation use	Ongoing construction
Siyoi-Muruny Dam	West Pokot	Unknown	Household use	Ongoing construction
Maruba Dam	Machakos County	Unknown	Household, irrigation use	Operational
Badasa Dam	Marsabit County	Unknown	Household, irrigation use	Incomplete
Kamburu Dam	Embu/Machakos Counties	123 million m^3	Hydroelectric Power supply	Operational
Masinga Dam	Machakos	1.5 billion m^3	Hydroelectric Power supply	Operational
Kiambere Dam	Kitui County	Unknown	Hydroelectric Power supply	Operational
Kindaruma Dam	Embu/ Kitui County	Unknown	Hydroelectric Power supply	Operational
Gitaru Dam	Kiambu County	16 million m^3	Hydroelectric Power supply	Operational
Ndakaini Dam	Muranga County	Unknown	Hydroelectric Power supply	Operational
High Grand Falls Multi-purpose Dam	Kitui, Embu and Tharaka Nithi	Unknown	Unknown	Unknown

Source: (NWHSA, 2021)

Photo by Adobe Stock | Garsen,, Kenya

Photo by Adobe Stock | Pink Flamingos, Kenya

4. Climate change impacts in Kenya's water sector

4. CLIMATE CHANGE IMPACTS IN KENYA'S WATER SECTOR.

There is enough evidence to suggest that climate change is occurring and more importantly the cost of not doing anything to combat it could cost the world trillions of dollars and the extinction of approximately 40% of plant species. Climate change is already affecting water access and quality for people globally, either through severe flooding or water scarcity (World Bank, 2019b).

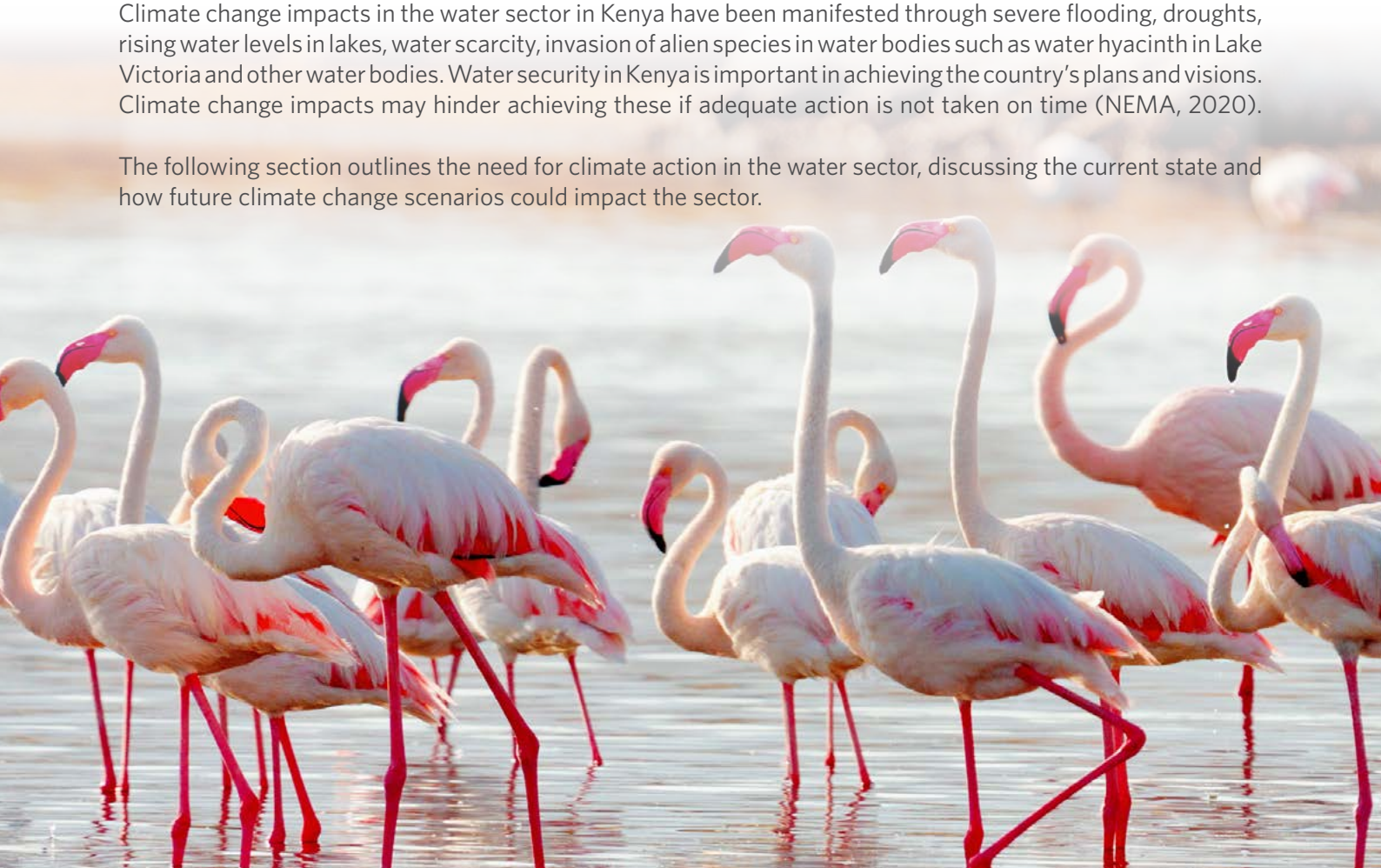
Climate change impacts on water availability are a consequence of the rising global temperatures which change the water cycle by influencing when, where and how much precipitation falls and evaporates, and such water is not always available when and where people need it. Furthermore, the impact of climate change on **water would result in supply cost increases in the future** not only because of climate change but also due to the increased demand on a reduced resource.

In Kenya, current climate change impacts on water availability are compounded by deforestation, unsustainable agricultural practices, low storage capacity (such as dams), as well as an increase in water demand from population growth and an expanding economy (MWS&I, 2018a). There is need for urgent climate change action in the sector to prevent the adverse impacts now and in the future. This can be achieved through allocating more resources for forecasting extreme climate events to help early planning, mitigation, and effective response.

Water managers have long dealt with the changing demands on water resources by typically assuming the natural resource base is reasonably constant over the medium term and therefore, past hydrological experience provide a good guide to the future. Climate change challenges this conventional assumption and may alter water reliability. Management responses to climate change include the development of new approaches to system assessment and design, and non-structural methods (IPCC, 2008) and (IPCC, 2014a). These aspects alongside various options for strengthening the resilience of the water sector in Kenya in terms of both supply and demand management are further presented in Section 7.

Climate change impacts in the water sector in Kenya have been manifested through severe flooding, droughts, rising water levels in lakes, water scarcity, invasion of alien species in water bodies such as water hyacinth in Lake Victoria and other water bodies. Water security in Kenya is important in achieving the country's plans and visions. Climate change impacts may hinder achieving these if adequate action is not taken on time (NEMA, 2020).

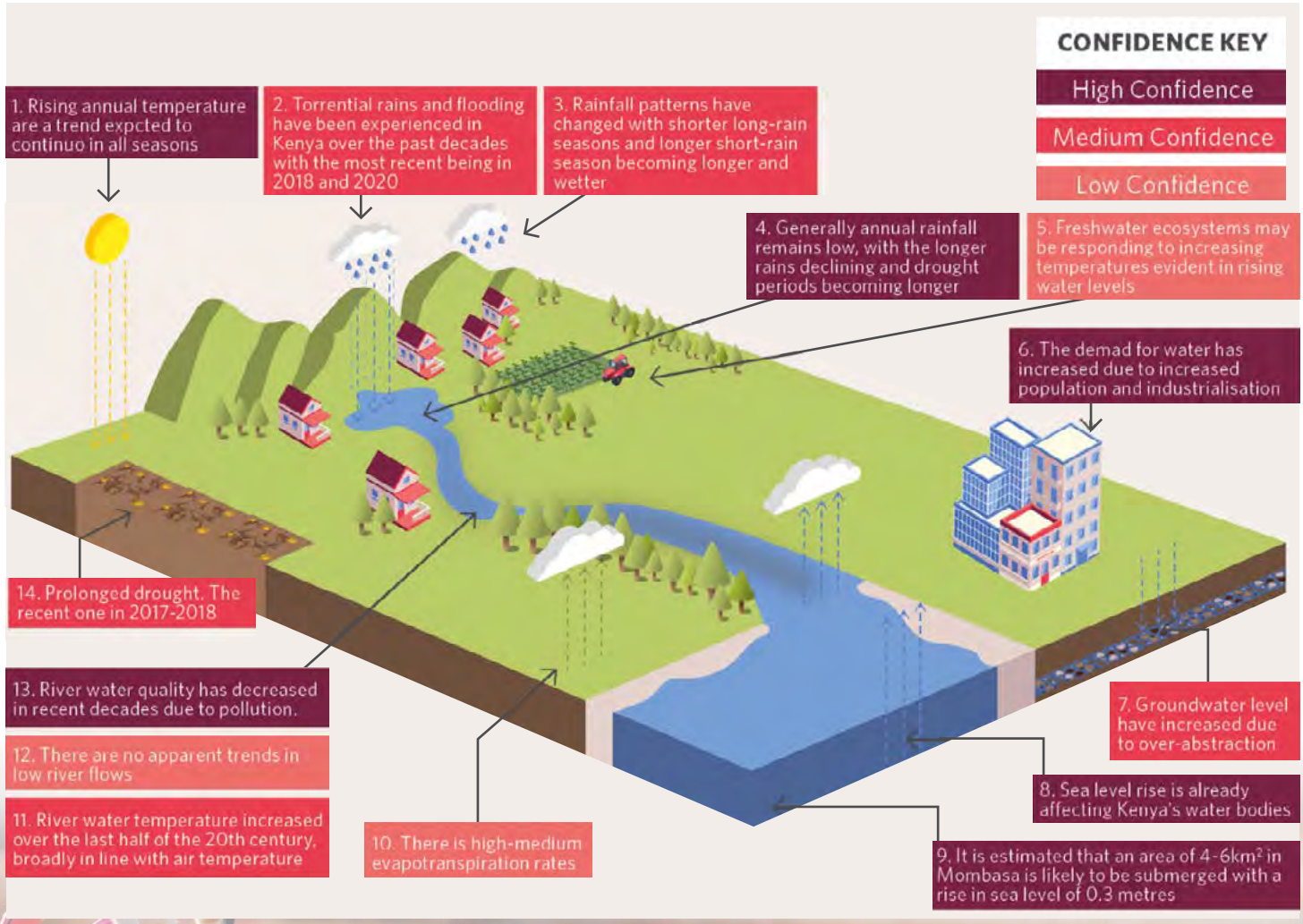
The following section outlines the need for climate action in the water sector, discussing the current state and how future climate change scenarios could impact the sector.



4.1. EXPECTED CLIMATE CHANGE IMPACTS ON WATER AND THE NEED FOR CLIMATE ACTION

A summary of the impacts of climate change in Kenya is outlined in Figure 4-1 and further presented below.

FIGURE 4-1. CLIMATE CHANGE IMPACTS IN KENYA



Source: AECOM - developed from various sources: (NERC, 2016), (GOK, 2018c), (IPCC, 2014a)

4.1.1 INCREASE IN RAINFALL AND INTENSITY

Future climate change projection models show that **mean annual rainfall in Kenya will increase** to 750mm and 801mm in 2030 and 2050, respectively. This is projected from the outputs of General Circulation Models (GCMs) of phase 3 of the Coupled Model Intercomparison Project[16]. Eleven GCMs obtained were used for the future projection of Kenya's climate for the years 2030 and 2050 (WASREB, 2013a). However, **climate change is anticipated to give rise to a greater spatial-temporal variability of precipitation patterns**, which may cause changes to the traditional rainfall seasons currently experienced and disruption to runoff patterns; greater intensity precipitation events are also expected (WASREB, 2013a). All models show that, by 2100, there will be more intense rains during wet seasons making flooding more common and severe (see Section 4.1.4. below).

4.1.2 INCREASE IN SURFACE TEMPERATURE

The earth's temperature has increased on average 0.6°C ever since temperature measurements were taken in the 1800s. An increase in surface air temperature will also be experienced in the future with an increase of around 1˚C by 2030 and 2˚C by 2050. Climate models indicate a global temperature increase of 1.4 – 5.8°C (2.5 – 10°F) by 2100 (Hoekstra et al., 2004). Decreased annual surface water run-off from 2030 to 2050 is supposed to be largely affected by the temperature rise predicted from climate change analysis with sharper increases in evapotranspiration. The combination of rapid runoff, floods and increased evapotranspiration will result in less water for recharge to aquifers and therefore a reduction in potential groundwater storage and availability.

4.1.3 INCREASE IN DROUGHT AND WATER SCARCITY OCCURRENCES

Drought is a naturally occurring phenomenon that exists when precipitation is significantly below normal recorded levels causing a serious hydrological imbalance that adversely affects land resource production systems (UNEP, 2000). Water scarcity is the lack of freshwater resources to meet the standard water demand. It can be brought about in periods of drought. Fourteen countries in Africa are already experiencing water scarcity and nearly 50% of the continent's predicted population of 1.45 billion people will face water stress or scarcity by 2025 (WWF, 2019b).

In Kenya, the climate impact on water resources are largest in the marginal rainfall areas of the country. In the last 100 years, Kenya has recorded over 30 drought events[17]. The result has been total crop failures and livestock deaths triggering severe food shortages in the country and more specifically in ASAL districts (Huho & Mugalavai, 2010).

Periods of intense drought may cause harvests to fail, which leads to food scarcity and dramatic food price rises. During times of water scarcity, the cost of 90 kilogram of maize, a food staple, rises from around KES3,000 to above KES4,000. Increased food prices make it very difficult for people with low income to afford food and a balanced diet (National Treasury, 2020). Long-term drought can therefore lead to malnutrition among poorer communities (Hayes, 2007).

Severe droughts have also led to water shortages in both urban and rural parts of the country resulting in reduced hydropower generation and power rationing. Widescale impacts can have knock-on impacts on economic productivity and can cause decreases in national GDP, as experienced in 2000 when drastic power rationing was imposed causing Kenya Power Company to lose US$20 million. Consequently, the economy was paralysed, and the national GDP contracted by 0.3% (Mbogo I. &., 2014).

Drought can also lead to increased regional conflict, particularly where there are shared transboundary aquifers and rivers for example along the Mara river. As the river flows change, regional conflicts amongst countries that share these rivers can increase. Local conflicts within a country can also increase as highlighted by the Red Cross (TRT, 2019).. Case studies highlighting recent conflicts are outlined in Box 4-1 and Box 4-2.

16 Coupled Model Intercomparison Project (CMIP) is used to better understand past, present and future climate change scenarios arising from natural, unforced variability or in response to changes in radiative forcing in a multi-model context.

17 Huho & Mugalavai reported 28 droughts as of 2010; 2 additional records of droughts have been identified in other literature since this time, which is how the number 30 was derived.

A recent study by Haile et. al (2020) found that the **projected temperature increases across East Africa would have devastating impacts in the areas already affected by extreme drought due to increased intensity**. In Kenya, the ASAL areas that usually experience droughts, are therefore likely to experience increases in duration, frequency and intensity of droughts. However, regions of the country that already experience high rainfall are likely to experience increased rainfall, thus making them even less likely to experience droughts, but instead suffer from flooding (Haile, et al., 2020).

Section 7 of this document describes various options for strengthening the resilience of the water sector in Kenya in light of drought and water scarcity challenges.

BOX 4-1. RECENT EXAMPLES OF DROUGHTS IN KENYA

In 2017, the Kenyan government declared a national emergency due to a drought that impacted 23 counties. Approximately 2.7 million people needed food-aid, which represented 20% of the population in pastoral areas and 18% in marginal agricultural areas. Pastoralists in counties like Turkana Isiolo, Garissa, Wajir, Mandera, Marsabit, Tana River, Samburu, Kitui and Baringo were the most affected. At the time of the drought, the Red Cross Kenya also reported an increase in local conflicts and violence among communities over grazing land and water, as a result of food insecurity (TRT, 2019). Women, the elderly and children are the hardest hit by the drought because of their limited movement.

The drought that occurred in Kenya in 2000 caused severe power shortages and affected neighbouring country Tanzania. Power shortages were also experienced in 2009 when there was significant reduction in water flowing at key dams due to lack of rainfall. Kenya is the largest consumer of hydropower in East Africa accounting for 4.1 billion kilowatts-hour or 60% of all consumption in East Africa. A drought emergency was declared in 2011 that hit the Northern and Eastern parts of Kenya in 2011 and affected nearly 3.5 million people. Most of the people living in Northern Kenya are pastoralists. The drought situation also led to the death of their livestock (NDMA, 2019).

During drought periods, the northern regions of Kenya suffer from significantly reduced water availability. Both the national and county government have always taken various drought response measures in the following sub-sectors; food and safety nets, agriculture, livestock, water, education, health and nutrition, and peace and security. In April 2019, the National Treasury, under Article 223 of the Kenya Constitution on supplementary appropriation, approved the allocation of KSh 1.85 billion for a response during the January to April 2019 period. The funds were used for food and safety nets (KSh 602 million), household irrigation water storage programme (KSh600 million), and provision of strategic water facilities, maintenance and rehabilitation (KSh 650 million) (NDMA, 2019). County Governments also supported interventions in some of the affected counties. However, the allocated KSh 1,242,698,872 (0.8%) is lower than the 2% of actual allocation for disaster response during the 2018/2019 budget provided for in the Public Finance Management Act, 2012 (NDMA, 2019).

BOX 4-2. CASE STUDY: WATER CONFLICTS IN LAKE VICTORIA BASIN

Lake Victoria is the second largest freshwater lake in the world and is considered one of the most important shared natural resources of the East African Community countries. Lake Victoria is shared by Kenya (6%), Uganda (43%) and Tanzania (51%). The socio-economic importance of the lake to its inhabitants, the East African countries and globally cannot be underestimated. The total fish production sourced from the lake is estimated at between 400,000 and 500,000 metric tons per year with Tanzania landing 40% of the Lake's fish catches, Kenya 35% and Uganda 25%. The lake catchment supports approximately 30 million people and is an important source of water for domestic, industrial and agricultural use (Martinon, 2010).

Despite the extraordinary natural wealth around the lake region, the surrounding communities face considerable challenges which at times result in conflicts. Key among the conflicts is water releases from Jinja Dam, the rising water levels in the lake and transboundary conflicts between fishermen in Kenya and Uganda. The Jinja Dam in Uganda is the only water outlet which controls the water flow from the Lake through a series of turbines and sluices. Power station operators have over the years increased or decreased water flowing from the Lake based on how much is needed to meet the East African countries electricity demand. This at times leads to flooding in the Lake; displacing people and impacting livelihoods

Degradation of important water catchments in bordering counties, such as the degradation of the Mau Forest and Mt Elgon is having an impact on the water quality and quantity that flows into the Lake. The use of fertilisers by farmers in upper parts of the basin leads to the flow of chemical components from the farms into the Lake causing rise in eutrophication levels (Martinon, 2010).

Eutrophication has resulted in the significant spread of the water hyacinth, Eichhornia crassipes, which has over the years led to decrease in fish stocks and plant species. Fishing is a major source of livelihood among the people living close to the lake, hence, the decrease in fish stocks and the reduced fishing area is impacting those depending on the resource through loss of livelihood (Martinon, 2010). As competition intensifies over the limited fish stock in the Lake, conflicts emerge between the nations sharing the water resource. The Miging'o Island claimed by both Kenya and Uganda has caused several conflicts in the past that led to arrest of Kenyan fishermen for illegally crossing the borders. Such conflicts have a serious economic bearing on the region as inadequate communication and ignorance of fisheries law regulating fishing grounds could be a major cause of conflict (Martinon, 2010).

4.1.4 SEVERE FLOODING AND INCREASED RISK OF WATER POLLUTION AFFECTING WATER QUALITY

Despite being a water scarce country, **Kenya also suffers from severe floods in parts of the country during the heavy rain seasons. This impacts people's health, livelihoods and access to clean water. Floods in early 2018 claimed over 183 lives countrywide, displaced more than 225,000 people and led to the closure of over 700 schools** (GOK, 2018b). In early 2020, flooding in 29 of the 47 counties led to the deaths of almost 200 people and more than 100,000 people displaced (Flood List, 2020). The economic cost of floods is estimated to create a long-term fiscal liability equivalent to 2-2.8% of GDP each year, the equivalent of approximately USD$2-2.8 billion (GOK, 2018b). In 2018, extreme rains and subsequent flooding damaged roads and infrastructure, seasonal crops across an estimated 8,500 hectares of land were destroyed, and over 20,000 livestock drowned, as well as resulting in outbreaks of water-borne diseases (GOK, 2018b).

With the predicted increase in the mean annual rainfall as well as more intense periods of precipitation in Kenya from 2030, the country is likely to experience increased instances of severe flooding. Furthermore, with deforestation in key water towers and the conversion of land to agriculture, there will be an increase of sedimentation and the leaching of chemicals and fertilisers into water bodies thus leading to a decrease in water quality. Severe flooding has also previously led to bursting of dams in different parts of the country causing death and destruction of property. At the same time, the expansion of urban areas and related construction activities contribute to an increasing share of sealed-off (non-permeable) surfaces which further complicate stormwater and flood risk management.

4.1.5 LAKES AND SEA LEVEL RISE

Most of the lakes in the Rift Valley in Kenya have been experiencing rise in water levels. This includes Lake Victoria, Lake Nakuru, Lake Baringo, Lake Bogoria and Lake Turkana. The rise has been attributed to climate change impacts such as severe rainfall, flooding and land use degradation. The rise in water levels in these lakes have affected businesses, schools, and homes, led to pollution of fresh water while bringing crocodiles and hippos dangerously close to homesteads. Scientists and officials are concerned that the freshwater Lake Baringo and alkaline Lake Bogoria could merge which would cause cross-contamination and threaten aquatic species (NASA, 2020).

The Intergovernmental Panel on Climate Change currently predicts an 18 to 59 cm rise in global sea levels by 2100. This may have significant impacts on the **coastal belt in Kenya**, particularly around Mombasa (IPCC, 2008). Direct impacts from sea-level rise include population displacement, inundation of low-lying areas, shoreline erosion, coastal wetland loss, saltwater intrusion and increased salinity in estuaries and coastal aquifers, higher water tables and impeded drainage and higher extreme water levels leading to coastal flooding with increased damage. Extreme rainfall and flooding events also impact the capacity and maintenance of stormwater, drainage and sewer infrastructure in coastal areas where sea-level rise reduces drainage capacity to bays and oceans (AECOM, 2020)

Human-induced pressures on the coastal zone (such as the growing population, water abstraction, and alteration of the hydrological regime including the damming of sediments) are likely to have further socio-economic impacts on coastal communities and businesses. The potential impacts of sea level rise are usually uneven, affecting the most vulnerable, due to their lower ability to prepare, adapt and respond to related risks.

4.1.6 OTHER IMPACTS

Changes in river flow and groundwater systems will affect water availability and the function and operation of existing water infrastructure (including hydropower, inland navigation, irrigation systems, drinking water supply and wastewater treatment). Water is also essential in energy supply, agriculture, tourism, industry, etc. across the Kenyan economy. Ancillary stresses of pollution, salinisation, sedimentation and over-extraction of groundwater exacerbate vulnerability to current and future climate risks (SEI, 2009).

Other anticipated climate change impacts in Kenya include soil structure changes, increased instances of heat stress, and an increase in the range and occurrence of pests and diseases (FAO, 2010). These effects combine to reduce the quality and quantity of Kenya's already scarce water resources leading to decreased access to yet increased pressures on clean and reliable water sources (WASREB, 2019). All these impacts necessitate the need for urgent climate action.

4.2. THE ECONOMIC COST OF INACTION

A study by the Stockholm Environment Institute (SEI) found that future climate change will lead to additional and potentially substantial economic costs. Although the future economic costs are very uncertain, the aggregate models indicate that the additional net economic costs (on top of the costs of existing climate variability) could be equivalent to **a loss of 2.6% of GDP each year by 2030 in Kenya** (SEI, 2009). In the longer-term, after 2050, the economic costs of climate change in Africa are expected to rise, potentially very significantly. The historical and current economic costs associated with flooding and droughts are discussed in the sections above; with future climate change, these costs are expected to increase.

BOX 4-3. NATIONAL DROUGHT MANAGEMENT AUTHORITY – KEY MESSAGES FROM THE 2019 REPORT

- Insufficient rains received in most Arid and Semi-Arid Lands counties during the season led to low recharge of surface water sources such as water pans, shallow wells and dams. Open water sources were poorly recharged during the 2019 March to May season, with most sources holding less than 50 per cent of their capacity.
- High return trekking/walking distances to access sources for domestic water use was witnessed in Samburu (Nachola, Nyiro and Ndoto) and Marsabit (Moyale and Laisamis), where return distances of 10 - 15 kilometres were recorded. Exceptionally longer trekking distances of up to 30 kilometres were observed in Lekushu, Lependera in Laisamis Sub-County, Hurri Hills, Kubi Adhi, Konon Gos Malabot and Kalesa in North Horr Sub-County and Elledimtu in Moyale Sub-County.
- Prices of staple foods have been on the rise across ASAL counties since March 2019. Prices rose by 10-40 per cent between April and July. This is attributed to a decrease in supplies as stocks held by various actors locally decline following below average 2018 short rains harvests and reduced imports from Tanzania and Uganda.

Source: (NDMA, 2019)

In terms of the impact on water resources, the SEI (2009) study assessed the potential of multi-sectoral effects of water resources and climate change in the Tana river basin as a case study using a water planning model. The study considered projections of future climate change from a suite of downscaled global models for Kenya: temperature, rainfall and extreme events. Whilst the results vary strongly with the climate projection, it found that without adaptation measures the economic impacts of climate change for this one river basin ranged from a benefit of USD2 million to a cost of USD$66 million per year for hydropower, irrigation and drinking water across the range of projections (SEI, 2009).

With predicted sea level rise that would impact communities along the coast through flooding, the associated economic costs in 2030 are estimated to be USD7-58 million per year. By 2050, these costs could increase to USD31-313 million per year.

There are also anticipated economic costs in the energy sector as a result of water scarcity and excessive water availability. For example, the reliance on water for hydropower station operation could continue to be a challenge during drought periods when water levels drop and the energy output decreases (or stops) from these stations. In the case of extreme precipitation and flooding events, there is also a risk of damage to the energy generating infrastructure . The projected higher temperatures will increase demand for cooling systems and thus increase the demand on electricity. Climate change is predicted to cause prolonged droughts which will in turn lead to reduced water levels in hydroelectric dams, thus decrease their generation capacity (MoEF, 2010).

Photo by Adobe Stock | Mairobi, Kenya

5. Climate finance landscape in Kenya

5. CLIMATE FINANCE LANDSCAPE IN KENYA

5.1. CLIMATE FINANCE NEEDS IN KENYA

The previous chapters have discussed the current situation of the water sector and the impacts and risks current and future climate change poses. Climate finance is needed in the sector to help alleviate the impacts experienced in the water, sanitation and irrigation subsectors.

When the Government of Kenya published its second NDC in 2020, it estimated the implementation of the required mitigation and adaptation actions across all sectors up to 2030 to cost approximately USD62 billion (Ksh6,775 billion) (MoEF, 2020). The funds are to be sourced both locally and internationally with significant contribution expected from the private sector (UNDP, 2020a). If these financing requirements are met, the country may achieve its commitment to abate its GHG emissions by 32% by 2030 relative to BAU scenario under its second NDC.

The 2020 NDC only provide cumulative investment needs for mitigation and adaptation actions and is not broken down into sectors yet. Therefore, the NCCAP 2018-22, based on the previous 2015 NDC represents the most recent available estimate of investment needed to implement priority actions for the Water and the Blue Economy sector.

The **NCCAP 2018-2022 estimated that Ksh430 billion (USD4.261 billion) is needed to implement the priority actions** in those five years (GOK, 2018b) with a further Ksh629 billion (USD6.23 billion) required for the following five years (UNDP, 2020). Second only to Energy, the Water and Blue Economy requires the second highest amount of investment to implement Kenya's NDC goals by 2030.

5.2. CLIMATE FINANCE FLOWS IN KENYA

In 2020, the National Treasury of Kenya, in partnership with Climate Policy Initiative, conducted a study into the climate finance flows in Kenya in 2018, 'The Landscape of Climate Finance in Kenya'. This exercise mapped the life cycle of finance targeting climate mitigation and adaptation activities in Kenya, financed through domestic, international, public and private sources, at the national and county level. The Landscape of Climate Finance in Kenya found that KES243.3 billion (USD2.4 billion) flowed to climate-related investments in 2018, just one third of the finance needed annually.

Kenya's climate-related expenditures to NDC priority sectors in 2017/18 fall short of the estimated budget for 2018/19 for most of the corresponding NCCAP sectors. This is most stark in the main adaptation sector – water - and in the forestry and land-use sector. Whilst most sectors fall below the anticipated need, only the energy, health, and manufacturing sectors seem to fulfil the budgeted needs.

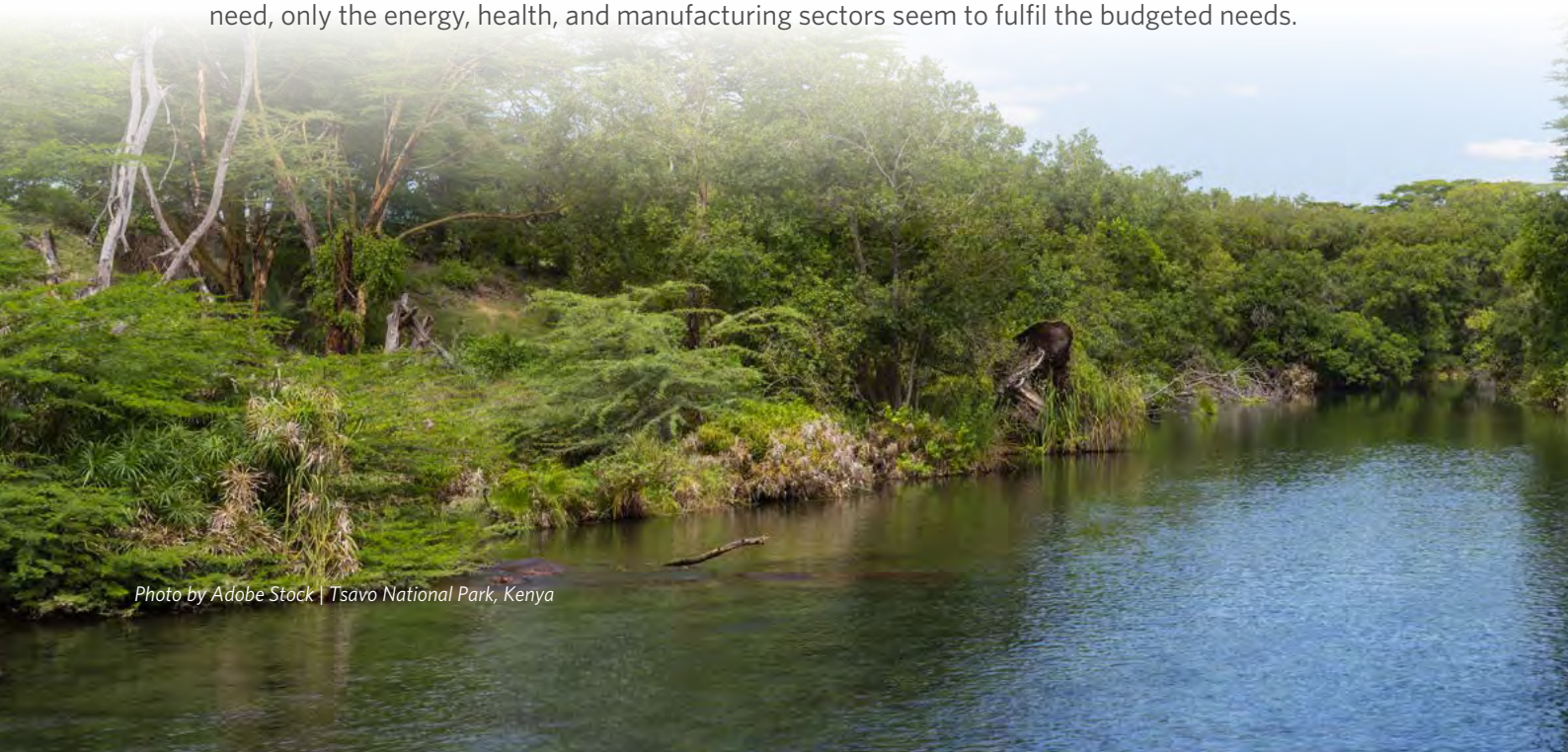
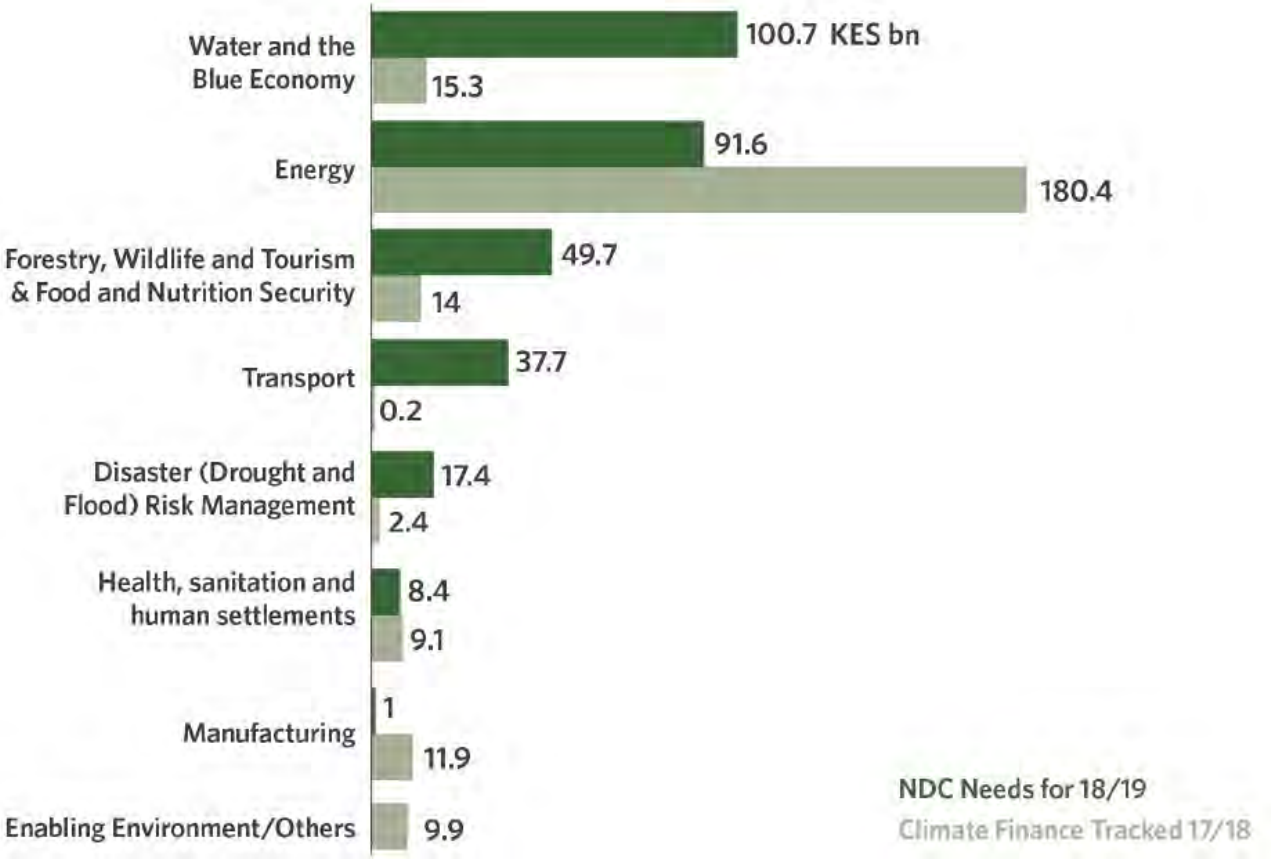


Photo by Adobe Stock | Tsavo National Park, Kenya

FIGURE 5-1. INVESTMENT GAPS IN NDC PRIORITY ACTIONS



Notes: the report combined the Forestry, Wildlife and Tourism with the Food and Nutrition Security sector for practical reasons. Figures include public and private, domestic and international climate-related investment in Kenya refer in the fiscal year 2017/18. Needs are based on the NCCAP 2018-22, where the earliest year available is the year 2018/19. Source: (CPI, 2021)

The report identified **Ksh15,239 million (USD151 million) in investment relevant for the Water and Blue Economy sector in 2017/18, roughly about one sixth of the Ksh100.7 billion that the NCCAP estimated were needed annually.** As shown in Table 5-1, the majority (65%) of this amount was provided by bilateral and multilateral development partners', while the Government of Kenya has channelled over Ksh5 billion (USD49.5 million) in direct funding through its Ministries, State Departments, and Semi-Autonomous Agencies (SAGAs). Only a residual amount was invested from the private sector, and almost all of this came from the Kenyan private sector corporations.

TABLE 5-1. A BREAKDOWN OF CLIMATE FINANCE FLOWING TO KENYA'S WATER SECTOR IN 2018 BY PROVIDER

Sources	Domestic (million Ksh)	International (million Ksh)	Total (million Ksh)
Private	**162**	**1**	**163**
Corporations*	162	-	162
Philanthropic foundations	-	1	1
Public	**5,109**	**9,967**	**15,076**
Kenyan Ministries	5,109	-	5,109
Bilateral Development Partners**	-	3,357	3,357
Multilateral Development Partners**	-	6,610	6,610
Kenyan SAGAs	0.3	-	0.3
Total	**5,271**	**9,968**	**15,239**

*Notes: * These figures were captured through dedicated surveys to private sector companies in Kenya and may include funding obtained from international partners. ** Bilateral and multilateral international funding channelled through Kenya's National Budget. Source: (GOK, 2021).*

It is important to note that due to data limitations, expenditures from SAGAs may have been underreported in the study. This means that the actual figure is likely to be higher, however the gap is so significant that data limitation is only a partial explanation for this shortfall in finance.

Significant amounts of finance need to be directed at the Kenya's water sector, in order to achieve its climate change and sustainable development commitment targets. Given fiscal limitations, the use of public resources (including external development finance) needs to be maximised and made more efficient to unlock and leverage greater amounts of private sector investment, that at the moment is almost non-existent. Investment inaction will lead to much higher long-term costs, which could have considerable impacts on the economy – including private investments – given its importance to many elements of Kenya's GDP, and to millions of Kenyans.

Photo by Kwa Wahome Pasenga Dam, Kenya

Photo by Nyangoro Maktau Water Supply

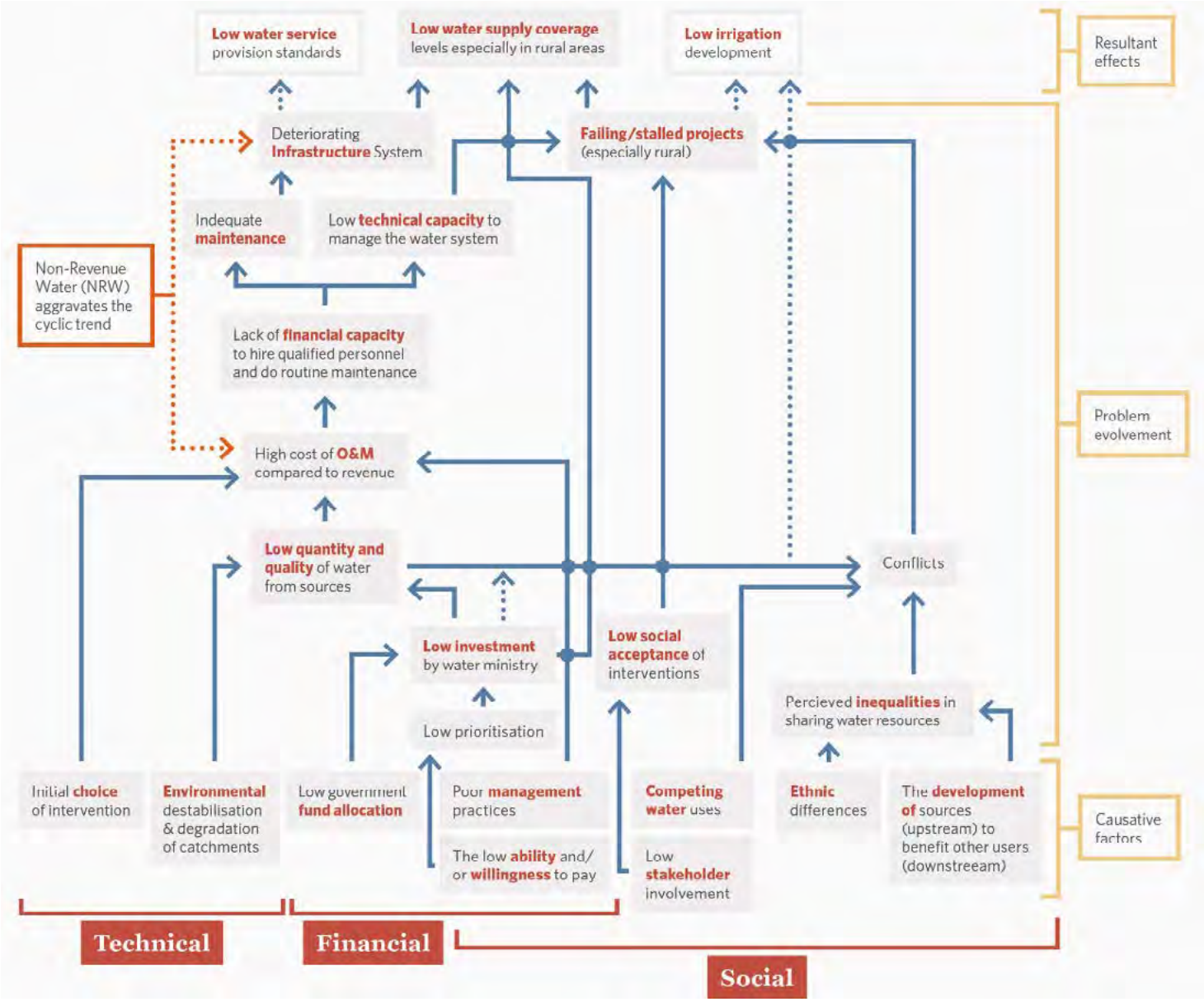
6. Gap Analysis And Challenges In The Water Sector In Kenya

6. GAP ANALYSIS AND CHALLENGES IN THE WATER SECTOR IN KENYA

The Government of Kenya has made significant progress in the expansion of water infrastructure, sanitation and irrigation services in the past decade. This includes the construction of several dams across the country to mitigate the risk of extreme water shortages arising from increased water demand and the impacts of climate change. The MWS&I plans to construct two large dams, four medium sized dams and 500 small dams by 2022 (MWS&I, 2018b). These dams are among the various measures the Government is taking to make progress and ensure universal water access by 2030, which currently stands only at 57%.

The first section of this chapter aims to highlights the main challenges in the water sector that hinder water conservation and management efforts as well as the achievement of universal water access in Kenya. The challenges impacting the irrigation sector and the sanitation sector are also discussed with some of the main causative factors illustrated in Figure 6-1, Figure 6-2 summaries key barriers and threats, which are subsequently discussed in more detail.

FIGURE 6-1. CHALLENGES FACED BY THE KENYA WATER SECTOR



Source: adapted from (Chepyegon & Kamiya, 2018)

FIGURE 6-2. SUMMARY OF THE BARRIERS AND THREATS TO KENYA'S WATER SECTOR

Financial and Economic	▪ High import duty and tariff on water saving technology equipment. ▪ High public debt reducing funds allocated to Water Ministry. ▪ Low levels of cost recovery from maintenance. ▪ High water treatment cost as a result of anthropogenic pollution. ▪ Lack of understanding of the economic value of water in all productive uses and the impact of climate change and the resulting cost of inaction in the sector.	▪ Lack of incentives or tax relief by the Government for water efficency practices. ▪ There is a general culture in the country that water services should be financed by the government and not by the private sector. This is because water is a basic right, as outlined in the Constitution. This therefore makes it less profitable to the private sector to invest.
Social-economic	▪ Low ability and willingness to pay for water resource by most of the populace. ▪ Increase in population has resulted to increased water demand for household and industrial water use. Sanitation services have also been impacted with the increasing population. ▪ Over-abstraction from depleting aquifers.	▪ Increasing rates of industrialisation and urban development demands for more water. ▪ Water conflicts that arise from transboundary water sharing and lack of cooperation. ▪ Unequal development of water resources among the 47 counties. ▪ High poverty levels in some regions make it hard for some residents to construct simple pit latrines.
Environmental and Climate Change	▪ Natural disasters (e.g. flooding) have negative impacts on water resources such as destruction of dams and other water infrastructure including underground water distribution pipes and sewerage systems. ▪ Severe droughts cause little or no rain hence water shortages that have direct and/or indirect impact on many businesses and households.	▪ Deforestation has negative impacts on water catchments in terms of water quality, quantity and flow. ▪ Sedimentation and pollution of water resources. ▪ The rising water levels of inland lakes is a major challnge that is impacting livelihoods and communities.
Legal and Institutional	▪ Lack of institutional coordination and unclear/ overlapping mandates between national and county governments and their agents has resulted in stalled projects. Limited data and information flow among the institutions is also a major challenge. ▪ Lack of enforcement of regulations in line with the Water Act 2016, NCCAP and the Climate Change Act, and failure to develop requisite strategies and plans. ▪ Rule of law challenges that lead to poor implementation of existing legislation.	▪ Lack of control and enforment of regulations - drillling of boreholes and abstraction of water without permit, indiscriminate discharge of wastewater to surface water bodies. ▪ The process of acquiring water use permit from the Government atuthorities is long. ▪ The Constitution is not clear on the roles of the County Government on water management. ▪ Limited technical capacity of staff working in water, sanitation and irrigation.
Physical (Infrastructure), Technological & Technical	▪ Poor maintenance of existing water and sewerage infrastructure. ▪ Deteriorating water and sewerage infrastructure leads to increased water leakages and hence the high Non-Revenue Water. ▪ High cost of technological innovations that inhibit the purchase of innovative water saving techniologies or water-efficiency products. ▪ Lack of sufficient data to quantify the current and future climate change impacts on water resources in Kenya. ▪ Inefficient management of irrigation schemes thus reducing the crop yields.	▪ Lack of sufficient water storage facilities to tap into surface run-off water. ▪ Water Service Providers still rely on traditional water infrastructure approaches such as centralised water distribution pipes that are very expensive and difficult to maintain and monitor. ▪ Project implementers and policy makers put actions based on the old routines to water infrastructure development. Deployment of smart technologies, circular economy and water recycling should be incorporated in infrastructure development and policies.

6.1. NON-REVENUE WATER

Non-revenue water (NRW) currently stands at 42% in Kenya, but the Government has set a national target that the average NRW ratio should be less than 20% by 2030. The 42% NRW ratio means that Water Service Providers only get revenue from 58% of the water they distribute (MWS&I, 2018a). The main cause of the high NRW is not entirely technical but largely commercial and governance, for example this could include the lack of installed water meters, faulty/inaccurate meters, poor water infrastructure, intermittent supply, or unreliable systems for data storage. A recent report published by WASREB shows that 14 counties recorded water losses of 50% and above. The counties include Mombasa with NRW of 50%, Kwale 64%, Kajiado 61%, and Nairobi 50% (WASREB, 2020a). In other African countries, the average NRW percentage was 40% in West Africa, 38% in Central Africa and 50% in Southern Africa (AfWA, 2015).

6.2. ECONOMIC AND FINANCIAL BARRIERS

The Landscape of Climate Finance in Kenya showed that the water and the blue economy sector had the largest finance gap between what is needed and what is currently flowing. Therefore, it is also one of the areas which need the most attention and support to scale-up climate finance flows. Almost all the finance is coming from the public sector (i.e. the Government of Kenya), so there is a need for a more conducive enabling environment to overcome the barriers to entry for the private sector. In the short term, there is an urgent need to scale-up investment, from both domestic (i.e. both public and private sector) and international sources to stimulate investment in the sector.

There are also significant data gaps from the counties that are responsible for the water sector. Capacity building for counties on data reporting will improve the understanding of the activities in this sector and help to allocate sufficient financial resources during planning.

High import duty and tariffs/taxation rates imposed on the importation of water conservation and treatment technologies and equipment make it difficult for individuals and the private sector to invest in water-saving technologies due to the low/extended period of return on investments. The availability of tax incentives would create a favourable market environment for such businesses to thrive, which could, in turn, help in the efforts of water resources conservation and save operational costs for large industrial and irrigation water users and general water consumers. Other barriers to investment as cited by the private sector include:

- Water supply is viewed as a government's responsibility.
- The perception of water being a right hence its low cost.
- High upfront cost in setting up a water company.
- Limited water projects to invest in.
- Lack of policy incentives and sufficient legal framework to involve the private sector in water supply.

Better awareness and understanding of the economic value of water and the benefits of water conservation and management will enable decision-makers and stakeholders to make informed decisions on water allocation, conservation, water infrastructure development and planning, particularly during periods of droughts in different locations. Kenya relies on rain-fed and irrigation systems for agricultural use to be able to produce high yield crops for export and local consumption. Other important uses of water that impact on the economy include water for hydro-electric power generation and supply, water for ecological functioning and water for domestic and industrial use.

Pollution of surface water sources, for example, the pollution of Lake Victoria has resulted in the eutrophication of Lake Victoria, which has caused the intensive spread of the water hyacinth in the lake. This has high financial implications to the Government when it comes to controlling the spread of the invasive aquatic plant. Billions of shillings have been spent to control the weed since its invasion in Kenya in the 1980s. Fishermen communities in the Lake Basin are also impacted as the fishing grounds become covered by the weed making it difficult to fish and earn a living from the Lake. Generally, anthropogenic pollution of water resources is costly as there is minimum investments done on water treatment technologies.

6.3. POPULATION PRESSURE

The rapidly growing population in urban areas in Kenya place pressure on water resources availability. The high population, industrialisation and urbanisation require high water demand for industrial and business operations, energy supply, infrastructural development, irrigation and general water consumption at the domestic level. This is particularly pronounced in major urban centres that experience further rapid growth, such as in counties in the North-Eastern part of the country.

6.4. ENVIRONMENTAL DEGRADATION AND CLIMATE CHANGE IMPACTS

The emergence of natural disasters in Kenya arising from climate change such as flooding coupled with poor planning and lack of early warning systems has resulted in devastating impacts to the people, economy, livestock and wildlife. Water infrastructure such as dams and underground water distribution pipeline networks are destroyed during flooding events which eventually results in high repair and maintenance costs.

Furthermore, the human encroachment of natural forests for agricultural, settlement and logging have negative impacts on water resources, causing a reduction in quality and quantity. For instance, agricultural practices encroaching into the Mau Forest are leading to widespread water pollution that flows to Lake Victoria. The excessive plant nutrients released from the fertilisers cause eutrophication and insufficient dissolved oxygen that lead to the death of fish and other aquatic species. Untreated and undertreated effluent discharge from industries is also a major challenge in the country.

Measures taken to tackle these challenges will help to improve water security and ecosystem protection in the long term.

6.5. OVER-ABSTRACTION OF GROUNDWATER RESOURCES

Between 2017 and 2018, the WRA analysed water levels in the six catchment areas by analysing production boreholes that were simultaneously used as groundwater monitoring stations in the six catchment areas. There were 140 monitoring stations across the country as of 2018. The study found that stable groundwater trends were observed in Athi and Ewaso Ng'iro North basins. However, declining levels were evident in the Rift Valley basin, especially the Rongai Aquifer (WRA, 2018). In the Nairobi area sub-basin, aquifers covering the areas of Westlands, Limuru, Kikuyu, City Centre were declining, which could be attributed to overreliance on abstracted groundwater in the locations. The main aquifer in Nairobi can be found at depths ranging between 120 – 300 meters below ground level (Owuor, 2019). Along the coastal basin, groundwater levels have fluctuated over time. According to the WRA, the fluctuations in the coastal aquifer were the result of a number of factors including: evapotranspiration from the surrounding environment; a prolonged dry spell resulting in reduced aquifer recharge; and continuous water pumping and discharge from wells owned by the Mombasa Municipality (WRA, 2018).

6.6. SURFACE WATER CONTAMINATION

Sources of water are contaminated from inadequately treated industrial discharge, urban effluent, agriculture, as well as salination in coastal areas. However, one of the biggest challenges comes from sanitation and the lack of solid waste management plants, resulting in the contamination of rivers and surface water bodies. In 2018, the World Bank estimated that only 30% of Kenyans had access to improved sanitation, that is, the use of sanitation facilities that hygienically separate excreta from human contact. This means that most of the population are still using unsafe sanitation methods such as rudimentary latrines or defecating in the open (World Bank, 2018b). Access to improved sanitation is only one part of the problem – containing, transporting, treating and disposing of the waste is also a significant issue in Kenya, with corresponding impacts of surface water quality.

6.7. LEGAL AND INSTITUTIONAL ISSUES

The Climate Change Act, 2016 requires that climate change is mainstreamed in the Government planning processes. The County Governments are required to have a climate change unit with a qualified climate change focal point. This is yet to be achieved in most of the Counties due to lack of budgetary allocations, hindering the implementation of climate change actions at the Counties. Further, failure to fully mainstream climate change in County Integrated Development Plans means that there are limited linkage of water and climate change issues at the county-level and missed opportunities by counties to champion adaptive activities and enable a regulatory environment for actions that enhance adaptation, build resilience and address climate risk of high temperatures and changing precipitation patterns causing water shortages.

The Water Act, 2016 presents an opportunity for Kenya to transition the water sector in accordance with the letter and spirit of the Constitution to ensure sustainable management of water resources as well as efficient and equitable water supply to all Kenyans. To be effectively operationalised, it requires the enactment of various regulations, which are yet to be enacted. The regulations currently under discussion whose gazettement needs to be expedited include the Draft Irrigation (General) Regulations, 2020 operationalising the Irrigation Act 2019, Draft Water Services Regulations, 2019, Draft Water Tribunal Rules, 2019, Draft Water Resources Regulations 2019 and Draft National Water Harvesting and Storage Regulations 2019. These regulations will operationalise features of the Water Act, 2016, such as on water harvesting and storage and ensure institutions such as the National Water Harvesting and Storage Authority are operating as envisioned.

At the **policy level, there is a need for development and enactment of a sustainable National Water Policy alive to the Constitutional realities of Kenya, as such an overarching policy is lacking.** Strategy documents required under the Water Act, 2016 such as the National Water Sector Investment and Financing Strategy are lacking, leaving Kenya with disjointed infrastructural investments, and a lack of synergy in addressing different needs and inefficiencies (Matie & Mugo, 2018). The National Water Resources Strategy required under Section 10 of the Water Act 2016 and the National Water Services Strategy required under Section 64 of the Water Act 2016 have yet to be formulated by the Cabinet Secretary responsible for water, yet this was required within one year of commencement of the Act. Failure to develop the necessary policies, plans and strategies in a timely manner hampers sustainability in the management and supply of water resources.

At the **institutional level, there is weak coordination among National and County Governments**, as well as national and regional sector institutions and other stakeholders, particularly regarding investment planning, which has not been properly linked with national and county economic planning and budgetary processes. Conflicts also arise with regards to separation of powers between the national and county governments and the interpretation of responsibilities as set out in the Water Act, 2016 as well as in Schedule Four of the Constitution. For example, WASREB acts as an agent of national government with wide-ranging powers in relation to water service provision, whilst County Governments establish water service providers. As such, conflicts have sometimes arisen between County Governments and WASREB with regards to interplay in their role, with claims of one party attempting to usurp another's powers and responsibilities. Community-level institutions such as Water Resource User Associations face challenges such as elite capture, dependency on donor support, lack of meaningful participation, and difficulties scaling up initiatives hampering their effectiveness (Richards N. and Syallow D., 2018), which are not adequately addressed by the legal framework.

Furthermore, **rule of law challenges has resulted in instances of improper implementation of the Water Act, 2016**. For example, the primary mode of granting water rights under the Act is through the grant of permits from the WRA. The Act sets out the activities requiring permits, the procedure to be followed and the activities exempted from this requirement. There have, however, been instances where permits are granted and then deemed to have been granted illegally, following which demolitions of water intakes by the government are ordered without following the due process laid out on the revocation of permits (and potentially unnecessarily demolishing valuable water infrastructure).

Overlapping mandates in the legal framework also cause inefficiencies. At section 44 of the Environmental Management and Co-ordination Act, for example, the National Environment Management Authority has responsibility in consultation with the relevant lead agencies, to develop, issue and implement regulations, procedures, guidelines and measures on among others- prohibition of water pollution, regulation on effluents to

be discharged into the sewerage system, and licensing for the discharge of effluents. Whilst this responsibility is set out as a function for NEMA under EMCA, this responsibility is placed on the WRA under the Water Act, 2016. This overlapping mandate leads to a lack of clarity on overall responsibility and hinders full success of either entity's execution of the role.

The transfer of water service provision to the Counties has in practice left the water service providers bearing debts, and their creditworthiness is largely insufficient to secure new financing. There have been calls for action to increase their free cash flows, improve the creditworthiness, enable them to secure commercial financing, reduce the financial burden on the public sector and improve their performance (PPIAF, 2020). The NCCAP calls for the development of the water utility creditworthiness index, as well as tool kits on commercial lending to the water and sanitation sector to attract Public-Private Partnerships (PPPs). This had been introduced by the World Bank and WASREB, with the publication of Kenya Water Service Provider Creditworthiness Index Reports and needs to be a practice that is upheld.

The NCCAP aims to reduce water wastage and non-revenue water from the current 43% to 20% through innovation in water tracking and leakages identification and reporting, awareness programmes for water efficiency, and also to increase the number of people and entities accessing good quality water for domestic, agricultural and industrial use from increased 58% to 65% through the large-scale installation of water meters. There is a need for the creation of financial incentives to enhance **adoption of smart meters and other technologies in the water sector, as well as the creation of technical standards for equipment including meters to ensure quality in the market, which is a current challenge.**

6.8. PHYSICAL (INFRASTRUCTURE), TECHNOLOGICAL AND TECHNICAL CHALLENGES

There is a lack of uptake of the technological advances that have been made in the water sector, such as the use of smart meters, leak detectors, smart controllers and advanced water treatment equipment as essential tools for effective water conservation and management across all sectors (industrial, domestic, agricultural and commercial sectors). The use of inefficient water equipment and practices is still common across the country.

In urban areas, water supply and sewerage services are yet to result in increased water coverage and quality especially in lower-income and slum areas. Water shortages still occur due to limited water storage infrastructure and treatment facilities. Rural water supply and sanitation coverage is low as most people living in rural areas still rely on rivers, springs and boreholes for water. The County Governments have a responsibility to put in place measures for the provision of water services to the rural areas. Addressing droughts and floods through infrastructure development should be the immediate priority at the community levels as it affects other important aspects such as food security.

Limited uptake of irrigation technologies is a major challenge in the agriculture sector due to unaffordability of the irrigation equipment. High water tariffs for irrigation makes it unaffordable to farmers. The Water Resources Authority is working with the National Irrigation Authority to make the tariffs more affordable. Limited investments for irrigation infrastructure are also a challenge in the irrigation sub-sector.

In addition to this, there is limited publicly available data, especially temporal and precipitation data on the future climate change scenarios on water resources in Kenya. There is also limited data on the status of groundwater, river flow records, water quality records etc. which makes the calculation of change and impact difficult to carry out.

Availability of such information is important for research and development and early planning by the Government, private sector and other water actors. Changes in climatic conditions of a place may result in changes in the productivity of cash crops, tourism, or other economic activities in different regions. Hence, the need for data for early adaptation, mitigation and planning is essential.

In Kenya, unlicensed discharge of effluent (i.e. both domestic and industrial) into the environment is prohibited under the law (Water Regulations, 2006). Sewage service providers are responsible regulating the of discharge into sewers based on given specifications under the regulations, however given the large number of informal settlement present in areas across the country, the sanitation infrastructure network is not present for the monitoring to take place. Where it is present, strict monitoring of household and industrial polluters is currently missing.

Photo by WRA | Common intake constructed to reduce water conflicts

Photo by WRA | Children & community Members of Machinjoni elated after officially being handed over the protected spring

7. Opportunities for sustainable water resources conservation and management

7. OPPORTUNITIES FOR SUSTAINABLE WATER RESOURCES CONSERVATION AND MANAGEMENT

7.1. OPPORTUNITIES AND AREAS FOR FUTURE DEVELOPMENT

As the Government plans towards universal access to safe drinking water by 2030 and the Big Four Agenda, several opportunities and development areas in the water sector can be implemented by different actors to support the national Vision 2030 and development agenda. The following suggestions will support Kenya to be better placed to increase its water coverage, improve sanitation services, enhance irrigation, understand its water data and implement initiatives within the sector as well. These suggestions were sourced from stakeholders as well as from AECOM's water experts following the literature review. The actions are a combination of short, medium and long-term initiatives including recommendations for both "hard" technical/infrastructural measures and "soft" policy/managerial/capacity measures.

As part of GNI^{plus} deliverables, AECOM's technical water experts will also develop a Water Sector Roadmap, that will map these activities, as well as prioritise them based on the MWS&I's ranking of the initiatives. The aim of this activity is to be undertaken in consultation with the Ministry, private sector and other concerned stakeholders.

7.1.1 BETTER UNDERSTANDING OF WATER DATA (TECHNICAL AND FINANCIAL)

Access to accurate and up-to-date data, both in terms of water usage and financials flows, will improve the water sector's ability to provide services and undertake meaningful planning exercises. This will also allow for:

- Implementation of incentive schemes to overcome barriers to entry for the private sector.
- An uplift in spending by the Government of Kenya to meet as a minimum the levels required by the NCCAP to achieve the five priority actions in the Water and Blue Economy sector.
- Mobilising additional international public finance to the water sector.
- More investments by the private sector in water resources supply and management as they will be aware of the opportunities available in the water sector.
- Technical training of the new workforce in the water sector is key as there is a gap in technical knowledge and skills. In order to support this, capacity building for counties on data monitoring and reporting is also required.
- Strengthening performance contracts is key in the water sector. This will help in accountability, as well as efficient and sustainable use of resources.
- The private sector should be involved during the development of the monitoring and evaluation framework for the sector, and enforced to comply with reporting to support the better understanding of water use (which will also support the understanding of efficiency measure that have been put in place).
- Adequate documentation of the available water resources contained in the water catchment areas will help in the future assessment of the impact/threat of climate change to the water sector.

7.1.2 CENTRAL AVAILABILITY OF WATER RESOURCE PLANNING AND RECONCILIATION

The data used for planning water resources developments and projected water balances for both domestic and industrial water users is based on a reliability of 1/10 (WASREB, 2013a). As discussed in Section 3.3, this means that whilst climate variability is being considered, the risk allowed for is higher than typically targeted in some other African countries. Additionally, the period of continuous hydrology and modelling is 20 years, which while being enough for assessing water supply at a 1/10 reliability, is less than the ideal 50 years needed for more through water planning and water supply assessments.

As such, a recommendation is to select a suitable example catchment to assess the relative impact on water availability when higher target reliability is selected for industrial and possible domestic users too. This higher assurance should be assigned to a portion of the industrial supply that is required to maintain operations. Thus, a multi-assurance criterion is proposed (i.e. multiple reliability levels for various portions of the total use). This is not only allowing the assessment of water availability for long-term supply more accurately, but also prepares the way for linked drought operating rules with levels of restrictions.

Since such an exercise is only as good as the hydrological records that drive the assessment, the case study catchment should have adequate hydrological data to warrant the exercise. The output will be an assessment of how more detailed consideration of hydrological variability and risk affects water availability and allocation.

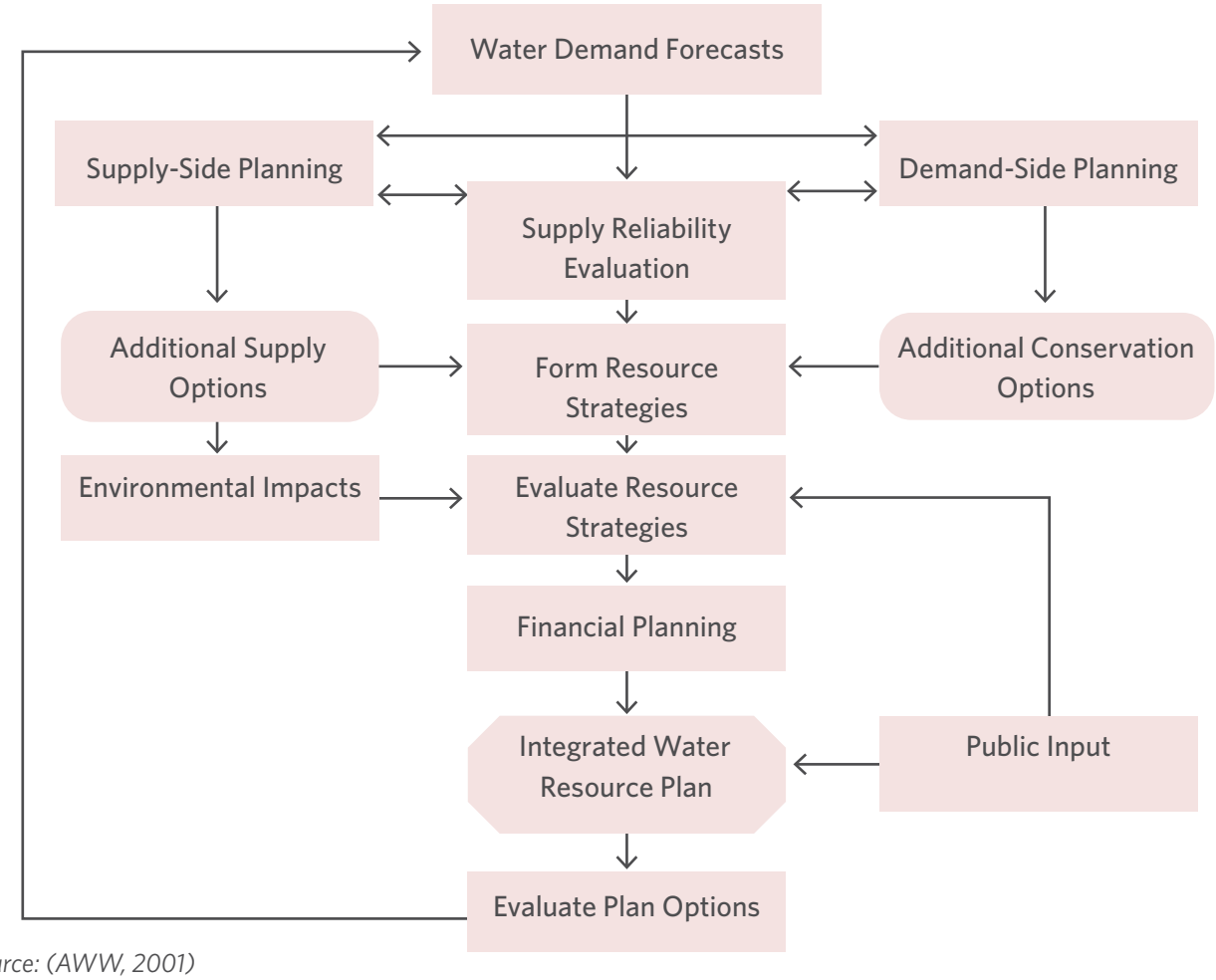
A central planning tool, platform or database that could be hosted by the Ministry of Water Sanitation and Irrigation or the Water Resources Authority will enable easy access to information and effective planning. It will also enable long-term planning for sustainable water supply as the population and urban expansion increases in the country. The tool will incorporate a cross-sector approach when planning. Central planning for new water services should also include the treatment and possible reuse, embracing a circular economy approach towards water resource use and management. This will ensure that the limited water available is used to the maximum before exploring other water sources.

This tool must be developed with input from all stakeholders through a public consultation process to raise awareness and gain acceptance by all stakeholders. Furthermore, the planning tool should be developed following an integrated water resources management approach that takes into consideration the available (sustainable) water supply sources, water demand forecast, water quality, water charges rate (tariffs – water price and water demand) structure, potential environmental protection and challenges, climate change variation (including drought contingency planning), financial planning, and stakeholder identification and engagement. The tool, once fully developed, should also be backed up by strong policies and practices that facilitates implementation at all levels. An example of a typical integrated water resources planning tool/process is presented in Figure 7-1.

Central planning for new water services should also include the treatment and possible reuse of wastewater, embracing a circular economy approach towards water resource planning and management.

Notes:
LEADER: In this context, whilst the Government of Kenya is identified as the "LEADER", it does not necessarily need to be the main financial of the intervention. As the leader, its role here will be to drive the interventions through the devolved government and other international donors and partners. The trainings can be organised and financed by the "SUPPORT" or in some cases "STAKEHOLDER"
SUPPORT: In this context, the "SUPPORT" team includes an exhaustive list of Government Agencies, Parastatals, Local and International NGOs, Governments of other Nations, such as the UK DFID, GNIplus, Philanthropists etc. who are willing to support the efforts of water conservation and management in Kenya either through direct finance or sponsoring/delivering training courses to promote water management and conservation measures.
STAKEHOLRDERS: In this context is defined as anyone with interest in the water sector that will constitute the "PARTICIPANTS" "TRAINEE" in a training programme/ course.

Figure 7-1. Concept of Integrated Water Resources Planning



Source: (AWW, 2001)

7.1.3 DESIGNING CLIMATE-RESILIENT WATER AND SANITATION INFRASTRUCTURE

There are many areas in the country with limited water infrastructure such as in slums and arid and semi-arid rural areas. People and livestock must walk long distances almost daily to be able to access the resource. There are also many areas in the country where piped water connections do not produce a reliable and constant water flow. This forces people to purchase water from water bowsers which is often more expensive – the high cost of purchasing the resource leads to theft from the water pipes. This results in losses to the water companies through non-revenue water. Design and development of adequate climate-resilient water infrastructure is therefore key in both rural and urban areas. This infrastructure will have the potential to improve the reliability of service provision while increasing the asset's lifetime. Water infrastructure developers could also consider constructing dual water infrastructure: one for domestic consumption/quality drinking water and another for industrial/ manufacturing and landscaping uses. This will also aid in the reduction of clean water wastage.

The Ministry of Water, Sanitation and Irrigation has been constructing small, medium and large water storage infrastructure such as dams in different counties to store harvested rainwater. With financial support, the planned medium and large dams could be completed sooner.

Integrating climate change resilience into new and existing sanitation infrastructure, strategies, targets and plans is a much-needed starting point for the government and financing institutions. This is because the sector (globally) is estimated to contribute between 2- 6% of the global methane emissions, and between 1-3% of the nitrous oxide emission. Opportunities to therefore access climate finance should be a priority for institutions managing the sanitation sector in Kenya. The sources of this finance could be from the Green Climate Fund (GCF), the Global Environment Facility (GEF) the Adaptation Fund, the Least Developed Countries Fund and the Special Climate Change Fund (GIZ, 2021).

7.1.4 DEPLOYMENT OF SMART TECHNOLOGIES

Technological advances in the sector, such as the use of smart meters, leak detectors, smart controllers and advanced water treatment equipment are essential for effective water conservation and management across all sectors (industrial, domestic, agricultural and commercial sectors). Enhanced uptake of these technologies can assist in the better understanding of water usage and can also lead to cost savings in water consumption. Technologies can be implemented by industries, as well as at the household level. Some of the technology updates could include:

- Irrigation technologies, since agriculture is among the largest sources of water use in the country (and is anticipated to increase significantly), the implementation of enhanced/ best practices for water efficiency, such as applying overhead irrigation, water pans and drip irrigation. Sensors for irrigation can also inform farmers when the crops need water.
- Technologies could also be deployed to continuously monitor the quality of water in high population areas.
- Smart meters to monitor live water consumption and discharge – this could be at the household and industrial level.
- Introduction and promotion of water reuse and saving technologies, such as rainwater harvesting and purifying technologies. The Government could give incentives for such technologies as they would help people to access safe drinking water. The Government through the relevant Ministries have a role of demonstrating to the public on water saving technologies.
- Use of Internet of Things (IoT) to monitor live effluent discharge systems that detect water pollution in main catchment areas (particularly targeting industry). This will not only support the Government of Kenya monitor water quality, but it will also assist industries with their own understanding and reporting of their water usage and water quality, supporting safer operations and efficient resource management.

7.1.5 PROVISION OF INCENTIVES BY THE GOVERNMENT TO PROMOTE WATER CONSERVATION

The Government could take steps to protect the available scarce water resources by introducing incentives that will help to enhance water use efficiency and conserve water at both domestic and industrial applications. Greater efficiency of water use could protect water availability and reduce scarcity issues in catchment areas. The Government could utilise tax incentives and rebates or other performance incentives such as certification/rating schemes for businesses that meet certain levels of water efficiency targets.

An example of such an initiative that can be borrowed from the United States Government is the WaterSense programme where water-saving household and industrial water appliances are labelled before being sold. Such initiatives enable the conservation of water resources (both groundwater and surface water) at the catchment level while creating savings for consumers.

Further research and investment in source water protection measures and programme as well as collaboration and participation in international conferences such as the African Source Water Protection Conference among others, will undoubtedly help in the water conservation efforts. Use of market-based mechanisms to incentivise industrial water use efficiency and promotion of nature-based solutions

In Greater Nairobi, total water demand outstrips supply which is anticipated to worsen with future population projections and the impact of climate change. Nairobi is not the only city in Kenya facing this issue. The supply deficit already creates challenges for businesses; and the supply-demand gap is expected to widen, leading to significant social and economic hardships. Accounting for water consumption in a transparent manner could lead to greater efficiencies and help ensure the vital resource remains available for residents and businesses.

One such mechanism for enhancing water use efficiency could involve establishing a collective reduction target amongst a group of users/stakeholders and allowing industrial water users to determine the most cost-effective means to achieve the target – either by making on-site efficiency improvements or purchasing water consumption credits to meet their commitment.

Another mechanism to meet the NCCAP aims to reduce water wastage, is to encourage both upstream water conservation and enhance water use efficiency. This could be achieved by applying nature-based solutions that incorporate the value of ecosystem services such as water quality and quantity supply and sediment reduction by e.g. encouraging upstream water users to use manure instead of fertilisers in their farms or plant and conserve indigenous trees that would increase water supply while reducing sedimentation. Downstream water users, such as water companies and hydropower generating companies, would pay for the conservation of the water resource. These fees would then go into water conservation efforts. GNIplus aims to develop a Payment for Ecosystem Service (PES) toolkit that will guide stakeholders on how to successfully implement PES schemes in the country.

7.1.6 ACCESS TO CLIMATE FINANCE

Research was undertaken by Climate Policy Initiative (CPI) under GNI^{plus} reviewing the climate finance flows in Kenya. Some of the recommendations of how climate-related investments can be scaled in Kenya include (CPI, 2021):

- There is an urgent need to increase finance for adaptation in Kenya, particularly in the water, disaster risk management, and forestry sectors.
- There is a need for international public finance to focus on more challenging sectors which are not receiving private finance at scale. For example, using innovative financing to mobilize investment into key underfunded sectors, such as forestry, transport, and water.
- Improved coordination among actors at all levels to increase the impact of climate finance.

A database of climate finance sources should be made available to institutions and organisations active in the sector by the MWS&I or the National Treasury to support actors apply for funding for the sector.

7.1.7 RESTORING DEGRADED WATER ECOSYSTEMS AND IMPROVING WATERSHED MANAGEMENT

Wetland management helps in both climate change adaptation and mitigation. This is because wetlands around seas, rivers and lakes provide important areas for flood waters to inundate. They therefore slow the flow of the water during floods thus lowering the flood risks and potential impacts on settlements and important infrastructure. Wetlands also store water in drought-prone areas and recharge groundwater thus making water available for human, livestock and wildlife use. Wetlands have a role in climate change mitigation as they contain a significant percentage of carbon that is sequestered in natural systems such as in marine life and in peatlands.

For those reasons restoring degraded wetlands in Kenya should be a priority as this can contribute to achieving Kenya's climate change mitigation goals as well as enable people to access resources from lakes, rivers and the ocean. Some of the ways to restore the watersheds include afforestation, reforestation and good land use are some of the ways that help restore watersheds.

7.1.8 IMPROVEMENT IN POLICIES

As discussed in section 6.7, there are a few challenges with the current legal framework in the water sector. At the policy level, there is a need for the development and enactment of a sustainable National Water Policy linked to the Constitutional realities of Kenya, as such an overarching policy is lacking. Strategy documents required under the Water Act, 2016 such as the National Water Sector Investment and Financing Strategy are lacking, leaving Kenya with disjointed infrastructural investments, and a lack of synergy to address different needs and inefficiencies (Matie & Mugo, 2018).

There is thus the need for additional or updating of current policies to support more efficient use of water, effective and safe sanitation and efficient irrigation. For example, looking at efficient water use, policies should consider alternative water infrastructure that is not reliant on the traditional "grey infrastructure", such as pipe systems for water distribution, as it is more expensive to install and maintain. The policies should for example advocate for and promote water harvesting at the household level to ensure water availability during dry

seasons; this would also reduce the fresh water footprint for sanitation (or in places where sanitation facilities are missing, provide a source of water for safe sanitation facilities). A lot of rainwater in Kenya goes to waste due to lack of adequate water infrastructure, policies and incentives that would encourage people collect rainwater, even at a small-scale level. There is a need for the creation of financial incentives to enhance adoption of smart meters and other technologies in the water sector, as well as the creation of technical standards for equipment including meters to ensure quality in the market, which is a current challenge.

7.2. OPPORTUNITIES FOR PRIVATE SECTOR INVESTMENT IN THE SECTOR

There is a significant gap in terms of the water sector's ability to meet the needs of a growing population and the industrial sector's growth in Kenya. These needs include access to safe drinking water, sanitation and irrigation services requirements. Public funds and concessional donor finance used in developing and improving the water infrastructure are not enough hence the need for private sector financing. However, there are constraints to private sector investment in the sector such as revenue uncertainty and lack of appropriate regulation (OECD, 2018a). The Government needs to first create a conducive business environment for private sector investments in this sector. Private Equity firms can then be leveraged to increase the sources of blended finance , which has grown in prominence within the sustainable development arena. Blended finance could help bridge the water infrastructure gap, while allowing flexible entry/exist and instruments for different types of investors (lenders, public sector, institutional investors, corporations, etc.).

Some of the opportunities for the private sector in the water sector in Kenya include:

- Expansion and modernisation of water and sanitation infrastructure, particularly in rural areas, urban areas and/or for industrial uses.
- Improving the efficiency of water distribution systems such as smart leak detection and smart meters, incentivised by performance-based contracting.
- Use of Internet of Things (IoT) to monitor and report effluent discharge systems in water catchments.
- Investing in water-saving technologies and equipment such as efficient showers, taps, flush toilets and irrigation technologies, supported by government incentives e.g. for reduced taxes or charges on related equipment manufacturing, importing, and/or sales.
- Increased investment for efficient and sustainable irrigation schemes across the country (both small and large scale).

Photo by Adobe Stock | Ewaso Ng'iro River

8. Way forward: capacity building and roadmap of priority projects in the water sector

8. WAY FORWARD: CAPACITY BUILDING AND ROADMAP OF PRIORITY PROJECTS IN THE WATER SECTOR

8.1. ROADMAP OF PRIORITY PROJECTS

A Water Sector Roadmap will be developed as a next step to this report; it is designed to support the Government of Kenya, the Ministry of Water, Sanitation and Irrigation (MWS&I) and other key stakeholders in the private sector and NGOs to draw a path towards achieving the country's NDC, NCCAP, Kenya Vision 2030, and SDG goals. The roadmap will provide a high-level concerted strategic blueprint and implementation pathway to guide both the short-term and long-term holistic development of the water sector priority projects and the blue economy. The roadmap combines the water-related Strategic Actions and associated water projects outlined in the NCCAP with other key water-related projects (both proposed and ongoing projects) not included within the NCCAP. It will also take into consideration other government initiatives, including the objectives of Kenya Vision 2030, which are considered vital in the development of the water sector, meeting the overall aim of the NCCAP and the Government of Kenya climate change commitments and SDG goals.

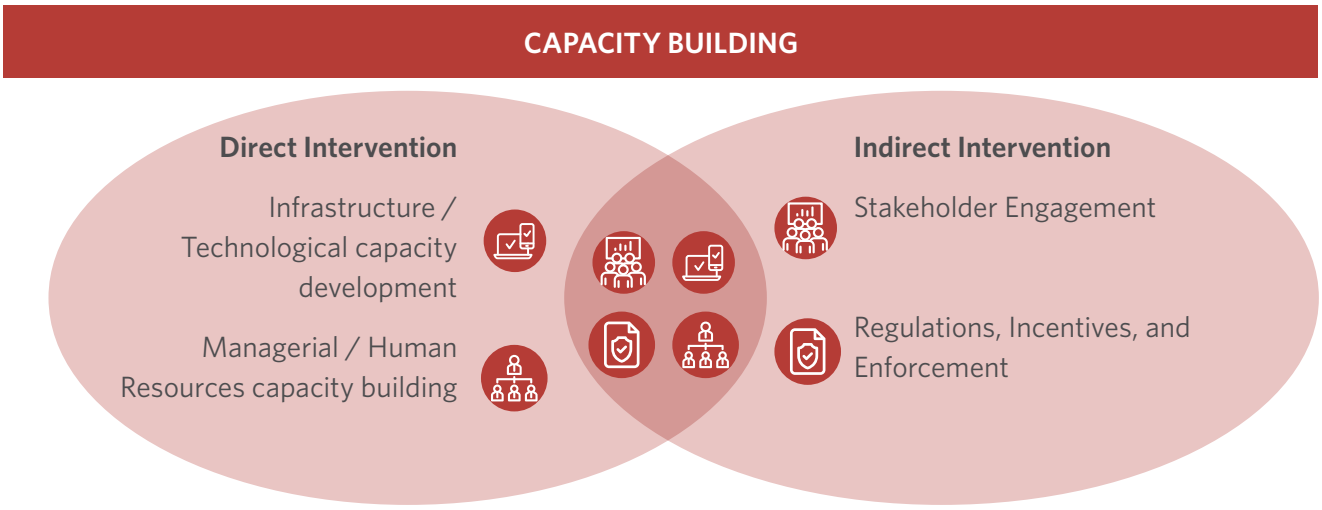
8.2. CAPACITY BUILDING

In order to achieve tangible gains in the implementation of Kenya's NDC and NCCAP for the water sector, collective efforts by all stakeholders are required through direct and indirect government interventions. Government is a critical stakeholder that must provide and undertake a leadership role to direct the necessary actions in the sector, without necessarily implementing all initiatives.

This section aims to identify some of the options that can be taken forward by the Government and other relevant stakeholders in order to overcome existing and future barriers in the water sector from a capacity-building perspective. An integrated approach with full participation from all stakeholders in the water sector is required to overcome the many barriers, challenges and solutions discussed throughout this document and summarised in the following Section.

In order to reach the implementation stage of interventions, be they legal, policy, technical or financial, capacity building is a critical and fundamental aspect that needs to be taken into consideration. It should be developed from both direct and indirect interventions, as shown in Figure 8-1.

FIGURE 8-1. CAPACITY BUILDING TYPES



Source: AECOM

8.2.1 DIRECT INTERVENTIONS

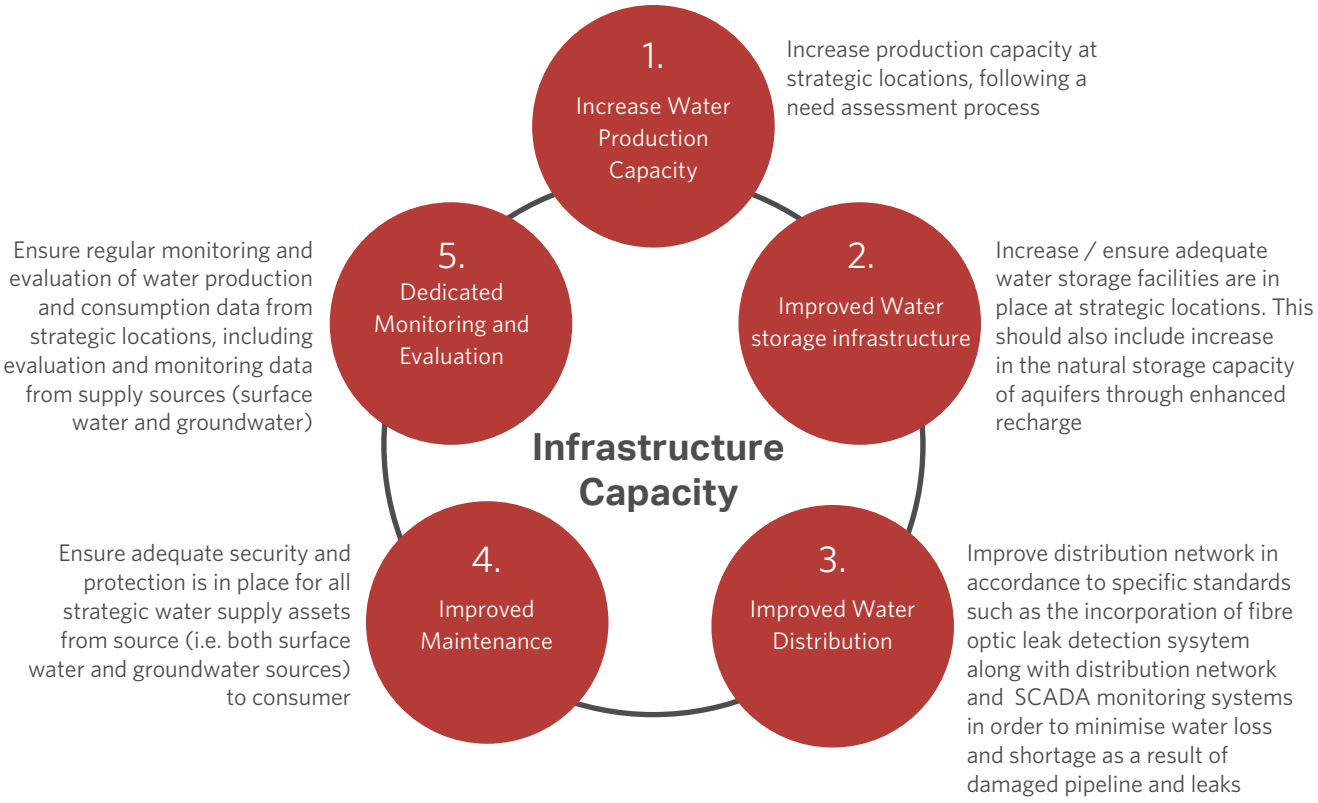
Direct interventions are proposed actions to be undertaken by the Government of Kenya towards capacity building, which need to be approached from two core areas as follows:

- Infrastructure/technological capacity building
- Managerial/human resources capacity building

INFRASTRUCTURE / TECHNOLOGICAL CAPACITY BUILDING

Infrastructure / technological capacity building involves direct investment by the Government of Kenya in water infrastructure and it needs to be built around five pillars, as outlined in Figure 8-2. Within these five pillars, surface water and groundwater capacity building are two important sub-pillars associated with the water storage capacity pillar. All these needs to be holistically developed as part of an integrated water resources management (IWRM) planning process.

FIGURE 8-2. DIRECT CAPACITY BUILDING INTERVENTIONS – INFRASTRUCTURE



Source: AECOM

SURFACE WATER RESOURCES AND STORAGE CAPACITY DEVELOPMENT

Developing the understanding and knowledge of surface and groundwater sources is an particularly important area for the Government of Kenya to focus capacity building effort to support efforts in water resources management conservation. Groundwater is a strategic resource in Kenya, therefore, technical strategies should be put in place to confront the challenges (such as over-exploitation and excess abstraction of groundwater) in places like Nairobi. A collective action of source-side management, demand-side management intervention and supply-side engineering measure must be put in place at a local, regional and national level. Policies should be put in place to exert overriding influence on the behaviour of groundwater abstraction and thus on resource development pressures and management strains. to circumvent the issues of over-abstraction and to maintain a sustainable water-balance, complementary local supply-side measures such as rainwater harvesting for irrigated agriculture, aquifer recharge enhancement (using excess surface run-off), and urban wastewater reuse should always be pursued especially in area where the conditions are favourable. These measures are particularly important in terms of building better relationships with groundwater users and can provide an initial focus for their participation in aquifer management.

It should be noted that increase in irrigation efficiency does not always represent increase in water resources saving. Thus, the primary aim of agricultural demand management for groundwater resource conservation should be to reduce water use through the implementation of agricultural practices that:

- reduce evaporation from the irrigation water distribution system;
- reduce soil evaporation from between crop rows;
- reduce evapotranspiration by the crop itself ineffective in producing yield;
- reduction direct phreatic evapotranspiration by unwanted vegetation; and
- reduction in direct evaporation during spray irrigation.

These should be pursued through encouraging the use of agricultural water saving techniques such as:

- Engineering measures: such as irrigation water distribution through low-pressure pipes (instead of earth canals) and irrigation water application by drip and micro-sprinkler technology;
- Management measures: to improve irrigation water scheduling and soil moisture management; and
- Agronomic measures: such as deep ploughing, straw and plastic mulching, and the use of improved strains/seeds and drought-resistant agents.

Furthermore, in areas where larger water savings are needed to mitigate adverse groundwater depletion, the Government of Kenya should consider the use of policies that will drive the changes in crop type and land use (e.g. through higher-value crops under greenhouse cultivation or returning a proportion of the area to dryland cultivation of drought-resistant crops). An even more radical option could be to place a ban on the cultivation of certain types of irrigated crop in critical groundwater areas.

The success of agricultural water-saving measures in reducing the decline in aquifer water levels depends directly on these savings being translated into permanent reductions in well abstraction rights and actual pumping. It is essential that water savings are not used to expand the irrigated area or to increase water usage in other sectors. This will require a flexible system of abstraction rights and clear incentives for users to act in the collective interest of resource conservation.

GROUNDWATER STORAGE CAPACITY

Groundwater storage is the only source of freshwater in extended drought, and ways need to be found to exploit this resource while mitigating the impacts on aquifer water-level related services. Improvement in the natural groundwater storage capacity should be pursed using aquifer recharge enhancement scheme in order to maintain the water balance and capacity. In addition, conjunctive groundwater use (i.e. water resource management strategy in which groundwater and surface water are used in tandem, making use of the comparative advantages of both) should be encourages. A range of structures such as injection wells and/or in-channel structures like recharges dams can be used for groundwater recharge systems, but it is important that technique selection is closely related to hydrogeological site conditions. it will further be necessary to consider: the quality of water for recharge (after consideration of natural contaminant attenuation processes) so as not to degrade the receiving aquifer water quality; institutional issues must be clearly defined amongst stakeholders in terms of raising investment (who pays?), use priorities (who benefits?), and management arrangements (who controls?).

SURFACE WATER RESOURCES AND STORAGE CAPACITY DEVELOPMENT

Surface water management interventions can be grouped into three main areas, source protection, storage and efficiency. Each of these interventions requires different capacity building efforts within government and the private sector.

Source Protection: The volume and quality of water available for use is maximised by protecting the water. This includes protecting the water towers where most surface water in Kenya originates and protecting the water in the rivers and lakes from pollution or over abstraction. These interventions are largely about effective

regulation, where the regulations controlling water are enforced by the authorities. Nature based solutions are also effective and affordable means of source water protection. Additional capacity and appetite for this enforcement is required.

Storage: Increased surface water storage capacity (primarily through the construction of new dams) increases water availability by capturing water in periods of high flow. This becomes even more important for water security if climate change leads to higher rainfall variability. Interventions to increase surface water storage require additional studies to determine effective design and signing and significant capital investment for major new infrastructure.

Use Efficiency: The use of surface water for human consumption, industry and irrigation has many inefficiencies where water is lost from the system through leakage, over-consumption or misuse. Interventions to improve efficiency require improved operational control and improved maintenance.

MANAGERIAL / HUMAN RESOURCES CAPACITY BUILDING

Managerial / human resources capacity building involves direct investment by the Government of Kenya in training and development of personnel/expertise involved in the water sector to ensure adequately skilled professionals are available to manage the sector. This could be achieved through:

- Dedicated University and Technical and Vocational Education and Training (TVET) water programmes and courses to prepare the workforce (both new and existing personnel)
- Institutional framework that supports vocational/apprenticeship programmes
- Training (both short-term and long-term training programmes) that supports the professional development of both existing and new personnel within the sector. Some of the online water courses can be found in the following websites
  - Kenya Water Institute: https://kewi.or.ke/index.php/short-courses/
  - University of Nairobi- Hydrology and Integrated Water Resources Management: https://eclass.uonbi.ac.ke/course/index.php?categoryid=438
  - Jomo Kenyatta University of Agriculture and Technology – Soil, Water and Environmental Engineering: https://www.jkuat.ac.ke/undergraduate-courses/bsc-soil-water-environmental-engineering/
  - Jomo Kenyatta University of Agriculture and Technology – Science Water and Environmental Management
  - Coursera Water Management Courses: https://www.coursera.org/courses?query=water%20management&page=1
  - World Bank Group – Water Utility Financing: https://olc.worldbank.org/about-olc/water-utility-financing-self-paced
  - World Bank Group other water courses: https://olc.worldbank.org/search?search_api_views_fulltext=water
  - United Nations– Addressing the global crisis- an open online course: https://www.unwater.org/water-addressing-the-global-crisis-an-open-online-course/
  - International Water Association – Water Fund Training and other water courses: https://iwa-network.org/learn/water-fund-training/
  - UNESCO Institute for Water Education- https://www.un-ihe.org/online-courses

8.2.2 INDIRECT GOVERNMENT INTERVENTIONS

Indirect government interventions are to be by the Government of Kenya towards the capacity building, which need to be centred around two core areas:

- Stakeholder Engagement
- Regulations, incentives and enforcement

STAKEHOLDER ENGAGEMENT

Effective stakeholder engagement is the "building block" for the successful implementation of any integrated water resources management strategy. This is because irrespective of their interest, every relevant stakeholder has a say in the management of water resources, and the interest of each stakeholder must be carefully considered in the development of a water conservation and management strategy. Therefore, for the Government of Kenya to succeed in the implementation of any water resources programme, it must embrace and engage all relevant stakeholders through several channels such as training and incentives. Some of the benefits of stakeholder engagement include:

- Conflict prevention through information sharing and the development of consensus;
- Social benefits, because it tends to promote equity among users;
- Economic benefits, because it reduces unforeseen costs;
- Technical benefits, because it usually involves stakeholders in maintenance and leads to better estimates of water abstraction;
- Environmental benefits, because specific local concerns are addressed and incorporated into water management plan and the related design of interventions; and
- Management benefits, because they trigger local stakeholder initiatives to implement demand and supply measures and reduce the cost of regulation.

Additionally, and very importantly, participatory management of highly stressed aquifers should help in the implementation of otherwise unpopular decisions such as jointly changing groundwater consumption patterns in the long-term communal interest. Other stakeholder decisions may also relate to land use, waste management, and protected areas. By involving stakeholders, this helps to improve the overall governance of the resource by giving credibility and accountability to the management process.

Stakeholder involvement should be an on-going, long-term process that adapts to the contextual conditions and needs, and changes therein. For example, stakeholders, such as groundwater users, will tend to have a long-term interest in protecting the aquifer and ensuring that groundwater use is sustainable. It should be noted that the participation of stakeholder can take many forms. Stakeholder mobilisation may take place at any time for a variety of reasons, and it is vital to be clear on the purpose of stakeholder mobilisation.

Figure 8-3 and Table 8-1 provide a non-exhaustive list of water sector-related stakeholders and proposed training, workshop, and/or seminar topics that the Government of Kenya or other leaders in the water sector can pursue as part of an indirect intervention programme to stimulate stakeholders' participation in water conservation and management efforts. The training code number in Figure 8-3 are directly linked to the code number in Table 8-1 below and should be read concurrently.

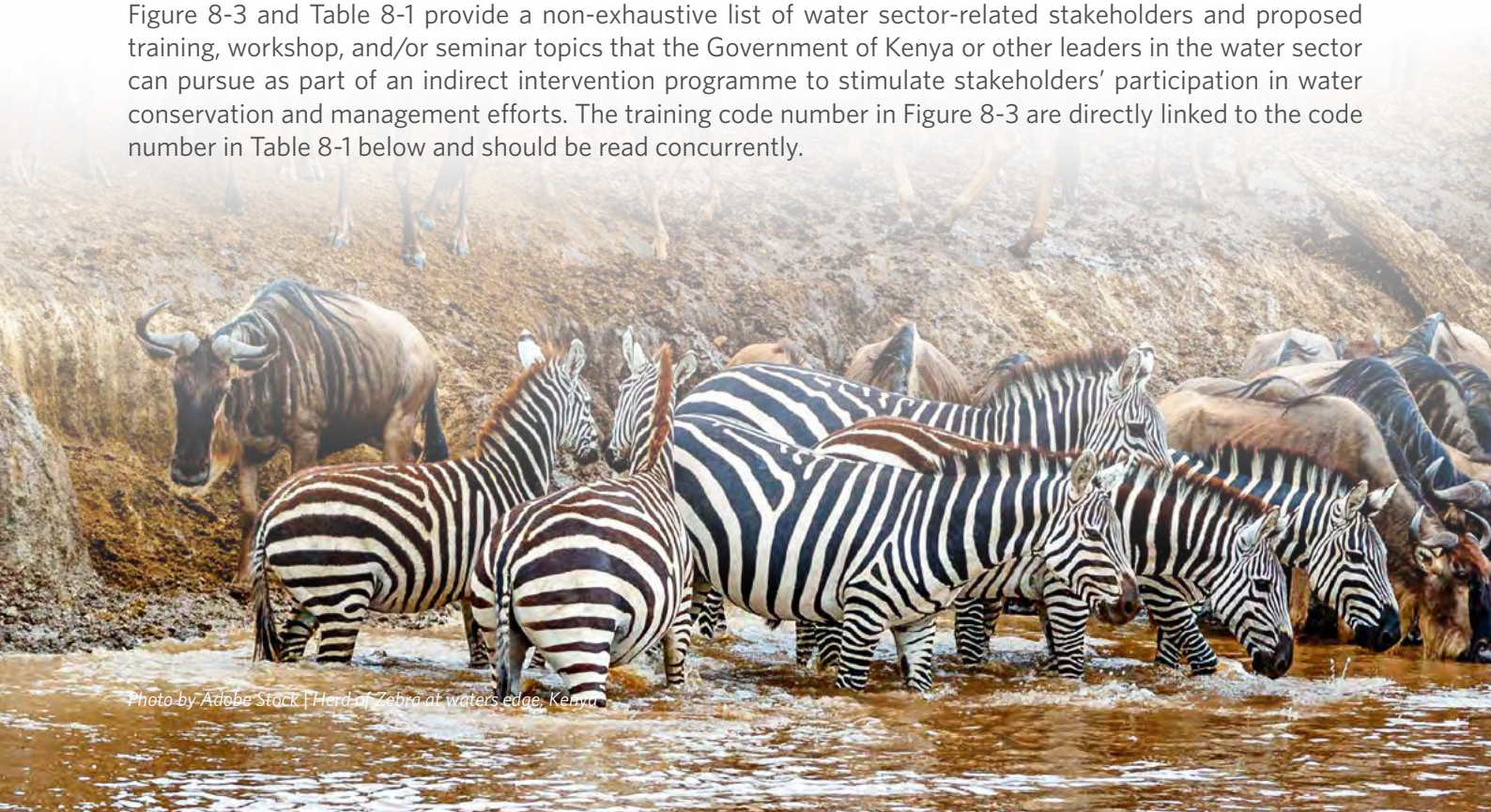


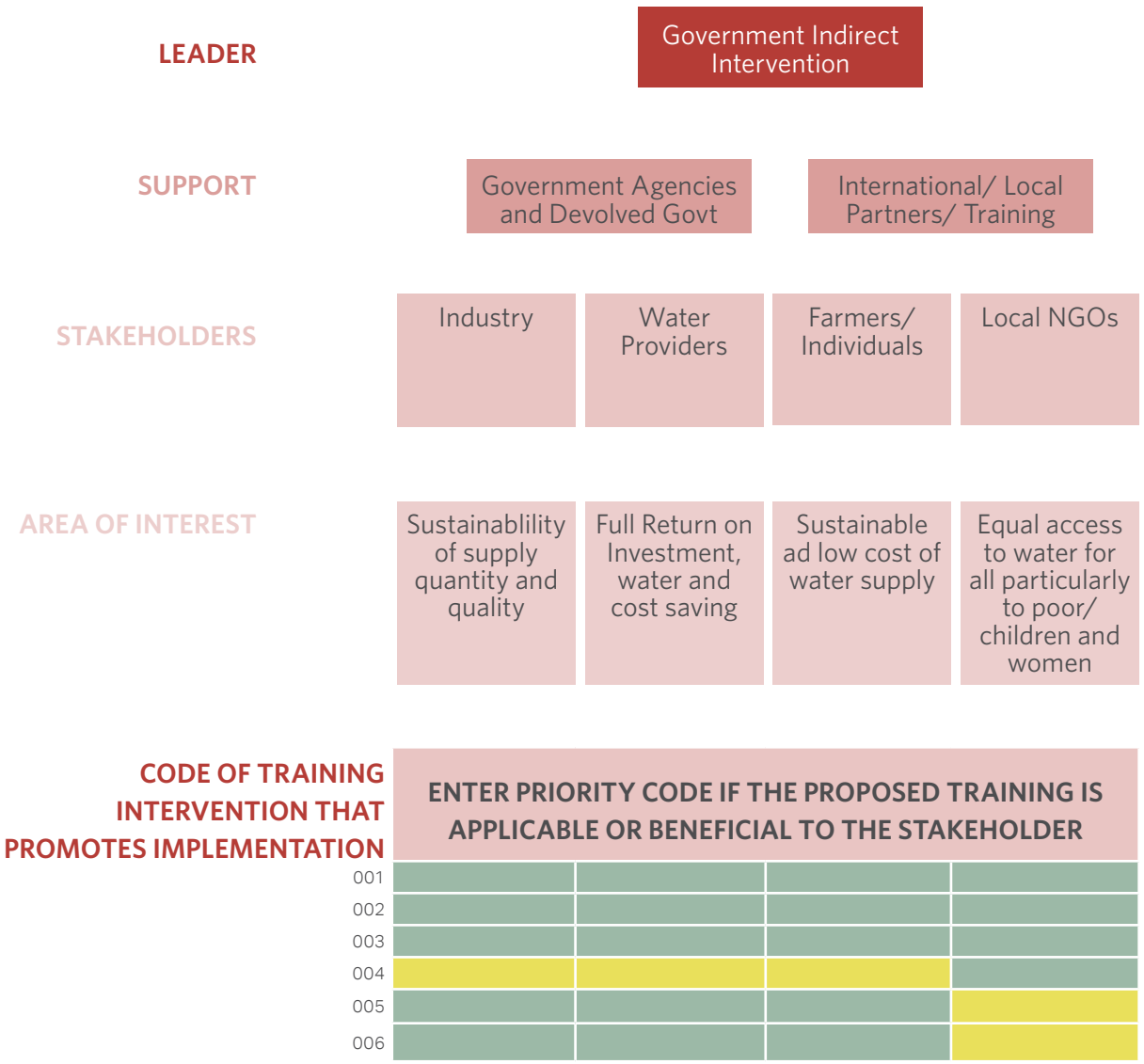
Photo by Adobe Stock | Herd of Zebra at waters edge, Kenya

REGULATION, INCENTIVES AND ENFORCEMENT

The use of regulation, incentives, and effective enforcement are other indirect interventions that the Government of Kenya can pursue as part of the national intervention programme. A number of regulations to incentivise and enforce performance for water management and conservation in Kenya are already in place (see section 2.1); however, strengthening and incorporating additional regulations is required. Some of these have already been discussed in Section 7.1, but they could include (amongst other initiatives):

- Institutional reforms that enhance water access such as water infrastructure expansion to accommodate the growing population, investment in water management and distribution.
- Principles of reusing and recycling of water resources should be incorporated into water management plans.
- The availability of tax incentives for water conservation equipment would create a favourable market environment for such businesses to thrive, which will, in turn, help in the efforts of water resources conservation and save operational costs for large industrial and irrigation water users and general water consumers.
- Exploring innovative financing mechanism for funding in the sector to unlock funding for climate change adaptation and resilience activities.

FIGURE 8-3. EFFECTIVE STAKEHOLDER ENGAGEMENT PROCESS AND PROPOSED TRAINING TOPICS



Priority Rating

- Low Priority to Stakeholder
- Medium Priority to Stakeholder
- High Priority to Stakeholder
- May or May Not Be of Priority to Stakeholder

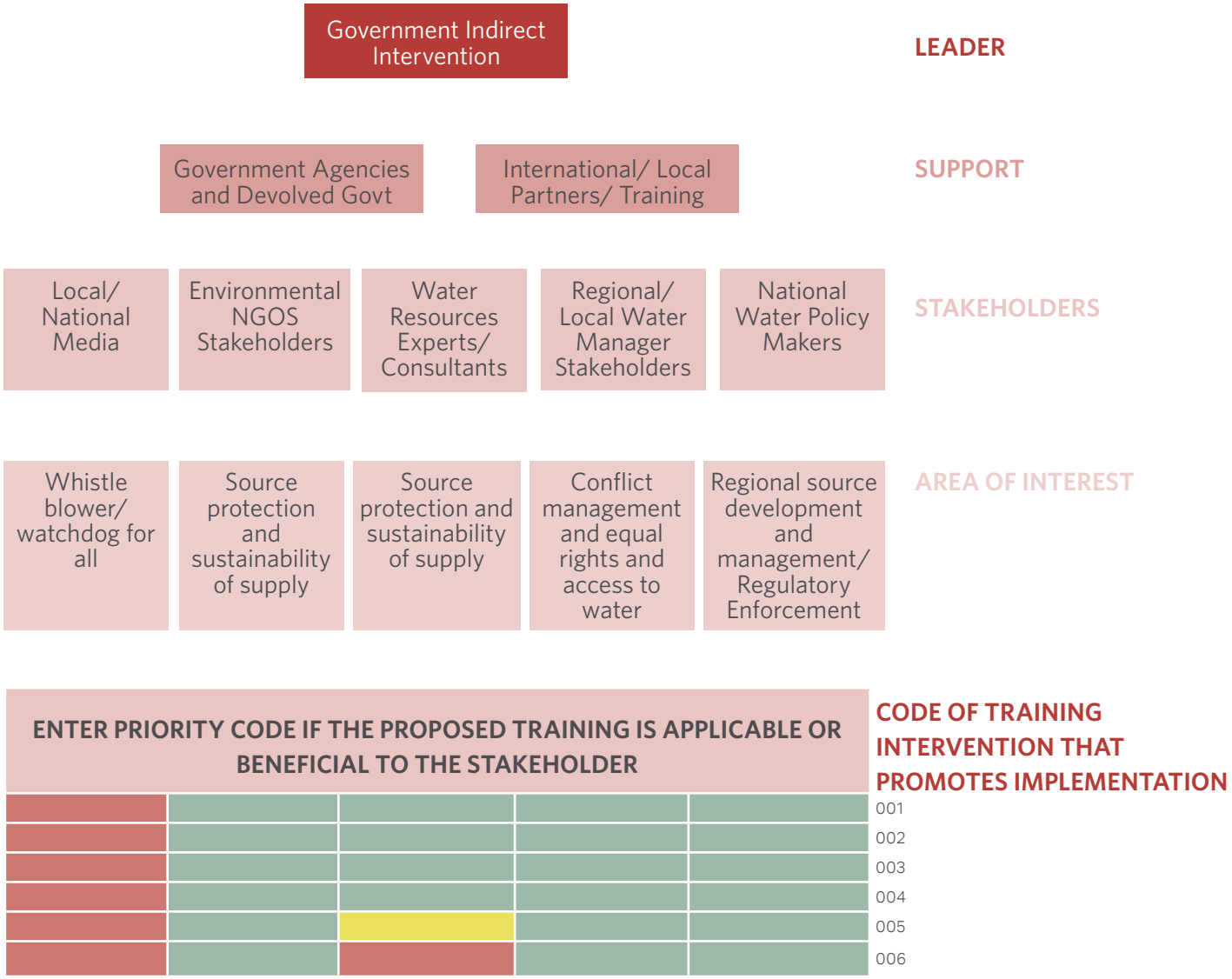

Government Indirect Intervention
LEADER
Government Agencies and Devolved Govt
International/ Local Partners/ Training
SUPPORT
Local/ National Media
Environmental NGOS Stakeholders
Water Resources Experts/ Consultants
Regional/ Local Water Manager Stakeholders
National Water Policy Makers
STAKEHOLDERS
Whistle blower/ watchdog for all
Source protection and sustainability of supply
Source protection and sustainability of supply
Conflict management and equal rights and access to water
Regional source development and management/ Regulatory Enforcement
AREA OF INTEREST
ENTER PRIORITY CODE IF THE PROPOSED TRAINING IS APPLICABLE OR BENEFICIAL TO THE STAKEHOLDER
CODE OF TRAINING INTERVENTION THAT PROMOTES IMPLEMENTATION
001
002
003
004
005
006

TABLE 8-1. PROPOSED CAPACITY BUILDING TOPICS FOR STAKEHOLDERS IN THE WATER SECTOR

Topic Code	Training Topic	Aims and Objectives/Benefit to Stakeholders [18]	Water Sector Benefit
01	Groundwater Monitoring and Management Strategy	- To gain understanding of the impact of land-use activities and climatic variation on groundwater quantity and quality - To gain understanding of groundwater monitoring requirements and relevant legislations - To gain understanding and control of the impacts of groundwater abstraction/over abstraction and contamination - To gain understanding of the processes of groundwater recharge, flow and diffuse contamination - To gain understanding of the benefit of regular groundwater monitoring data collection, analysis and storage - To gain understanding of the benefits and promotion of self-monitoring amongst stakeholders - To gain understanding of the importance of accurate data monitoring and reporting to regulatory authorities	Water Resources conservation and management
02	Surface water monitoring	- To gain an understanding of different water parameters that can be monitored. - To gain an understanding of setting up a monitoring station. - To gain an understanding of reading and interpreting data from a monitoring station equipment.	Water Resources conservation and management
03	Source water protection and management	- To gain understanding of potential legislation and regulations surrounding source water protection and to encourage willingness to comply - To gain understanding of the potential impacts on sources water (surface water and/or groundwater or both) from: - Intensive irrigation, livestock and agricultural land use - Industrial land use activities Land reclamation areas - Mining and quarry activities - To encourage and emphasise on the benefit of collective data collection, storage and sharing amongst all stakeholders through a systematic database that is accessible by relevant stakeholders via the internet - To gain understanding of sustainable water resources usage - To gain understanding of the impact of climate change on source water quantity and quality - To gain understanding of potential source water polluters and to promote defensive monitoring at site level	Water Resources conservation management and security
04	Effective Financing of the Water Sector	- To gain understanding on the need and benefit of effective financing of water related projects - To gain understanding of the level of financing required to develop the water - To gain understanding of the economic value of water - To gain understanding of the impact of climate change on source water quantity and quality	Water Management and Security
05	The role of effective stakeholder engagement in source water management and protection	- To gain understanding of the importance of support and effective communication to support water resources management - To gain understanding and appreciation of the role of effective stakeholder engagement in the source water management - To gain understanding of the ways to categorise stakeholders and to identify different stakeholder interests and responsibilities - To raise awareness and gain understanding/guidance on how to support/encourage participation on water conversation and management efforts - To gain understanding of the impact of climate change on source water quantity and quality	Water Resources conservation, management and Security

18 NB – this is not an exhaustive list of capacity building /training options, it is a guide and will need to be developed further by each stakeholder.

06	Avoiding the impacts of agricultural practices on source water quantity and quality	- To gain understanding of agricultural land-use activities - To gain understanding of how soil leaching, and runoff can occur and the threat they pose to source water quality - To gain understanding of the different types of contamination and to understand the differences between point and non-point source contamination - To gain understanding of the different types of chemical processes used in agricultural practices/operations and their potential impacts on source water quality and quantity - To gain understanding of the impact of poor irrigation practices on source water quality and quantity - To gain understanding of agricultural best practices that promotes source water protection and conservations - To learn about different water stewardship programmes (e.g. Alliance for Water Stewardship Programme) and how to become good water steward.	Water Conservation, Management and Security
07	Avoiding the impacts of industrial activities on sources water quantity and quality	- To gain understanding of the different types of industries activities and their impact on sources water quantity and quality - To gain understanding of the various industrial contaminants likely to be associated with different industry types - To gain understanding of industrial best practices that promotes source water protection and management - To learn about different water stewardship programmes (e.g. Alliance for Water Stewardship Programme) and how to become good water stewards - To learn how to carry out best practice internal water audit and self-monitoring of water consumption - To learn about water saving technologies and practical approaches to water conservation - To gain understanding of the impact of climate change on source water quantity and quality - To learn how to develop and set a Water Conservation Policy and gaining management commitment	Water Conservation, Management and Security
08	Wastewater treatment, management and circular economy	- To understand the concept of circular economy and how to apply it - To gain an understanding on how circular economy results to cost saving of industrial resources including water - To understand the different technologies used for wastewater treatment - To understand the theories and principles involved in wastewater treatment	Water Conservation, Management and Security
09	Use of Internet of Things to monitor water quantity	- To gain an understanding of the different IoT technologies in the market for monitoring water quality. - To understand how to read data from the technologies and utilise the information to make informed decisions.	Water Resources conservation management and security
10	Climate proofing water infrastructure	- To gain an understanding of impacts of climate change on water infrastructure. - To gain an understanding of the roles of climate resilient infrastructure in a changing climate. - To gain an understanding of how to plan and design climate resilient infrastructure. - To gain an understanding of the challenges in making infrastructure resilient.	Water Conservation, Management and Security
11	Climate Change Science and carbon markets	- To gain an understanding of Payment for Ecosystem Services (PES) - To gain an understanding of climate change; causes, impacts, adaptation, mitigation and resilience. - To gain an understanding of climate finance, carbon credits, trade-offs and markets.	Water conservation

Source: AECOM and stakeholders working in Kenya's water sector

Photo by Adobe Stock | Boy pumping water for his sister, Kenya

9. Conclusion

Photo by Adobe Stock | Nairobi downtown, Kenya

9. CONCLUSION

This report is intended to collate information on the status of Kenya's water sector and provide information on the impacts of climate change in the sector. Kenya, still being a developing country, faces many challenges including financial resource gaps, high incidences of poverty, inadequate legal and policy framework as well as infrastructure challenges. Climate change impacts in the sector as discussed in chapter 4 are also a key concern for the country, as these negatively affect all the sectors of the economy and social well-being, for instance as a result of droughts, flooding and infestation of pests and water-borne diseases. All these challenges cumulatively slow down the rate at which the government can increase water coverage which currently stands at 57%, as well as improve irrigation and sanitation services across the country.

Despite the challenges facing the water sector, the Government through the Ministry of Water, Sanitation and Irrigation has in recent years expanded water infrastructure with support from development institutions. Various stakeholders in the private sector, NGOs, and local communities are also actively implementing water projects of different scales. These are efforts to achieve the ambitious target of ensuring universal access to water and improved sanitation services by 2030. Other key developments in the sector include the operationalisation of the Water Act, 2016 and establishment of most of the water institutions created by the Act.

As the report outlined, there are several gaps and barriers for implementing the goal to achieving universal access to water and improved sanitation services to all by 2030. This report aimed to undertake a status review of the sector to identify where further work and attention are needed. The opportunities identified in earlier chapters highlight areas where the Ministry of Water, Sanitation and Irrigation, as well as other actors active in the sector should prioritise actions. The opportunities were categorised into technical, financial, governance and capacity development.

This report will also support the development of a Water Sector Roadmap which will be delivered through the GNI^{plus} project as a next step. The aim of the Roadmap document is to set out a blueprint and implementation pathway to support the Government of Kenya towards developing the water sector to deliver its NDC commitment, SDG goals and Vision 2030 target. It can also help attract investors participation and market finance for investments in the water sector whilst acting as a valuable tool for tracking and evaluating relevant projects.

Photo by Nyangoro Maktau Water Supply project with financing from Europen Union- CIPRA programme

Photo by Projected WRA | Children & community Members of Machinjoni elated after officially being handed over the protected spring

10. References

Photo by WRA Intake constructed to reduce water conflicts

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Appendix A

APPENDIX A. GOVERNMENT OF KENYA NCCAP 2018-2022 PRIORITY ACTIONS IN THE WATER SECTOR

A.1. PRIORITY ADAPTATION ACTIONS

Adaptation is a priority for the Government of Kenya, as outlined in its NDC and NCCAP. Kenya's National Climate Change Action Plan 2018 – 2022 aims to enhance the resilience of the water sector by promoting access to and more efficient use of water for agriculture, manufacturing, domestic, wildlife and other uses. Specific water adaptation actions identified by the Government of Kenya in the NCCAP are detailed below (GOK, 2018b):

TABLE A-1. WATER ADAPTATION ACTIONS IN THE NCCAP

STRATEGIC OBJECTIVE: ENHANCE RESILIENCE OF THE WATER SECTOR BY ENSURING ADEQUATE ACCESS TO AND EFFICIENT USE OF WATER FOR AGRICULTURE, MANUFACTURING, DOMESTIC, WILDLIFE AND OTHER USES.			
Issue/Problem: Assess to and quality of water is expected to decline because of climate change (drought, reduction of glaciers).			
Opportunity	**Actions**	**Sector**	**Adaptation**
Increase annual per capita water availability through the development of climate-proofed water infrastructure	• Mainstream climate change adaptation into and implement the National Water Master Plan • Develop and implement adaptation (compliant design and construction codes and standards for all water resources infrastructure) • Increase the annual number of climate-proofed water harvesting and water storage infrastructure from 700 to 2,000 by June 2023 • Increase annual per capita water availability (harvested, abstracted and stored) from 647 m3 to 1000 m3 by June 2023 • Increase the number of people and entities accessing good quality water for domestic, agricultural and industrial use from 58% to 65% by June 2023 • Climate-proof the construction and maintenance of at least 12 (at most 36) multipurpose dams, small dams, water pans and in situ water harvesting and storage structures countrywide by June 2023 • Mainstream disaster risk reduction measures in the water sector planning and service delivery, particularly in vulnerable, high risk regions • Access at least 2 untapped aquifers by June 2023. Undertake national hydrogeological surveys to identify strategic aquifers • Undertake a national ground water survey to establish abstraction levels against recharge, and map locations and buffer zones suitable for direct artificial groundwater recharge and other priority interventions • Develop at least 56 ecosystem-based adaptation and integrated sub-catchment management plans and implement at least 236 other sub-catchment management plans by June 2023	Ministry of water and sanitation, Water Resources Authority (WRA), National Water Storage Authority, Research Institutions and Academia, Ministry of Health and sanitation, Water service providers, Water Service Boards, Water Consumers, Ministry of Environment and Forestry, Kenya Water Institute	Adaptation

Opportunity	Actions	Sector	Adaptation
Increase number of pro-poor water harvesting-based livelihood resilience programmes to enhance household water access, food security and boost groundwater recharge of the aquifers	• Establish at least 300,000 on-farm ponds in at least 15 counties for on-farm (in-situ) agricultural water harvesting • Support improved, water-harvesting-based livelihood systems on at least 60,000 ha through various methods of land reclamation • Support and strengthen local communities to protect at least 5 water catchment areas • Develop a water utility creditworthiness index as well as financial instrument for adaptation	National Irrigation Board, Ministry of water and sanitation, National Water Storage Authority, Structured community groups	Adaptation
Promote efficient use of water	• Reduce water wastage and non-revenue water from the current 43 per cent (unbilled and unaccounted for) to 20 per cent by June 2023 a. Conduct awareness programme for water efficiency b. Introduce innovation in water tracking and leakages identification and reporting	Ministry of water and sanitation, County Governments, Local communities, Ministry of Education, Water Consumers	Adaptation
Improve water access for wildlife in major game parks and reserves	• Develop and implement an integrated water management strategy for rangeland economy (wildlife and pastoral livestock) a. Restore degraded rangeland units through planting indigenous trees, and constructing artificial water dams for wildlife use b. Identify and map locations suitable for harvesting flood water in rangelands	Ministry of Tourism and Wildlife, Kenya Wildlife Service, Research Institutions and Academia, Kenya Forest Service, Ministry of Environment and Forestry	Adaptation
Policy dialogue	• Zero rate taxes of water harvesting and storage equipment to stimulate household and institutional water harvesting both at rural and urban areas • Review by-laws that prohibit water harvesting in urban areas like in Nairobi • Develop a policy to make water harvesting mandatory for institutions and households that consume over 20 m3 per month or to have a 60 – 40 per cent balance between tap and harvested water respectively • Enforce laws on urban planning and storm water management in urban areas – desilting of drainage, riparian protection • Formulate policy for recycled water pricing and beneficiary sectors such as construction, watering flower beds, and car washes. • Conduct national awareness and education to increase uptake of recycled water for secondary water uses. • Develop a national framework for wastewater management	Ministry of water and sanitation, Water Resources Authority (WRA), National Treasury	Adaptation

A.2. PRIORITY MITIGATION ACTIONS IN THE INDUSTRY SECTOR (WITH A FOCUS ON WATER)

This table outlines a list of mitigation actions for the Industry Sector that have (or could have) links to water, as presented in the NCCAP 2018-2022 (GOK, 2018b) .

TABLE A-2. WATER MITIGATION ACTIONS IN THE NCCAP

Strategic Objective: Promote/encourage the growth of green industry to drive jobs in the manufacturing sector			
Issue/Problem: Inefficient use of resources			
Opportunity	**Actions**	**Sector**	**Mitigation**
Energy efficiency	• Increase the number of companies participating in energy efficiency initiatives by1,000 and increase the number of energy audits by 1,000 by 2022: • Develop Minimum Energy Performance Standards (MEPS) for 5 more appliances, and upscale the existing testing facilities to include these 5 appliances	Ministry of Industry, Trade and Cooperatives (MITC), KIRDI, Kenya Bureau of Standards (KEBS), KAM, KIRDI, Private Sector (Industrialists)	Mitigation and Enabler
Industrial symbiosis.	• Set up waste exchange clearance centres in all Special Economic Zone (SEZ) by 2022 (This action should be made part of the implementation of the Solid Waste NAMA in the Waste Sector) ▪ Undertake a baseline survey of all SEZs and Industrial Parks (IPs) by 2022 ▪ Set up a Waste and By-product Exchange database for match making. • Set up common waste management facilities for all SEZ (effluent Treatment Plants) by 2022. • Establish infrastructure for waste recovery, reuse and recycling to create 20,000 decent green jobs by 2022 (5% of jobs created under four sectors: leather, textiles and apparel, fish and agro-processing)	MITC, KIRDI, KAM, KIRDI, Private Sector (Industrialists), KEPSA, County Governments	Mitigation
Industrial process improvements and optimization	• Implement the NAMA for the Charcoal Sector in Kenya. (Linked to the forestry sector mitigation actions) • Introduce process improvements and energy efficiency in the cement sector (Energy efficiency already covered in the energy sector) • Increase number of entities adopting environmentally sound technologies by 50% by 2022 • Promote sustainable energy sources for industrial heating processes (Under energy sector)	KFS, MITC, KEBS, KIRDI, KAM, KEPSA, Farmers, KEFRI, Charcoal producers, Cement manufacturers, County Governments, Police, MEF, Private Sector	Mitigation
Eco- innovation for productivity and competitiveness	• Strengthen academia- industry- government-civil society (quadruple helix) collaboration to boost research and innovation for productivity and competitiveness and attract funding opportunities.	MITC, KIRDI, KAM, KEPSA, Private sector, Academia, Civil society	Capacity building

Photo by Adobe Stock | Elephant and Calf enjoying water, Kenya

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Appendix B

APPENDIX B. GOVERNMENT OF KENYA INVOLVEMENT IN THE WATER SECTOR

B.1. AGENCIES OUTSIDE THE MWS&I WITH LINKS TO WATER

As outlined in Section 2, there are other Ministries (and departments) within the Kenyan government that support water initiatives(but are not limited to), as per Table B-1.

TABLE B-1. AGENCIES OUTSIDE THE MWS&I WITH LINKS TO WATER

Name of body	Overview of the mandates and responsibilities of the institution
County Governments	The Water Act 2016 gives powers to the County Government to establish WSPs by complying with the standards of commercial viability set out in by WASREB. County Governments also have the responsibility of enforcing the law set in the Water Act (MoEF, 2016a).
Ministry of Tourism and Wildlife	The ministry has a responsibility to conserve at least 15% of coastal and marine areas, especially areas of important biodiversity and ecosystem service. The institution also addresses climate risk of onshore fish moving into deeper waters. It is also the responsibility of the ministry to protect water resources across the National Parks and Reserves. (MoTW, 2020). **More information of the Ministry is found on the MoTW website:** http://www.tourism.go.ke/our-services/ .
National Drought Management Authority (NDMA)	The NDMA is an agency which establishes mechanisms to ensure that drought does not cause emergencies and ensures that the impacts of climate change are mitigated sufficiently. The Adaptation Consortium (Ada) is a component of the National Drought Management authority in Kenya. The Ada is piloting Country Climate Change Funds in eleven arid and semi-arid counties (Garissa, Isiolo, Kitui, Makueni, Bomet, Kisii, Nandi, Kisumu, Vihiga, Wajir and Kakamega). (Adaptation Consortium, 2020). **More information of the Climate Change Fund can be found:** https://www.adaconsortium.org/index.php/about/about-ada
Kenya Water Towers Agency (KWTA)	KWTA is a state corporation under the MoEF established in 2012. The agency is mandated to coordinate and oversee the protection, rehabilitation, conservation and sustainable management of all critical water towers in Kenya. Water towers support socio-economic development; supporting generation of electricity, industrial development, irrigation, agriculture, wildlife, tourism, conservation of biodiversity indigenous knowledge and research. (KWTA, 2020b). **More information on KWTA can be found on its website:** https://watertowers.go.ke/ .
Kenya Meteorological Department	The departments fall under the MoEF and has the responsibility of provisioning of meteorological services to agriculture, forestry, water, civil aviation and private sector including industry, commerce and public utilities. It also provides water resources development and management. Providing early warnings of weather events such as flooding helps institutions and households prepare in advance by putting in place measures that will counter the impacts of floods. (MoEF, 2020). **More information on KMD found on its website:** https://meteo.go.ke/
Kenya Forest Service (KFS)	KFS is a corporate body established under the Forest Conservation and Management Act no 34 of 2016, as a replacement of the old Forestry Department. The Act gave the Service a mandate "to provide for the development and sustainable management, including conservation and rational utilisation of all forest resources for socioeconomic development of the country". KFS therefore has a responsibility to rehabilitate and restore forests (both terrestrial and mangrove) which maintain water quality. (KFS, 2020). **More information on KFS can be found on its website:** http://www.kenyaforestservice.org

B.2. OVERVIEW OF LEGISLATIONS IMPACTING THE WATER SECTOR

The following sections provide a more detailed overview of the legalisation and rules impacting the water in sector to what is outlined in Section 2.1.

CONSTITUTION OF KENYA, 2010

The following are the provision in the Constitution with relation to water:

- The Fourth Schedule to the Constitution sets out the distribution of functions between the National Government and the County Governments.
- With regards to water, it provide that the National Government shall be responsible for (a) the use of international waters and water resources, (b) transport and communications including in particular marine navigation, (c) protection of the environment and natural resources with a view to establishing a durable and sustainable system of development including in particular water protection, securing sufficient residual water, hydraulic engineering and the safety of dams.
- The Schedule provide that the County Governments shall be responsible for (a) county transport, including ferries and harbours but excluding the regulation of international and national shipping and matters related thereto, (b) implementation of specific national government policies on natural resources and environmental conservation and (c) county public works and services such as storm water management systems and water and sanitation services.
    - There is however weak coordination among National and County Governments, as well as national and regional sector institutions and other stakeholders, particularly regarding investment planning, which has not been properly linked with national and county economic planning and budgetary processes (Matie & Mugo, 2018).
- Article 43 (1) (d) guarantees the right to clean and safe water in adequate quantities, whilst Article 21(2) requires the State to take legislative, policy and other measures including the setting of standards to achieve the progressive realisation to the rights to clean and safe water in adequate quantities.
    - There however lacks legislative and policy directive on what clean and safe water means in the context of Kenya as well as what would constitute adequate amounts. The realisation of this right requires cooperation and collaboration between the National and County Governments, especially as Counties are responsible for water service provision.
- Public land under the Constitution is defined to include all rivers, lakes and other water bodies as defined by an Act of Parliament under Article 62 (1) (i).
    - The inclusion of rivers, lakes and other water bodies as public land has implications on management, as the National Land Commission is mandated to administer public land, The Commission's functions are set out in the Constitution as well as in the National Land Commission Act, 2012. However, the Water Act (2016) contains no explicit recognition of this oversight role of the National Land Commission with regards to water,

The Environment and Land Court called for under Article 162(2)(b) of the Constitution, to hear and determine disputes related to environment and the use and occupation of, and title to land. Also has a bearing on water as it hears and determines water related court cases. The Environment and Land Court Act, No.19 of 2011 sets out more details on the workings of the court.

WATER ACT 2016

The Water Act is the main law governing the water sector. The Act delineates roles of the various regulatory bodies, operationalises devolution of water and sewerage services and the privatisation of water services, and aligns the water law to the Constitution. Key provisions of the Act include:

1. Recognition under Section 5 of the Act that every water resource is vested in and held by the National Government which holds in trust for the people of Kenya.
2. Establishment of an elaborate institutional framework that sets out key functions of the various institutions and roles of various players at different levels. These include at the national level- the Cabinet Secretary in the Ministry of Water and Sanitation, the Water Services Regulatory Board (WASREB), the Water Works Development Agencies (WWDAs), the Water Resources Authority (WRA), Water Sector Trust Fund, the National Water Harvesting and Storage Authority, and the Water Tribunal; as well as at the sub-national level entities such as - County Governments, Water Service Providers, Basin Water Resources Committees, and Water Resource Users Associations (WRUAs) at the community level.

Limitations of the Water Act include:

1. WASREB acts as an agent of national government with wide-ranging powers in relation to water service provision, calling into question the extent to which service provision under the Act has been devolved to county governments as anticipated by Schedule Four of the Constitution. County Governments establish water service providers and in doing so are to comply with the standards of commercial viability set out by WASREB, County Governments are also responsible for giving effect to national water services standards and conditions and requirements relating to tariffs set by WASREB. As such conflict has sometimes arisen between County Governments, water service providers and WASREB with regards to interplay in their role, with claims of one party attempting to usurp another's functions. (Muranga County Government, 2019).
2. Section 64 mandates the Cabinet Secretary responsible for matters relating to water in consultation with County Governments, to formulate a National Water Sector Investment and Financing Plan which should include the time frames for the plans and an investment programme based on the investment plans. This Plan is yet to be developed and there overall lacks a clear and coordinated water and sanitation investment planning in Kenya.
3. Rule of law challenges mean that implementation of the Act is not carried out as should be done in all instances. For example, the primary mode of granting water rights under the Act is through the grant of permits from the Water Resources Authority. The Act sets out the activities requiring permits, the procedure to be followed and the activities exempted from this requirement. There have however been instances where permits are granted and then deemed to have been granted illegally, following which demolitions of water intakes by the government are ordered without following the due process laid out on the revocation of permits (Oyugi C., 2019).
4. Whereas Water Resource User Associations provide opportunity for collaborative management of water resources by local communities and resolution of conflicts concerning the use of water resources, they face challenges such as elite capture, dependency on donor support, lack of meaningful participation, and difficulties scaling up initiatives hampering their effectiveness (Richards N. and Syallow D., 2018). These challenges not adequately addressed by the Act.
5. The transfer of water service provision to the Counties has in practice left the water service providers bearing debts and their creditworthiness is largely insufficient to secure new financing. They face the challenge of increasing their cash flows and improving their creditworthiness, to enable them to secure commercial financing, to reduce the financial burden on the public sector and improve their performance. (PPIAF, 2020)

For the Act to be effectively operationalised it requires the enactment of various regulations, which are yet to be enacted. Reliance is still had on regulations passed under the Water Act 2002, pending enactment of proposed regulations under the 2016 Act.

ENVIRONMENTAL MANAGEMENT AND COORDINATION ACT, 2015

The Environment Management and Coordination Act (EMCA) provide for the establishment of an appropriate legal and institutional framework for the management of the environment and for matters connected therewith and incidental thereto. With regards to the water sector, the Act provides-

- At section 44 that the National Environment Management Authority shall, in consultation with the relevant lead agencies, develop, issue and implement regulations, procedures, guidelines and measures on among others- prohibition of water pollution, regulation on effluents to be discharged into the sewerage system, licensing for discharge of effluents. Whilst this responsibility is set out as a function for NEMA under EMCA, this responsibility is placed on the WRA under the Water Act, 2016. This overlapping mandate leads to lack of clarity on overall responsibility and hinders full success of either entities' execution of the role,
- Section 58 of the Act makes Environmental Impact Assessments (EIA) mandatory for certain projects set out in the Second Schedule to the Act, to ensure proposed projects and activities are environmentally sustainable. This includes projects in the following categories:
- Dams, rivers and water resources- including storage dams, and large- scale flood control schemes.
- Natural conservation areas- including establishment of Protected Areas, wetland reclamation and any projects likely to affect wetlands.
- Section 63 empowers NEMA to issue EIA licences upon evaluation of an environmental impact assessment study report where NEMA is satisfied of the adequacy of the report. The licence is issued on such terms and conditions as may be appropriate and necessary to facilitate sustainable development and sound environmental management.
- Whereas the Act and the Environmental (Impact Assessment and Audit) Regulations of 2003 thereunder set out the procedure and principles for EIAs, implementation tends to fall short of the required standard, for example with public participation which is a critical component of the EIA process inadequately done in certain cases or projects proceeding altogether without EIAs (Kenya Law Reports, 2019). At section 57 that the Cabinet Secretary responsible for Finance may propose to Government tax and other fiscal incentives, disincentives or fees to induce or promote the proper management of the environment and natural resources or the prevention or abatement of environmental degradation including (a) tax rebates to industries or other establishments that invest in plants, equipment and machinery for among others pollution control, water harvesting and conservation and prevention of floods; (b) tax disincentives to deter bad environmental behaviour that leads to depletion of environmental resources or that cause pollution.
- At section 71 that the Cabinet Secretary responsible for matter relating to environment and natural resources shall establish criteria and procedures for the measurement of water quality and recommend to the National Environment Management Authority minimum water quality standards for all the waters of Kenya. The Environmental Management and Coordination, (Water Quality) Regulations, 2006 are established pursuant to this requirement, and are applied in conjunction with the 2008 WASREB issued Guidelines on Water Quality and Effluent Monitoring.
- At Section 72, penalties for water pollution. It provides that a person who discharges or applies any poison, toxic, noxious or obstructing matter, radioactive waste or other pollutants or permits any person to dump or discharge such matter into the aquatic environment in contravention of water pollution control standards shall be guilty of an offence and liable to imprisonment for a term not exceeding

two years or to a fine not exceeding one million shillings or to both imprisonment and fine. The Act also adds a requirement for a person found guilty to pay the cost of removing the pollutant, costs of restoration incurred by a government agency or organ and third- party costs as determined by the courts on application of such third parties.

IRRIGATION ACT, 2019

The Irrigation Act provides for the development, management and regulation of irrigation, to support sustainable food security and socioeconomic development in Kenya. It regulates development, management, financing, provision of support services and regulation of the entire irrigation sector in Kenya. The Act:

- Sets up institutions such as the National Irrigation Authority, to develop and improve irrigation infrastructure for national or public schemes provide irrigation support services to private medium and smallholder schemes, in consultation and cooperation with county governments and other stakeholders and to provide technical advisory services to irrigation scheme.
- Delineates the role of County Governments with respect to irrigation within the County's area of jurisdiction, requiring the establishment of a county irrigation development unit for the better carrying out of functions.
- Provides for formation of irrigation water users' association. A resident of a catchment area who is a crop farmer, livestock producer, fish pond user, or small rural industry entrepreneur or otherwise uses water for irrigation purposes from a common water source may, together with other members or persons resident in the same area, form or join such an association. The association may, with the approval of the Cabinet Secretary, enter into an agreement with the National Government, a County Government, a private sector institution or another farmers' association for the establishment, expansion, implementation, improvement, modernisation, operation or maintenance of a scheme.

Draft Irrigation (General) Regulations, 2020 operationalising the Irrigation Act 2019, have been published by the Cabinet Secretary, Ministry of Water, Sanitation and Irrigation in line with the requirement of section 34 (1) of the Act, for the Cabinet Secretary in consultation with county governments to make Regulations, for the better carrying out of the purposes and provisions of the Act. The regulations are undergoing stakeholder consultation and are yet to be gazetted as law.

ENVIRONMENTAL MANAGEMENT AND CO-ORDINATION (WATER QUALITY) REGULATIONS, 2006

The main objects of the Water Quality Regulations are to prevent water pollution, set standards for sources of domestic water, maintain water quality monitoring for sources of domestic water and provide for the issuance of an effluent discharge licenses.

ENVIRONMENTAL MANAGEMENT AND CO-ORDINATION (WETLANDS, RIVERBANKS, LAKE SHORES AND SEA SHORE MANAGEMENT) REGULATIONS, 2009

The objectives of these Regulations include (a) to provide for the conservation and sustainable use of wetlands and their resources in Kenya (b) to promote the integration of sustainable use of resources in wetlands into the local and national management of natural resources for socio-economic development (c) to ensure the conservation of water catchments and the control of floods (d) to ensure the sustainable use of wetlands for ecological and aesthetic purposes for the common good of all citizens (e) to ensure the protection of wetlands as habitats for specwies of fauna and flora (f) provide a framework for public participation in the management of wetlands (g) to enhance education research and related activities and (h) to prevent and control pollution and siltation.

THE WATER (SERVICES REGULATORY) RULES, 2012

These Rules enacted under the repealed Water Act 2002, are aimed at regulating all water sector licensees in Kenya or their contracted agents or associates and all Water Service operators.

There are Draft Water Services Regulations, 2019 that have been published but are yet to be gazetted as law. These draft regulations aim to align water service provision with the Water Act 2016. The regulations make key elements of the Water Act 2016 operational by among others, defining various procedural matters; specifying the form and process requirements for applications for licenses, approvals and the accreditation of Water Services Providers; specifying the functions, areas of operation, financing and powers of Water Services Providers; keeping public registers of information related to water supply and sewerage services; specifying modalities for consumer engagement through Water Action Groups; specifying arrangements for bulk water supply by the Water Works Development Agencies (WWDAs); specifying modalities for tariffs and levies for and by WSPs; specifying the roles and functions of county governments in water and sewerage services provision; specifying the systems and standards for the operation of water services and effluent discharge; and specifying arrangements for mechanisms for complaints, compliance and enforcement; among others.

WATER APPEAL BOARD RULES, 2007

These rules were enacted under the repealed Water Act 2002 and were not repealed when the Water Act of 2016 was enacted. The rules set out the procedures and guidelines for conducting appeals at the Water Appeal Board. The Water Appeals Board has since been replaced with the Water Tribunal but since new rules of procedure for the Water Tribunal have not been promulgated, the Water Appeal Board Rules continue to apply. The Ministry of Water, Sanitation and Irrigation, has however published draft - Water Tribunal Rules, 2019, but these are yet to be gazetted as law.

WATER RESOURCES MANAGEMENT RULES, 2007

These rules were enacted pursuant to the repealed Water Act 2002 and were amended in 2012. They were not repealed when the Water Act of 2016 was enacted, and they currently govern ongoing management of water resources. They outline the details on water resource management, including setting out rules on the requirements and procedure for the designation of certain areas as Protected or Groundwater Conservation Areas where doing so is necessary for the protection of the water resource and its multiple uses.

- An example is the Lake Naivasha Catchment Area Protection Order, 2012 made pursuant to the regulations, which protects the Lake Naivasha Catchment Area by providing for the requirement of a permit for water abstraction, monitors the use of the lakes water, requires uprooting of eucalyptus trees in the lakes catchment area and prohibits tilling, cultivation, clearing of indigenous trees or other vegetation, building of permanent structures, developing or operating greenhouses and tunnels used to grow horticultural crops, disposing of effluent or wastewater without treatment, excavation of soil or rock, planting of exotic species, or irrigating within Lake Naivasha and the feeder rivers' riparian land without prior written approval. The Lake Naivasha Groundwater Conservation Area Order, 2012, further regulates the use of groundwater in the Lake Naivasha Groundwater Conservation Area.
- These attempts to amend these orders have been controversial and demonstrate the lack of a coherent approach in the sector, with concerns that WRA through publication of a Draft Lake Naivasha Catchment Area Protection Order 2018, as well as Draft Management Guidelines and Conservation Plans, has sought to change the lake's riparian land boundaries without public consultation and without the knowledge of other public entities such as NEMA.

The regulations also make provision for the construction of works, water storage and dams. However, they do not comprehensively address issues related to national water harvesting and storage and flood control, including the mandate of the newly established National Water Harvesting and Storage Authority. There are proposed National Water Harvesting and Storage Regulations 2019 which have been developed to operationalise the Water Act 2016 with regards water harvesting and storage, though they are yet to be gazetted as law.

The Draft Water Resources Regulations 2019 are also currently under discussion, which are aimed at making key elements of the Water Act 2016 operational by defining various procedural matters in relation to the approval, authorisation and issuance of permits; setting out regulations governing the surface water; specifying groundwater development, protected areas and groundwater conservation areas; specifying modalities on water quality monitoring and effluent discharge; specifying for the inspection of works; defining the conditions of authorisation, permits and approved water uses; specifying water use charges; providing process of identifying riparian land and the conservation of catchment areas; specifying the role of the Basin Water Resources Committees (BWRCs); and defining the reserve quantity amongst others. These proposed regulations are yet to be gazetted as law.

WATER (WATER SERVICES LEVY) REGULATIONS, 2008

These rules were enacted pursuant to the repealed Water Act 2002 and were not repealed when the Water Act of 2016 was enacted. The rules impose a levy called the Water Services Levy which is charged on all sales of water services to consumers by each water service provider operating under the Water Act. The levy is set at 1% of all sales of water services to consumers. The regulations provide that the purpose of the levy is to finance the operations of the Water Services Regulatory Board.

CLIMATE CHANGE ACT, 2016

The Act provides a regulatory framework for enhanced response to climate change, to provide mechanisms and measures to achieve low carbon climate development. The Act is applied to: mainstream climate change responses into development planning, decision making and implementation; build resilience and enhance adaptive capacity to the impacts of climate change; formulate programmes and plans to enhance the resilience and adaptive capacity of human and ecological systems to the impacts of climate change; mainstream and reinforce climate change disaster risk reduction into strategies and actions of public and private entities, amongst others. Due to this focus it has a clear bearing on water which is a resource under threat from climate change.

Photo by Adobe Stock | Irrigation scheme in Rift Valley, Kenya

Photo by Adobe Stock | Tsavo West, Kenya

Appendix C

APPENDIX C. MONITORING AND EVALUATION

C.1. MONITORING AND EVALUATION OF ADAPTATION ACTIONS

The following section provides an overview of the international monitoring and evaluation practices for adaptation actions, which could be applied to activities in Kenya's water sector. As seen section 4.1, climate change impacts in Kenya have direct consequences for water security and in some counties, it causes conflicts. Adaptation in the water sector is therefore crucial for strengthening the resilience of economies, livelihoods and natural ecosystems.

DIFFERENCE BETWEEN MRV AND M&E

Climate change mitigation has long been considered a global concern, the rationale being that regardless of where a tonne of carbon is emitted in the world, its contribution to global temperature increase will be the same. Having common international standards for monitoring/measurement, reporting and verification (MRV) of emissions is, therefore, important to ensure all countries' methods are equally robust and comparable. On the other hand, climate change adaptation has often been viewed as a local or national concern, albeit one demanding international funding to support developing countries. Hence, monitoring and evaluation (M&E) and reporting of adaptation is something that countries have felt that they should not be compelled to do by the international community. Nevertheless, there is increasing understanding that while the direct impacts of extreme weather events (e.g. heatwaves, droughts, floods, storms and coastal storm surges) and "slow-onset" changes (e.g. long-term changes in temperature and precipitation, seasonal patterns, and sea-level rise) may only be a local concern, their indirect impacts and spill-over effects may have far-reaching and potentially global consequences, for example, on markets and global supply chains, risk transfer, and migration and human security (GIZ, 2017a).

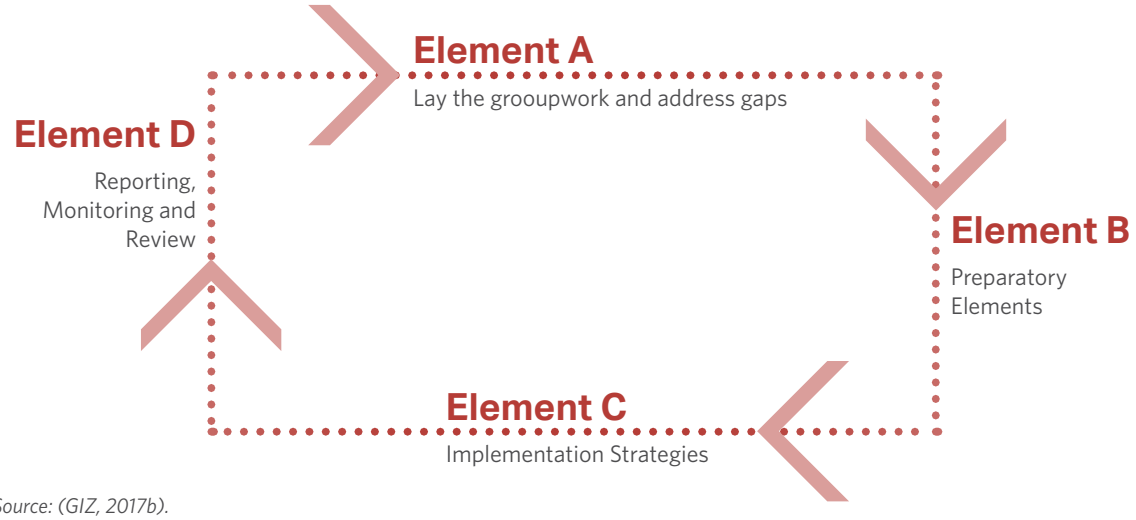
The Paris Agreement established the global temperature goal (Article 2.1), "Holding the increase in the global average temperature to well below 2 °C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5 °C above pre-industrial levels, recognising that this would significantly reduce the risks and impacts of climate change". It also established the global adaptation goal (Article 7.1) "enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change, with a view to contributing to sustainable development and ensuring an adequate adaptation response in the context of the temperature goal referred to in Article 2". Hence, the Agreement gave parity to mitigation and adaptation for the first time. Nevertheless, internationally, while MRV of climate mitigation is a mandatory requirement, M&E and reporting of adaptation remains voluntary. Hence, it is politically incorrect to talk of MRV when referring to adaptation since MRV is primarily associated with mitigation.

MONITORING AND EVALUATION AND THE NATIONAL ADAPTATION PLANNING PROCESS

Fundamentally, the aim of adaptation M&E is to track progress in implementing adaptation actions, and/or how these interventions are: reducing climate vulnerabilities[19], and associated risk[20] of impacts[21]. It is, therefore, critically important that M&E is mainstreamed into the national adaptation planning process.

19 Vulnerability: "Propensity or predisposition to be adversely affected." (IPCC, 2014b)
20 Risk: "Potential for consequences where something of value is at stake and where the outcome is uncertain, recognizing the diversity of values. Risk is often represented as probability of occurrence of hazardous events or trends multiplied by the impacts if these events or trends occur. Risk results from the interaction of vulnerability, exposure, and hazard." Ibid.
21 Impact: "Effect on a natural or human system... the interaction of climate changes or hazardous climate events occurring within a specific time period and the vulnerability of an exposed society or system." Ibid.

Figure C-1. Kenya's national adaptation planning process



Source: (GIZ, 2017b).

In practice this means for:

- Element A: Lay the groundwork and address gaps
  - Identifying all relevant data and existing assessments
- Element B: Preparatory elements (at a sector, subnational, national and other appropriate levels):
  - Identifying and prioritising climate vulnerabilities
  - Determining future climate scenarios
  - Identifying and prioritising climate risks
  - Identifying and prioritising adaptation options
- Element C: Implementation strategies:
  - This include developing a national strategy and promoting synergies at the regional level.
- Element D: Reporting, monitoring and review
  - Determining appropriate indicators to monitor: The progress of adaptation actions and how they are:
- Reducing climate vulnerabilities by reducing climate sensitivities[22] and improving adaptive capacities[23];
- Reducing climate risks by reducing the exposure[24] of climate vulnerabilities to hazards[25].

This is by no means a straightforward process. Data constraints and the scope and scale of uncertainties means that assessment of climate vulnerabilities, risks and adaptation options may inevitably be subjective and need to be determined qualitatively. Hence, it is vital that the process is systematic and involves all relevant stakeholders to ensure its saliency, credibility and legitimacy. Furthermore the time taken to realise the outcomes of adaptation actions can take long, hence, monitoring may have to focus on output/process indicators that measure the progress of adaptation actions rather than on outcome/results indicators, not only due to timescales but also due to the lack of a counterfactual (i.e. what would have happened without the action in place). Nevertheless, climate vulnerabilities, risks, actual impacts and changes in climate projections can also be reported

22 Sensitivity: "Degree to which a system or species is affected, adversely or beneficially, directly or indirectly, by climate variability or change." Ibid.
23 Adaptive capacity: "Ability of systems, institutions, humans, and other organisms to adjust to potential damage, take advantage of opportunities, or respond to consequences." Ibid.
24 Exposure: "Presence of people, livelihoods, species or ecosystems, environmental functions, services, and resources, infrastructure, or economic, social, or cultural assets in places and settings that could be adversely affected." Ibid.
25 Hazard: "Potential occurrence of a natural or human-induced physical event or trend or physical impact that may cause loss of life, injury, or other health impacts, as well as damage and loss to property, infrastructure, livelihoods, service provision, ecosystems, and environmental resources." Ibid.

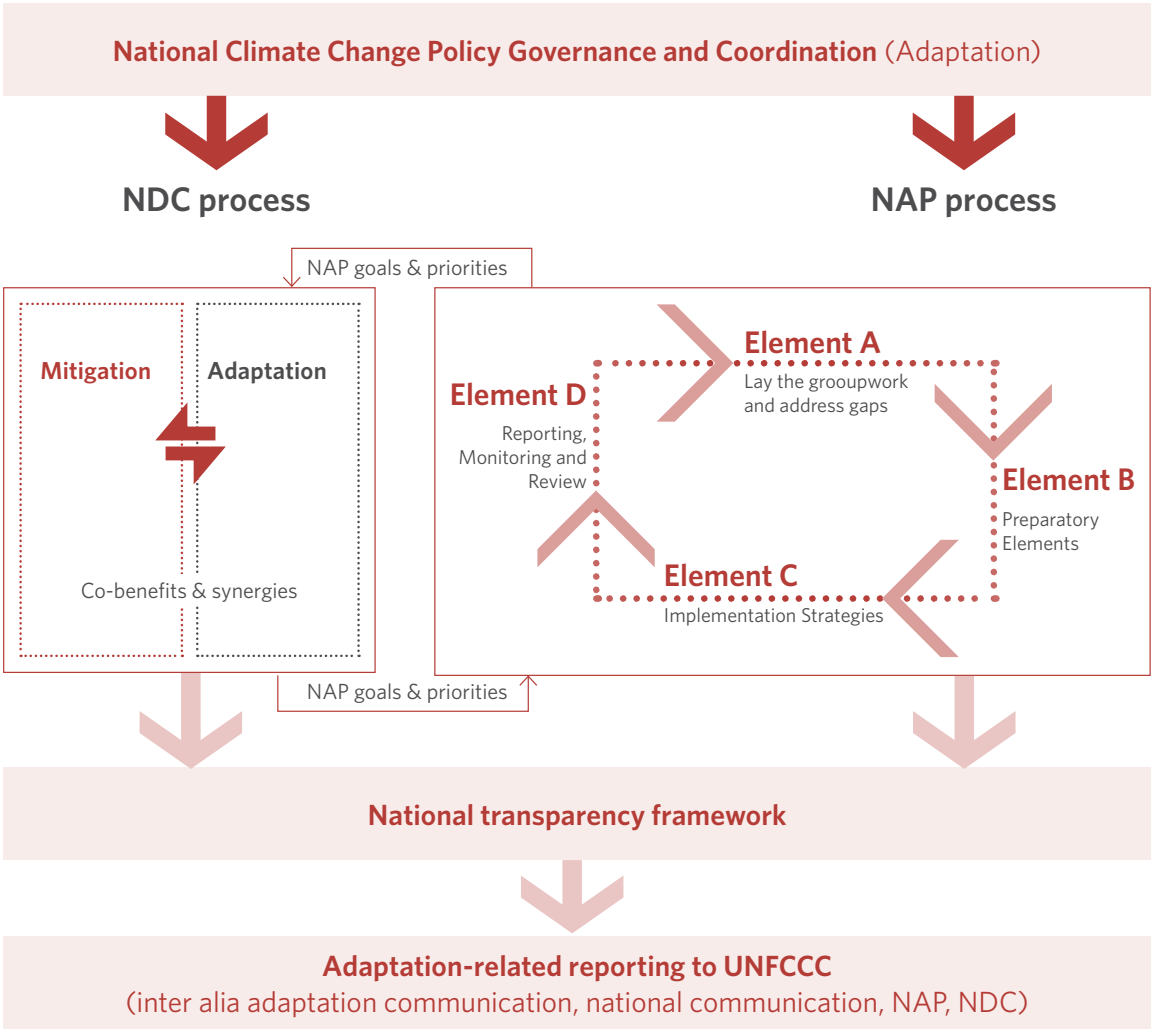
LINKAGE BETWEEN KENYA'S NATIONAL ADAPTATION PLANNING AND NATIONALLY DETERMINED CONTRIBUTION

Linking the national adaptation planning (NAP) process with the nationally determined contribution (NDC) process can have many benefits for Kenya. It can (GIZ, 2017b):

- Accelerate enhanced adaptation action;
- Raise the profile of adaptation action internationally and thereby provision of adaptation finance;
- Bolster domestic political support for adaptation;
- Help to identify mitigation-adaptation co-benefits;
- Take advantage of governance structures to avoid duplication of effort;
- Facilitate the integration into budget cycles; and
- Help to coordinate transparency efforts.

The above demonstrates the linkages between a mutually supportive NAP and NDC process, including how they fit into the broader national and international climate change policy, governance and reporting frameworks (GIZ, 2017b).

Figure C-2. Mutually supportive NAP and NDC processe



Source: (GIZ, 2017b).

Box C-1. Considerations for indicators for monitoring adaptation actions

Output/process indicators evaluate the extent to which adaptation actions have been completed, for example:

- Number of dams constructed
- Additional finances put in place to curb water scarcity through purchasing water storage tanks
- Number of water protection and conservation studies done
- Glacier monitoring on Mt Kenya
- Sustainable management of groundwater
- Number of wells dug
- Policies and measures implemented for water conservation at the national and county level

The key question to consider in the selection of output/process indicators:

- Do they measure the extent to which adaptation actions have been completed that have a bearing on key vulnerabilities and/or risks?

Outcome/results indicators evaluate the extent to which:

- Climate vulnerabilities have been reduced by:
  - Reducing climate sensitivities, for example
    a. Extent of soils liable to erosion
    b. % tree cover
  - Increasing adaptive capacities, for example
    a. % of people applying drought-resistant agricultural practices
    b. % of the population with health or property insurance
    c. Disaster early-warning system is in place and effectively communicates to public
- Climate risks have been reduced by reducing exposure to hazards posed by extreme weather events and slow-onset climate change. For example
  - Number or % of people living on floodplains
- Climate impacts have been reduced. For example:
  - Annual extent of crops damaged by weather events
  - Annual cost of property damaged by weather events.

The key questions to consider in the selection of output/process indicators include:

- Do they address climate sensitivities or adaptive capacities that determine highly vulnerable people or assets?
- Do they address the exposure of highly vulnerable people or assets to climate hazards that determine high risks?
- Over what timescale is the value of the indicator expected to change?
- Do the results reported on these indicators help to inform identification, prioritisation, implementation and review of adaptation actions?

C.2. MONITORING AND EVALUATION OF ADAPTATION ACTIONS IN THE KENYAN CONTEXT

Kenya has developed a NAP for the period 2015-2030 and an NDC, which highlighted Kenya's vulnerability to climate impacts and stated that adaptation is Kenya's priority. The NAP establishes high-level adaptation actions over a 15-year period and provides guidance to national and county Governments on priority actions in the short, medium and long terms. Water is among the priority climate change adaptation actions set in the NAP as long-term priority action. Both the NAP and the NDC are implemented through the second NCCAP for the period 2018-2022 which also articulates specific priority actions to be implemented which were informed by the second Adaptation Technical Analysis Report (ATAR) 2018-2022.

The ATAR describes climate-sensitive economic activities and currently associated limitations in adaptive capacities that, in combination, give rise to key vulnerabilities across specific systems, sectors and populations in Kenya:

> *"A high level of water insecurity, and reliance on such climate-sensitive economic activities as rain-fed crop production, livestock production, and tourism, contribute to the country's vulnerability to climate change. Kenya is a water-scarce country. Climate change, coupled with high levels of poverty, particularly among the Kenyan communities in ASAL areas; an ever-growing population; and increased manufacturing, have been cited to be contributors to increased water scarcity and competition over resources in Kenya* (Njoka, et al., 2016). *For ASALs where livestock production, mainly through seminomadic pastoralism, is the main income source, water scarcity is very devastating. Women are very vulnerable because they have less economic power than men, which makes it more difficult for them to recover from climate-induced disasters. Women's role as primary caregivers and providers of food and fuel also increases their vulnerability."*

The ATAR also identifies hazards associated with climate change and extreme weather events and identifies their risks of impact on the water and sanitation sector. In Kenya, the document highlights the climate change impacts on water as: reduced availability of surface water for irrigation, livestock, household and wildlife use, salt intrusion along the coast due to sea level rise with implications for domestic, industrial and agricultural use, continued retreat of glaciers on Mount Kenya that feed the Tana and Ewaso Ng'iro Rivers (MoEF, 2018).

The ATAR highlights several key next steps as 'lessons learned':

- "Emphasis on priority sectors and identification of measurable actions could provide more focus and direction."
- *"To enhance synergy in climate change action among the different actors, concepts and proposals and vulnerability assessments should be based on the actions in relevant NCCAPs that are designed to provide information or funding for the desired outcome."*
- This lesson learned should be reversed so that actions in NCCAPs are developed and prioritised based on vulnerability assessments, not the other way around as it is appearing to be stated.
- *"An appropriate MRV/M&E system should be developed and introduced in a phased approach, and include the collection of baseline data, and the identification of a number of key indicators to measure climate-related impacts."*
- *"Whilst outcome/results indicators to measure long-term reductions in vulnerabilities, risks and impacts are important; it is also important in the short term to use output/process indicators to measure the progress with the delivery of adaptation actions."*

In order to mainstream these lessons learned and achieve the climate change goals, Kenya must follow the adaptation action prioritisation process articulated. However, in order to do so, Kenya must have a firm understanding of its climate vulnerabilities and risks. It is encouraging that in the second ATAR, the definitions of key terms are becoming more aligned with the latest international definitions in the IPCC's Fifth Assessment Report (IPCC, 2014b). However, these international definitions should be fully adopted. In particular, consideration of the definition of vulnerability as the "propensity or predisposition to be adversely affected" avoids too much emphasis being placed on "preferred futures", which are determined by climate projections that include considerable uncertainties at a local scale, particularly with regard to the magnitude and frequency of extreme events, indirect impacts and spill-over effects.

Adoption of the international definitions can help with the goals articulated under the second ATAR, namely[26]:

- Establishing guidelines and building capacity for adaptation reporting.
- Considering adaptation actions (and the existing vulnerability and risk assessments that underpin them) in order to identify outcome and output indicators that can be harmonised.
- Reviewing and systematically updating the NAP.

26 Smither, R. 2019. Comment on the draft sNAPshot, Kenya's monitoring and evaluation of adaptation: simplified, integrated, multi-level. Provided privately to the Government of Kenya. Ricardo Energy and Environment.

Monitoring and evaluation responsibilities under the Climate Change Acts second ATAR provide an overview of the MRV (and M&E) requirements under the Climate Change Act 2016, particularly:

- The responsibility of the Climate Change Directorate to coordinate adherence to the country's international obligations, including reporting requirements.
- The climate change duties of public and private entities, and their requirement to regularly report on their climate change actions.
- The requirements for the Cabinet Secretary in charge of climate change affairs to:
    - Make regulations to guide the MRV of climate change actions.
    - Report on a bi-annual basis to Parliament on the status of implementation of international and national obligations to respond to climate change, and the progress towards attainment of low-carbon, climate-resilient development (MoEF, 2018).

C.3 REPORTING ADAPTATION UNDER THE PARIS AGREEMENT

The UNFCCC Conference of Parties in Katowice in 2018 (COP24) marked the deadline for countries to decide on the implementation guidelines for the Paris Agreement. These guidelines "establish an effective international system for promoting and tracking progress while empowering countries to build national systems for implementing the Agreement" (UNFCCC, 2018a).

With regards to climate change adaptation, voluntary guidelines were provided "on how to track efforts to enhance national capacities for adapting to climate change impacts" (UNFCCC, 2018a). Information on adaptation priorities, needs, plans and actions can be presented through "adaptation communications" as well as through the NDCs. The UNFCCC Secretariat is developing a portal with two parts: a registry for adaptation communications and one for NDCs.

The Katowice conference also agreed that the Adaptation Fund will now serve the Paris Agreement. The Parties to the Paris Agreement will review the adequacy and effectiveness of adaptation measures and support for adaptation in developing countries over the next few years. By 2022, the Adaptation Committee will work with the IPCC on drafting supplementary guidance on communicating information on adaptation. The suggested elements of voluntary adaptation reporting under the Paris Agreement can be found in Box C3-1.

BOX C-2. NATIONAL ADAPTATION PLANNING PROCESS IN THE PARIS AGREEMENT – ARTICLE 7

PARAGRAPH 9 - ADAPTATION PLANNING

Each Party shall, as appropriate, engage in adaptation planning processes and the implementation of actions, including the development or enhancement of relevant plans, policies and/or contributions, which may include:

- The implementation of adaptation actions, undertakings and/or efforts;
- The process to formulate and implement national adaptation plans;
- The assessment of climate change impacts and vulnerability, with a view to formulating nationally determined prioritised actions, considering vulnerable people, places and ecosystems;
- Monitoring and evaluating and learning from adaptation plans, policies, programmes and actions; and

Building the resilience of socioeconomic and ecological systems, including through economic diversification and sustainable management of natural resources (UNFCCC, 2015b).

PARAGRAPH 10 - ADAPTATION COMMUNICATIONS

Each Party should, as appropriate, submit and update periodically an adaptation communication, which may include its priorities, implementation and support needs, plans and actions, without creating any additional burden for developing country Parties (UNFCCC, 2015b).

PARAGRAPH 14 - GLOBAL STOCKTAKE

The global stocktake referred to in Article 14 shall, inter alia:

- Recognise adaptation efforts of developing country Parties;
- Enhance the implementation of adaptation action considering the adaptation communication referred to in paragraph 10 of this Article;
- Review the adequacy and effectiveness of adaptation and support provided for adaptation; and

Review the overall progress made in achieving the global goal on adaptation referred to in paragraph 1 of this Article (UNFCCC, 2015b).

MODALITIES, PROCEDURES AND GUIDELINES FOR THE TRANSPARENCY FRAMEWORK FOR ACTION AND SUPPORT REFERRED TO IN ARTICLE 13 OF THE PARIS AGREEMENT

This guidance document provides additional details for countries reporting under the Paris Agreement (UNFCCC, 2018b).

BIENNIAL TRANSPARENCY REPORT

Annex E (Paragraph 10) of this document outlines the reporting format of the biennial transparency report:

1. Each Party should provide information on climate change impacts and adaptation under Article 7 of the Paris Agreement, in accordance with the MPGs contained in chapter IV below.

INFORMATION RELATED TO CLIMATE CHANGE IMPACTS AND ADAPTATION UNDER ARTICLE 7 OF THE PARIS AGREEMENT

Section IV, Paragraph 104 states: Each Party should provide information related to climate change impacts and adaptation under Article 7 of the Paris Agreement, as appropriate. As such, providing this information is not mandatory.

Paragraph 105 states: Information provided below could facilitate, inter alia, recognition of the adaptation efforts of developing country Parties.

Each Party should also provide the following information, as appropriate:

A. National circumstances, institutional arrangements and legal frameworks

B. Impacts, risks and vulnerabilities, as appropriate

C. Adaptation priorities and barriers

D. Adaptation strategies, policies, plans, goals and actions to integrate adaptation into national policies and strategies

E. Progress on implementation of adaptation

F. Monitoring and evaluation of adaptation actions and processes

G. Information related to averting, minimising and addressing loss and damage associated with climate change impacts

H. Cooperation, good practices, experience and lessons learned

I. Any other information related to climate change impacts and adaptation under Article 7 of the Paris Agreement

MONITORING AND EVALUATION OF ADAPTATION ACTIONS AND PROCESSES

Section F of the 'Modalities, procedures and guidelines for the transparency framework' outlines the monitoring and evaluation processes:

Paragraph 112 - In order to enhance their adaptation actions and to facilitate reporting, as appropriate, each Party should report on the establishment or use of domestic systems to monitor and evaluate the implementation of adaptation actions. Parties should report on approaches and systems for monitoring and evaluation, including those in place or under development.

Paragraph 113 - Each Party should provide the following information, as appropriate, related to monitoring and evaluation:

1. Achievements, impacts, resilience, review, effectiveness and results;
2. Approaches and systems used, and their outputs;
3. Assessment of and indicators for:
    - (i) How adaptation increased resilience and reduced impacts;
    - (ii) When adaptation is not enough to avert impacts;
    - (iii) How effective implemented adaptation measures are;
4. Implementation, on: (i) Transparency of planning and implementation;
    - (ii) How support programmes meet specific vulnerabilities and adaptation needs;
    - (iii) How adaptation actions influence other development goals;
    - (iv) Good practices, experience and lessons learned from policy and regulatory changes, actions and coordination mechanisms.

Paragraph 114 - Each Party should provide information related to the effectiveness and sustainability of adaptation actions, as appropriate, including information on:

1. Ownership, stakeholder engagement, alignment of adaptation actions to national and subnational policies, and replicability;

The results of adaptation actions and the sustainability of those results.

FURTHER GUIDANCE IN RELATION TO THE ADAPTATION COMMUNICATION

The UNFCCC further guidance document (2018) provide additional detail on adaptation communication (including, inter alia) as a component of nationally determined contributions, summarised in the Table C-1. This is referred to in Article 7, paragraphs 10 and 11, of the Paris Agreement. UNFCCC.

Table. C-1. Elements of an adaptation communication

Overview
An adaptation communication may include information on the following elements: 1. National circumstances, institutional arrangements and legal frameworks; 2. Impacts, risks and vulnerabilities, as appropriate; 3. National adaptation priorities, strategies, policies, plans, goals and actions; 4. Implementation and support needs of, and provision of support to, developing country Parties; 5. Implementation of adaptation actions and plans, including: (i) Progress and results achieved; • Adaptation efforts of developing countries for recognition; • Cooperation on enhancing adaptation at the national, regional and international level, as appropriate; • Barriers, challenges and gaps related to the implementation of adaptation; • Good practices, lessons learned and information-sharing; • Monitoring and evaluation; 6. Adaptation actions and/or economic diversification plans, including those that result in mitigation co-benefits; 7. How adaptation actions contribute to other international frameworks and/or conventions; 8. Gender-responsive adaptation action and traditional knowledge, knowledge of indigenous peoples and local knowledge systems related to adaptation, where appropriate; Any other information related to adaptation.

Photo by Adobe Stock | Lioness drinking water from lake, Kenya

Photo by Adobe Stock | Blue Wildebeests drinking at Mara River, Kenya

Appendix D

APPENDIX D. DETAILED OVERVIEW OF THE PROJECTS AND INITIATIVES IN THE WATER SECTOR IN KENYA

The following section provides an overview of some of the water initiatives ongoing or undertaken in Kenya. It summarises some of the government initiatives, as well as development sector (bilateral support, and agencies), development bank, NGO/CSO, and private sector.

Note: the projects and initiatives identified in this Appendix are not an exhaustive list. This list was updated in 2020 and 2021.

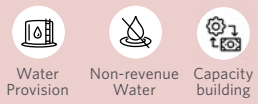
Photo by Adobe Stock Waterbuck at lake Naivasha, Kenya

D.1. GOVERNMENT INITIATIVES

Table. D-1. Government Water Initiatives

Initiative	Overview
Water Sector Trust Fund Climate related investments.  Water Provision  Sanitation  Financing	Water Sector Trust Fund (Water Fund) is the Kenyan State Corporation mandated to assist in financing water, sanitation and water resources management projects to the underserved and marginalized rural and urban areas. In the Water Act 2016, the Mandate /Object of the Fund is to provide conditional and unconditional grants to the Counties and to assist in financing the development of and management of water services in the marginalized and underserved areas. The Water Fund Climate Change Strategy provides a basis to mainstream Climate Change in its water programmes geared towards addressing current and future climate variability. The strategy provides a blueprint for climate change connection to water sector investments, attracting partnerships with Climate Change stakeholders and utilizing it for resource mobilization. The Water Fund supports water resources, water and sanitation through various investment pathways. On broad perspective they are based on rural and urban areas More information of the initiative is found on the Water Sector Trust Fund website.
Water Resources & Climate Change Investments  Water Provision  Sanitation  Water Stress  Financing  Capacity building	The Water Resources and Climate Change Investment Programme has been financing Water Resource Users Association (WRUA) projects from December 2008 and Community Forest Association (CFA) projects from February 2016. The investment has a mandate to manage, monitor and conserve the catchment areas and water resources for sustainable economic development in Kenya. Water Resources and Climate Change Investment Targets: • Fund 260 projects by 2019 • To reach 6 No. Catchment areas. • To improve the quantity and quality of water resources for enhanced livelihoods. • To improve the ability of the catchment and riparian areas to provide hydrological services. • To enhance good governance of water resources by promoting stakeholder participation in WRM. • To improve compliance to water resources regulations by promoting stakeholder participation in WRM. Water Resources Investment Programme works closely with 5 Development Partners namely: Government of Finland (GoF), Government of Sweden (GoS), International Fund for Agricultural Development- Upper Tana Natural Resources Management Project (IFAD-UTaNRMP), Danish International Development Agency (DANIDA) and European Union through the Climate Proofed Infrastructure Programme (EU-CPIRA). The Kenyan government covers operational costs of WSTF while other financiers do support development of projects depending on the funding agreements of specific partner. The target Counties by the Development Partners are: Garissa, Lamu, Isiolo, Tana River, Marsabit, Wajir, Turkana, Mandera, Nandi, Narok, Migori, Kwale, Laikipia, Meru, Muranga, Nyeri, Embu, Kirinyaga, Kilifi, Kajiado, Taita Taveta, Baringo, West Pokot, Kitui, Samburu and Tharaka Nithi Counties. The Water Resources and Climate Change Investment Programme Mission is to prudently manage and conserve all water resources in an effective and efficient manner by involving the stakeholders, guaranteeing sustained access to water and equitable allocation of water while ensuring environmental sustainability. This will be achieved through: • Rehabilitation of sub catchments and protection of water resources • Forest conservation and management • The Rural Investment Programme in the WSTF is mandated to finance water and sanitation projects in the underserved rural communities across Kenya. It is the pioneer funding mechanism at WSTF and began financing projects in late 2005. The key implementers are community-based organisations and increasingly water utilities who are involved in the preparation, planning, implementation and sustainability of their own projects. The programme relies upon outsourced support services from the private sector to offer technical support while the county governments assure coordination and supervisory roles. The projects funded through the Rural Investment Programme focus on the poor underserved communities in Kenya who are viewed as financial unviable and that are unattractive to the traditional commercial-based service providers. It focuses on target areas that are water stressed and that lack investment in water and sanitation facilities. More information of the initiative is found on the Water Sector Trust Fund website.

Initiative	Overview
Rural Investments (Ongoing)  Water Provision  Sanitation  Water Stress  Financing  Capacity building	The Rural Investment Programme objectives are to: Ensure that the poorest rural target areas have access to improved water and sanitation services Enhance the capacity of the implementers to realise their programmes successfully by providing technical, advisory and capacity development support The 'Ending Drought Emergencies' (EDE) programme is the government's commitment to end the worst of the suffering caused by drought by 2022. The EDE CPF was developed jointly between the Government and its development partners and focuses on the 23 most drought-prone counties in Kenya. Collectively these are known as the Arid and Semiarid Lands or ASAL counties). The programme embraces the Climate proofing approach by identifying risks to water, sanitation and water resources project and the consequence of both current and future climate variability and extremes, and ensuring that those risks are reduced to acceptable levels through long-lasting and environmentally sound, economically viable, and socially acceptable changes implemented at one or more of the following stages in the project cycle: planning, design, construction, operation, and decommissioning. The Medium-Term Arid and Semi-Arid (ASAL) Programme, MTAP in short, was funded by the governments of Kenya and Denmark and implemented through the Ministry of State for Development of Northern Kenya and Other Arid Lands (MDNKOAL). The development objective of the MTAP was to "contribute to poverty reduction in the context of Kenya's Vision 2030 and of safeguarding the state of the environment and promoting sustainable management of natural resources". The MTAP is intended to contribute towards empowerment, resilience and food security in drought-prone areas and marginalised counties targeted by the programme. It focuses on six counties i.e. Lamu, Tana River, Garissa, Isiolo, Marsabit and Wajir. WSTF has implemented two programmes under this financing mechanism, MTAP 1 and MTAP 2. Under MTAP 1, WSTF disbursed KES 451 million. The Programme implemented 361 small WASH grants and 18 Community Project Cycle projects. After the closure of MTAP, EU Share came in to support MTAP 2 Programme in the Rural Investment Programme. The SHARE Programme was for four years and aimed to strengthen food security and build disaster resilience in the region, in line with Kenya's Ending Drought Emergencies Strategy, hence improving the transition from emergency assistance to sustainable development. The total investment is KES 303,099,375 disbursed to support 32 water and sanitation projects targeting 181,998 beneficiaries. More information of the initiative is found on the Water Sector Trust Fund website.
Urban investments  Sanitation  Financing	Under the urban investments, Upscaling Basic Sanitation for the Urban Poor (UBSUP) financed by Gates Foundation in partnership with the German Development Bank and Kenya Government. The UBSUP programme won the WaterFund the UN Public Service Award 2019 for inclusive service to the poor. The proposed programme leverages on these and other similar programmes. More information of the initiative is found on the Water Sector Trust Fund website.
Irrigation projects  Irrigation	The MWS&I currently has several active irrigation projects across the country, including (MSW, 2020): • Koibei Irrigation Project • Kamusinga Irrigation Project • Wakulima Irrigation Project • Kingirwa Irrigation Project • Muungano Irrigation Project • Mrachaki Irrigation Project • Kaigunji Irrigation Project Agriculture is a key sector in Kenya's economy and is one of the sectors supporting the country's economic pillar. Additionally, food security is among the Nation's Big four agenda thus the importance of irrigations schemes. More information on the irrigation projects is found on the MWS&I's website.

Initiative	Overview
Non-Revenue Water Reduction Programme (2009-2014) 	The MWS&I approached the Government of Japan for assistance in the implementation of the project. The goal of the project was to effectively utilise Kenya's water resources by reducing NRW; the average NRW ratio within regulated WSPs was targeted to be reduced to 20-25% by year 2020. The project was implemented by JICA. Pilot projects were implemented in Tana River Service Board Area; Embu WSP area, Lake Victoria North WSP area, Kapsabet WSP area, Rift Valley WSP area and Narok WSP area. Achievements from the project includes (JICA, 2014): • Many of the WSPs under Tana Water Service Board established NRW unit during the project period. • The NRW reduction measures taken in the pilot projects were spilled over to other WSPs, for example, Narok WSP's experiences were passed on to Nakuru WSP. • Embu Water Service Provider prepared its NRW Reduction Plan. At the beginning of 2014, the NRW ratio was ranging between 7% and 38%compared to NRW ratio of 68% before the implementation of the project. • NRW of Narok WSP was 61% in March 2011 and in July 2014, the ratio had reduced to 34%. • NRW ratio of Kapsabet was 63% in July 2012 which reduced to 40% in July 2014. More information on the project is found on the MWS&I's website.
Water Sector Reforms Programme (WSRP) (2003 – 2013) 	There were three partners implementing the WSRP - the Government of Kenya (GoK), Sweden International Development Cooperation (SIDA) and Danish International Development Agency (Danida). The programme was designed to provide support in the setup of the new water sector institutions, and to help the institutions and subsectors to establish the new service delivery system for water and sanitation supply through the Water Sector Regulatory Board (WSRB), the Water Service Boards and Water Service Providers (WSPs). The overall objective of the programme was to improve the sustainable access of the urban poor to safe drinking water, increase the basic sanitation and improve water resource management. The total budget cost was KSH. 4.5 million. The programme focused on five components (SIDA, 2009): • Support to the Ministry of Water in the water sector reform by establishing water delivery systems as discussed above. • Regulation of the water sector and poverty-oriented financing. • Commercialisation of water supply and sanitation services. • Strengthening capacity of the water resource management structure. • Introduction of recycling-oriented sanitation More information on the project is found on the WSRP's website.https://www.sida.se/contentassets/ef453bf397bb40f0b09cf712850deed4/kenya-water-and-sanitation-programme-and-the-water-sector-reform-programmea-joint-sida-gtz-and-government-of-kenya-mid-term-e_2864.pdf
Ministry of Environment and Natural Resources Kenya Technical Report Assessment of National Forest and Landscape Restoration, 2016 	Seven options identified including Restoration Opportunities for Tree-based Buffer Zones along Water Bodies and Wetlands. This refers to potential areas along water bodies and wetlands where tree buffers can be established, and where currently there are no trees. These areas are very critical due to the importance of trees in helping to reduce erosion and sedimentation into waterways, and because of such, several laws and policies in Kenya require these buffers. It is important to note that while the total area where tree buffers could be established is relatively small, these areas play a key role in managing sediment and water quality and have the potential to provide high levels of ecosystem services and benefits to society and the environment.

Initiative	Overview
Kenya Water and Sanitation Programme (KWSP) 2005-2009	KWSP which ran from 2005 to 2009, had three partners: GoK, SIDA and Danida. The development objective of the KWSP was sustainable, safe and affordable water supply and sanitation facilities managed by communities with a special focus on the poor, women and disadvantaged groups. KWSP comprised of three components: • Rural Water Supply and Sanitation. • Water Resource Management, including flood and drought management. • Support to water sector reforms. Key achievements from the project include: • A sanitation policy was developed • Construction of 500 public latrine units (comprised of four compartments) at sites estimated to reach about 15,000 people. • Support to strategic planning, development of organisation and financial systems for the institutions. • Development of policies such as water services regulations and water services contracting and licensing tools and support to the tariff management process. • Support to commercialisation aspects of water including business development, improving service standards, clustering and billing systems. (SIDA, 2009) More information on the project is found on KWSP's website.

D.2. NON-GOVERNMENTAL INSTITUTIONS PROJECTS IN THE SECTOR

The following sections provides detailed overview of organisations and institutions implementing water projects in Kenya. The projects are divided into different themes. The table also maps the initiatives against the mitigation actions set in the new NCCAP.

WATER SUPPLY AND ACCESS

Table. D-2. Non-Governmental Institutions projects – Water Supply and Access

Programme/ Project	Donor / Implementing Actors	Details On The Initiative (Where Possible Amount Of Funding Allocated)	Nccap 2018-2022 Alignment
Adaptation to Climate Change in Arid and Semi-Arid Lands (KACCAL) 2013-2018 	The World Bank	This project aimed at enabling communities in arid or semi-arid lands to plan and implement climate change adaptation measures. One of the project components was to support climate risk management at the county level. Key activities in this component were construction of 14 mega inter-community investments including thirteen water pans and one camel milk value addition processing plant. The water infrastructure designed to increase access to better water quality for domestic and livestock use. Each water pan included construction of a de-silting trap, water pump, water tank and watering points for livestock. Other achievements from the project were (World Bank, 2018c): • Increased skills and climate change knowledge at national and county level. • Increased access to better quality water for people and livestock. • Reduced distance and time to water points. • Reduced animal loss caused by severe droughts. • Reduced incidences of water related conflicts. Funding: $5.5 million More information on the project is found on the World Bank's website.	1,2,3,5

Programme/ Project	Donor / Implementing Actors	Details On The Initiative (Where Possible Amount Of Funding Allocated)	Nccap 2018-2022 Alignment
Water Tower Protection and Climate Change Mitigation and Adaptation (WaTER) 2017-2021	European Union/Germany	The programme's purpose is to improve the quality and quantity of ecosystem services provided by Kenya's water towers through increased forest cover, improved landscape and natural resource management and waste management system. (SNV, 2020a) Funding: Not Available More information on the project is found on SNV's website.	2,3,5
Lake Victoria Basin Integrated Water Resources Management Programme. 2020-Ongoing	European Union/Germany	The project was launched in February 2020 and is being implemented by KfW Development Bank on behalf of the BMZ. The aim of the project is to improve water quality and water availability in the countries around Lake Victoria-Tanzania, Kenya, Uganda, Rwanda and Burundi. The project is funded by[27]: • BMZ who are providing EUR 20 million in grant funding • European Union who are providing EUR 10 million in delegated funds from the EU • the East African Community partner states involved in the project will be providing a further EUR 3 million will come from the East African Community partner states. The first phase of the project is scheduled to end in 2023. The project will finance measures to strengthen the capacity of Lake Victoria Basin Commission for cross-border integrated water resource management. (KfW, 2020) Funding: €33 million More information on the project is found KfW's website	2,3,4,5
Upper Tana-Nairobi Water Fund (2015-Ongoing)	Global Environment Facility (GEF)	The project is a public-private partnership co-funded by GEF, SIDA, Changieni Rasili Mali (CRM), Coca-Cola Replenish Africa Initiative, GOK and the Sall Family Foundation and managed the Nature Conservancy. It helps farmers in the Upper Tana catchment area harvest water, conserve soil and introduce more sustainable and high-value crops such as Haas avocados, grafted mangoes and oranges. The programme has trained and equipped farmers with resources to help keep nearby rivers healthy, conserve water and reap the benefits of higher crop yields such as Haas avocado, mangoes and oranges. The project has helped improve water quality by introducing a payment for environmental service like scheme where downstream water users-including companies such as Coca Cola finance upstream investments in water conservation and sustainable agriculture. The water fund is seen as an investment by downstream water users who comprise of companies such as Coca-Cola, the fund's business case showed that $10 million investment in water led conservation intervention is likely to return $ 21.5 million in economic benefits over a 30-year timeframe In Nairobi, the project's benefits by 2025 are expected to include increased water availability for the city, with up to 27 million more litres flowing in daily and increased reserves upstream. (GEF, 2020) (TNC, 2020) GEF Funding: $68.7 million More information on the project is found on the project's website.	2,3,4
Thwake Multi-Purpose Water Development Program-Phase 1(2013-2023)	African Development Bank	The 10-year programme commenced in 2013 and comprises a multi-purpose dam for water supply, hydropower generation and irrigation development in Makueni County. The dam also provides regulation of flows on Athi River downstream of the dam for flood and drought mitigation. The objective of phase 1 of the project is to enhance water security by increasing water storage for rural and urban human consumption. (AfDB, 2020a)Funding: $ 665 million.	3,5

27 At the time of writing

Programme/ Project	Donor / Implementing Actors	Details On The Initiative (Where Possible Amount Of Funding Allocated)	Nccap 2018-2022 Alignment
Rehabilitation of Water Supply and Sewerage of Oloitoktok Town (Dates of implementation not available)	Arab Bank for Economic Development in Africa (BADEA)	Projects supported by the bank are; rehabilitation of Water Supply and Sewerage of Oloitoktok Town, feasibility study for water supply and sanitation for seven town projects and Garissa Sewerage Project. (BADEA, 2020) Funding: $14.4 million More information on the project is found on the project's website.	2,3,5
Nairobi River Basin Rehabilitation and Restoration Program (2011-2016)	African Development Bank	The development objective of the project was to improve the access, quality, availability, capacity and sustainability of wastewater services in Nairobi for a sustainable environment through rehabilitation and extension of sewerage services and wastewater treatment facilities. Some of the achievements from the project include (AfDB, 2017): • The completion of the Dandora Treatment Plant which has an additional treatment capacity. • Construction and completion of an additional 63.3 km trunk sewer line and 43km reticulation lines. • Planting of 25,000 trees along riparian zones was completed. The Government of Kenya provided co-financing of $5.7 million. Funding: $ 29.3 million More information on the project is found on the project's website.	3,5
Water Sector Trust Fund	Sweden, Kenya and Denmark, IFAD, European Union	The Government of Sweden, Denmark, IFAD & EU among other institutions has given financial support to the Rural Investment Programme, a Kenyan Government Initiative under the Water Sector Trust Fund mandated to finance water and sanitation projects in the underserved rural communities across Kenya. (WSTF, 2020b) Funding: Ksh. 4.53 Billion More information on the project is found on the project's website.	2,3,5
Kenya Italy Debt for Development Programme 2006-Ongoing	Italy	The programme was signed in 2006 with the aim of supporting the Kenyan Government to reduce its external debt burden while at the same time sustaining its efforts towards achieving the development targets set in Vision 2030. The programme focuses on water and sanitation as one of its priority areas where 46 rural water supply projects are being funded. (AICS, 2020) Funding: Unknown More information on the project is found on the project's website.	2,3,5
Rehabilitation of Nairobi Water Supply and Sanitation System. 2005-2015	France-through France Development Agency	The aim of the project was to secure and increase the capacity of Nairobi's water and sanitation systems by rehabilitating the infrastructure. The project comprised of five components (AFD, 2020): • Rehabilitation of Ngethu and Sasuma treatment plants. • Rehabilitation of water pipelines and construction of a fourth pipeline to Gigiri and Kabete reservoirs. • Rehabilitation of sewer systems and Dandora wastewater treatment plant. • Construction of water kiosks and sanitary blocks and extension of water and sanitation networks in informal settlements. Achievements from the project include: • The volume of water produced increased by more than half between 2006 and 2013 and water sales increased by more than 40%. • Sasuma Dam has been rehabilitated and secured; more than 50 water kiosks and sanitary blocks were built in areas of Kibera, Mathare, Soweto and Embakasi Funding: €62 million More information on the project is found on the project's website.	2,3

Programme/ Project	Donor / Implementing Actors	Details On The Initiative (Where Possible Amount Of Funding Allocated)	Nccap 2018-2022 Alignment
Support to the Water Sector Trust Fund (WSTF) 2018-2021	Denmark, Sweden, Kenya IFAD & European Union	The sources of funding to the Water Fund are categorized as follows: - 1. Public (budgetary allocations) 2. Financing & Technical Partnerships a) Public, b) Private, c) Civil Society 3. Leveraging a) Commercial Banks b) Co-funding (County, Utilities, Community etc.) c) Households contribution on subsidized projects 4. Revenue generation (on-lending, subsidiary funds) 5. Levy Fund Funding: Ksh. 4.53 Billion More information on the project can be found on the Danida website.	2,3,5
Improving Water Catchment in the drylands (Dates of implementation not available)	United Nations Development Programme (UNDP)	The project involved the Rehabilitation on the Kivue catchment area in Mbeere North, Eastern Kenya through reforestation. Agricultural diversification, such as dry-land farming and beekeeping has been used to help conserve water in the area. The project spearheaded negotiations with the county authorities to involve the communities in the management of hilltop forest in a sustainable manner. Activities that community members are involved in include planting trees on the hills and its environs and establishing water kiosks and water toughs downhill for the human and livestock respectively. (UNDP, 2020b) Funding: Unknown More information on the project is found on the project's website.	2,3,4,5
Lake Victoria Water and Sanitation Programme (2020)	EIB, KfW, AFD and UN Habitat	The project is part of a three-country initiative to improve water in towns around the Lake Victoria in Kenya, Uganda and Tanzania. The project will include new water infrastructure as well as public health education and awareness raising hygiene campaigns. The project will also strengthen resilience to the coronavirus pandemic in informal settlements and vulnerable communities. It is implemented by local partners and backed by the European Investment Bank in partnership with UN-Habitat, AFD, KfW Development Bank and the European Commission. (EIB, 2020) Funding: Unknown More information on the project is found on the project's website..	2,3
United Nations Environment Programme (UNEP) 2020	Using Green Technology to improve water quality in Kenya's Mtwapa Creek.	The project aims at managing Shimo La Tewa Prison's wastewater in a sustainable and environmentally friendly way needed to safeguard the social, environmental and economic benefits provided by Mtwapa Creek. The prison's growing population has long overwhelmed the capacity of its septic system causing raw sewage discharge into the creek. The coral reefs at the nearby Mombasa Marine Park are also vulnerable to such pollution. A constructed wetland, also known as green infrastructure, mimic the functions of a natural wetland; providing water filtration. The project will then redirect the treated water to grow food crops at the prison farm. The outcomes of the project which started in early 2020 could be installed in other larger buildings and could help Kenya in achieving its commitments under SDGs 6 and 14. (UNEP, 2020a) Funding: Unknown More information on the project is found on the project's website..	3,5

Programme/ Project	Donor / Implementing Actors	Details On The Initiative (Where Possible Amount Of Funding Allocated)	Nccap 2018-2022 Alignment
Kenya Resilient Arid Lands Partnership for Integrated Development (Kenya RAPID) (2015-2020)	USAID	The programme brings together public and private institutions and communities with the goal of increasing access to water and sanitation for people and livestock and rebuilding a healthy rangeland ecosystem. The project focuses on five northern counties; Garissa, Isiolo, Marsabit, Turkana and Wajir. The programme is designed to increase the average water coverage rate in the five counties from 37% to 50 % while building a model that can be adapted for use by other counties. Achievements from the project include (USAID, 2019): • 184,172 people have access to improved access to safe and clean water. • More than 22, 512 people have gained access to basic sanitation. • 314, 510 livestock have improved access to water through constructed in the developed/ rehabilitated water points. Funding: $35.5 million More information on the project is found on the project's website.	2,3,5

WATER SANITATION AND HYGIENE

Table. D-3. Non-Governmental Institutions projects – Water Sanitation and Hygiene

PROGRAMME/ PROJECT	DONOR / IMPLEMENTING ACTORS	DETAILS ON THE INITIATIVE (WHERE POSSIBLE AMOUNT OF FUNDING ALLOCATED)	NCCAP 2018-2022 ALIGNMENT
Nakuru County Sanitation Programme	European Union	The EU-funded public-private partnership applied a behavioural change and market-based model of accelerating sanitation improvements in the county. The programme was implemented by Nakuru Water and Sanitation Company with Vitens Evides International and received technical support from SNV Netherlands Development Organisation (SNV, 2020b). Other EU funded water projects in Kenya include: • €35 million water transmission, storage and distribution in east and west Nairobi. • EU also supported the Rural Investment Programme. Funding: €4 million More information on the project is found on the project's website..	2,3
Water and Sanitation Development Project	The World Bank	This project aims to improve water supply and sanitation services in selected coastal and north-eastern regions of Kenya. The project has four components. (World Bank, 2020c): • Rehabilitation and expansion of urban water supply and sanitation services in the coastal region. • Expansion of water supply and sanitation services in the north-eastern counties. • National performance-based financing. Funding: $330 million More information on the project is found on the project's website.	

PROGRAMME/ PROJECT	DONOR / IMPLEMENTING ACTORS	DETAILS ON THE INITIATIVE (WHERE POSSIBLE AMOUNT OF FUNDING ALLOCATED)	NCCAP 2018-2022 ALIGNMENT
Finance approved for the Kenya Towns Sustainable Water Supply and Sanitation Program (KTSWSSP)	African Development Bank	The programme is designed to improve access, quality, availability and sustainability of water supply in 19 towns, as well as wastewater management services in 17 towns across the country. The programme is estimated to cost US $451.66 million. The World Bank's loans and grants will cover 86.52% of the total programme costs. The GoK will to contribute US $60.87 million in co-funding. The KTSWSSP is composed of three components: (AfDB, 2016) • Water and sanitation infrastructure development. • Institutional Development Support. Funding: $391million More information on the project is found on the project's website..	
The Kenya Water and Sanitation Civil Society Network (KEWASNET): Improved governance in the Kenya Water Sector. 2009-2015	Sweden, Kenya and Denmark	The aim of the project was to strengthen CSO participation in the water, sanitation and hygiene (WASH) sector in Kenya in order to secure better governance and sustainable delivery of water and sanitation services to the poor and underserved. Key achievements from the project include: • Improved citizen participation in WASH services • delivery and water resource management at the national and county levels. There was also evidence of duty-bearers being more accountable and responsive to the needs of citizens in terms of access to WASH. (SIDA, 2015) Funding: Unknown More information on the project is found on the project's website..	2,3,5
Kenya Water and Sanitation Programme (KWSP) 2005-2009	Sweden, Kenya and Denmark	The programme was jointly supported by Danida, SIDA and GoK. The development objective of the KWSP was sustainable, safe and affordable water supply and sanitation facilities managed by communities with a special focus on the poor, women and disadvantaged groups comprised of three components: • Rural Water Supply and Sanitation including construction of sanitation facilities in schools. • Improved water Resource Management, including flood and drought management, constructing sand dams for water storage. • Support to water sector reforms. Key achievements from the project include; • A sanitation policy was developed and construction of 500 units of 4 compartments each institutional and public latrine at sites estimated to reach about 15,000 people. • Support to strategic planning, development of organisation and financial systems for the institutions. • Development of policies such as water services regulations and water services contracting and licensing tools and supported the tariff management process. • The project supported to commercialisation aspects of water including business development, improving service standards, clustering and billing systems. (SIDA, 2009) Funding: Ksh. 5 million More information on the project is found on the project's website.	2,3,5

PROGRAMME/ PROJECT	DONOR / IMPLEMENTING ACTORS	DETAILS ON THE INITIATIVE (WHERE POSSIBLE AMOUNT OF FUNDING ALLOCATED)	NCCAP 2018-2022 ALIGNMENT
Integrated Water Sanitation and Waste Management in Kibera. (Dates of implementation not available)	UN Habitat / Sanitation Trust Fund / Water for African Cities	It supported small scale community-based initiatives in water, sanitation and waste management. The project also contributed to the Kenya Slum Upgrading Programme which was a collaborative initiative between the GoK and UN Habitat. The project had the following development objectives: • Supporting improved accessibility to water, sanitation and credit facilities. • Supporting improvements to the drainage system. • Establishing and strengthening governance frameworks to regulate distribution and accessibility to water and sanitation. The main activities included; • The construction of a 2.5km low volume upgraded road, 1.8 km storm water drains, and improvement of two-foot bridges to enhance movement of people and goods within Kibera. • Sanitation improvement by constructing communal water and sanitation facilities in strategic locations connecting them to the piped water and providing for local storage. Results from the project (UN Habitat, 2015): • Completion of community mobilisation on water management and conservation according to zones in Soweto East were completed • Physical identification of all the sites for the proposed infrastructure completed. • Design work for all the proposed infrastructure and information education and communication materials completed. • Prototype for the non-motorised transport system developed in Kibera using local artisans. • Upper container floor of the UN-HABITAT site offices cleared for partitioning to accommodate the ICT centre in Kibera. Funding: $579,684 More information on the project is found on the project's website.	3,45
Kenya Integrated Water Sanitation and Hygiene (KIWASH) 2015-2020	United States of America through USAID	KIWASH activities are expanding access to water for human, livestock, environmental and agricultural use and improving sanitation and hygiene in nine Kenyan Counties. The project's approach includes (USAID, 2018): • Strengthening operations and financial performance of Water Service Providers. • Engaging diverse private sector actors in the delivery of water and sanitation services. • Improving hygiene practices in households, communities and counties through an integrated approach. KIWASH is implementing activities which contribute to: • Scale up market-based WASH service delivery. • Increase and sustain access to finance for WASH. • Improved access to integrated WASH and Nutrition services. • Increased environmental sustainability. • Strengthen governance of WASH services and water resources institutions. Funding: $51 million More information on the project is found on the project's website..	2,3,5

PROGRAMME/ PROJECT	DONOR / IMPLEMENTING ACTORS	DETAILS ON THE INITIATIVE (WHERE POSSIBLE AMOUNT OF FUNDING ALLOCATED)	NCCAP 2018-2022 ALIGNMENT
Water Supply and Sanitation Program	Netherlands	The WASH programme was comprised of seven components: new water development, rehabilitation of existing schemes, schools WASH, health facilities WASH, household sanitation, hygiene education promotion and institutional capacity. A grant of $41 million was approved by the Government of Netherlands, $ 7.6million by UNICEF and the rest was to be contributed from the GoK. The programme operated in approximately 70% of the geographic area of rural Kenya with a priority towards the ASAL and food prone districts. Achievements from the project include; • Freed up time of community members, especially women, as a result of the water supply provided by the programme. People in the project area established vegetable gardens. • Savings for the project area community members on medical expenses due to improvement on household sanitation leading to less disease outbreaks. • Improvements in income to project area community members. The WASH infrastructure was catalytic in transforming the empowered groups to create or expand economic opportunities. • Integration of the WASH model by the county Governments to prioritize community development intervention strategies. Lessons learned from the programme include (UNICEF, 2016); • Capacity building and institutional strengthening - the programme had a strong component of training and collaborative partnership with the sector institutions and grass root-based organisations. • The use of rigorous and robust financial procedures, financial controls and timely availability and disbursement of funds provided greater predictability in project execution and enhanced the overall success of implementation. • Communication of programme results to foster innovation and technology adaptation - there is high importance in communicating the programme results; this should not be overlooked as it can enhance wider base of supporters for an initiative and more adopters of a concept, technology or idea. Funding: $70.5 million More information on the project is found on the project's website.	2,3,4,5

Photo by Adobe Stock Elephants, Kenya

WATER MANAGEMENT AND GOVERNANCE

Table. D-4. Non-Governmental Institutions projects – Water Management and Governance

Programme/ Project	Donor / Implementing Actors	Details on the initiative (where possible amount of funding allocated)	NCCAP 2018-2022 alignment
Support of transboundary water cooperation in the Nile Basin 2002-2021	European Union, Germany	The project is being implemented by the Nile Basin Initiative (NBI) in Kenya as well as in other Nile Basin riparian states. On behalf of The Federal Ministry of Economic Cooperation and Development (BMZ), Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) has been working with NBI since 2002 and since December 2017, the project has been co-financed by the European Union. GIZ supports NBI by providing technical and process advice in eight linked field activities (GIZ, 2020): • Supporting dialogue and trust building among Nile Basin states. • Facilitating a process that enables member states to conduct a joint analysis of the current and projected future water balance for the Nile Basin, thus contributing to the development of options for better basin-wide water resource management. • Laying the foundations for joint Nile Basin planning by way of a knowledge-based and cooperative planning process. • Developing a Basin-wide, cross-sector investment programme, thereby contributing to better water, energy and food security in the region. • Strengthening the application of existing policies, guidelines and standards in member states. • Supporting Eastern Nile countries in laying the foundations for optimised joint management of dam cascades. • Developing a Basin-wide hydrological monitoring system, thus contributing to the exchange of information among Nile basin states. Results achieved so far from the project include: • Political initiative has been transformed into an established and well-regarded platform for dialogue among the Nile Basin riparian states. • Since its creation in 1999, the NBI has contributed substantially to building trust and preventing conflict among Nile Basin states. The objectives of NBI include to develop the Nile Basin water resources in a sustainable and equitable way to ensure security and peace for all its people. Funding: Unknown More information on the project is found on the project's website.	2,3,5
Imarisha Naivasha Water Stewardship Project 2013-2016	Germany / United Kingdom -German Federal Ministry for Economic Development (BMZ) and Department for International Development (DFID	The project was implemented under the International Water Stewardship Programme (IWaSP) and aimed to improve water security and strengthen civil society organisations (CSO) related to the management of water in Kenya to reach more than 250,000 people. The project was initiated to restore the Lake Naivasha Basin. Approaches used in the project included: • Improved water access, quantity and quality for communities, industries and livestock. • Building capacity in Water Resource Users Association on institutional development, financial management and catchment and riparian land management. • Capacity building for the Kenya Water and Sanitation CSO Network (KEWASNET) to strengthen the institution's ability to conduct water resource management through knowledge and skills transfer. IWaSP supported the development of a water resources management strategy for CSO's and by advising on how to stimulate water stewardship partnerships. Through the support of IWaSP, KEWASNET developed the Kiambu Water and Sanitation Services policies. (IWaSP, 2019) Funding: Unknown More information on the project is found on the project's website.	2,3

Programme/ Project	Donor / Implementing Actors	Details on the initiative (where possible amount of funding allocated)	NCCAP 2018-2022 alignment
Support to the Water Service Trust Fund 2009-2019	Denmark, Sweden, Kenya, IFAD & European Union	The Mandate /Object of the Fund is to provide conditional and unconditional grants to the Counties and to assist in financing the development of and management of water services in the marginalized and underserved areas Funding: €10.5 million More information on the project is found on the project's website.	2,3,5
Kenya Water Security and Climate Resilience Project (2013 - 2022)	The World Bank	The objectives of this project are to increase availability and productivity of irrigation, enhance institutional framework and strengthen capacity for water security and climate resilience. Key achievements from the project as of 2020 include the Water Act being passed in 2016, which was the project's contribution to institutional framework. The Act is currently being implemented; as well as the operationalisation of water institutions such as Water Resource Authority. (World Bank, 2020d) Funding: $182.67 million More information on the project is found on the project's website.	1,2,3,5
African Water Facility - an initiative led by the African Ministers' Council on Water (AMCOW) to mobilise resources to finance water resources development activities in Africa.	African Development Bank	In Kenya, projects that were supported by this initiative include: **a)** Scaling up integrated rainwater harvesting, management (RHM) and complimentary livelihood systems in semi-arid districts of Kenya: The project was focussed in Baringo, Kiambu and Laikipia. The project influenced policy through the evaluation of past projects in a number of semi-arid districts, and the demonstration of the impacts of integrating RHM with complementary livelihood systems. (AfDB, 2020b) **b)** Integrated watershed management of Kiboun and Tende River basins € 2.04million (2008-2011) The project was implemented to demonstrate the benefits of applying appropriate practices in water and land management to land productivity and quality water resources. The expected long-term results of the project over the entire catchments include the following: • Improved and sustainable water flow discharge in the form of reduced floods and higher base-flows from the two rivers. • Increased vegetative cover in the catchment, consisting of forest, standing crops and grass strips along the buffer zone of the rivers. • Reduced soil and nutrient run-off, improved water quality. • Improved soil structure and fertility and hence productivity, and by extension, reduced impacts on Lake Victoria ecosystem. Mapping, assessment, management of transboundary water resources in the Intergovernmental Authority on Development (IGAD) sub-region The project aimed at creating and enabling environment for IGAD and member countries to address the challenges to environmental vulnerability and poverty. The expected outcomes of the project were. (AfDB, 2007); To build and enhance the capacity of IGAD and its member countries to implement integrated tans-boundary water resource development and management. enable national water sector authorities of the member states to produce appropriate and_sustainable hydrological and hydro-geological information services. Funding: Unknown More information on the project is found on the project's website.	1,2,3,5

Programme/ Project	Donor / Implementing Actors	Details on the initiative (where possible amount of funding allocated)	NCCAP 2018-2022 alignment
Sustainable Water Partnership Project (SWP) Ongoing	USAID	The project uses a participatory approach to water resource management and aims to strengthen water security, improve public health and livelihoods while alleviating poverty. It is led by Winrock International at the Mara River basin shared by Kenya and Tanzania. The river is drying up due to deforestation in the Mau Forest complex, land use changes and increasing population. Achievements from the project include: • Development of a Regional Water Allocation Plan to ensure efficient Mara River water utilisation between the two countries. • Institutional framework established between the two Governments as a tool to discuss the management of the Mara ecosystem. Lessons from the project include (Winrock International, 2018): • strengthening water allocation planning process requires enough data to inform evidence-based decision making and communal action. • involving the community to conserve and own the basin is a sure way to protect the basin. Funding: Unknown More information on the project is found on the project's website..	2,3,5
Implementation of the Strategic Action Programme for the Protection of the Western Indian Ocean from land-based sources and activities (WIO-SAP) (2017-2023)	UNEP	The ongoing project is intended to reduce impacts from land-based resources and activities and sustainably manage critical coastal-riverine ecosystem through the implementation of the WIO-SAP priorities with the support of partnership at national and regional levels. It identifies actions that need to be undertaken in the region in order to reverse degradation of the coastal and marine ecosystems. Water quality degradation is one of the issues the project aims to address. The project is implemented in Kenya, Comoros, Mauritius, Madagascar, Mozambique, Seychelles, Tanzania and South Africa. (UNEP, 2020b) Funding: $ 317million. More information on the project is found on the project's website..	3,5
Japan International Cooperation Agency (JICA) – The Project on the Development of the National Water Master Plan 2030. (2013)	Japan	The Government of Kenya under the assistance of JICA formulated the National Water Master Plan (1992). The situation of the water sector changed over the years with new sector legislations and policies, making it necessary to amend the Master Plan. In 2008, JICA conducted a technical cooperation project to support the development of the National Water Masterplan 2030. The objectives of the project were (WASREB, 2013b): • To assess and evaluate availability and vulnerability of the country's water resources up to around the year 2050. • To formulate the National Water Master Plan towards the year 2030 for sustainable water resources development and management for six catchment area. • To prepare action plan for activities of the Water Resource Authority (WRA) regional offices up to the year 2022 in order to strengthen their water resources management capability. • To transfer technology on water resources development and management through implementation of the program. Funding: Unknown More information on the project is found on the project's website..	2,3

Programme/ Project	Donor / Implementing Actors	Details on the initiative (where possible amount of funding allocated)	NCCAP 2018-2022 alignment
Project for Management of NRW in Kenya (2010-2014)	Japan	The MWS&I approached the Government of Japan for assistance in the implementation of the project goal of the project was to effectively utilise Kenya's water resources by reducing NRW; the average NRW ratio within regulated Water Service Providers be reduced to 20-25% by year 2020. The project was implemented by JICA. A pilot project was implemented in Tana River Service Board Area; Embu Water Service Provider (WSP) area, Lake Victoria North WSP area, Kapsabet WSP area, Rift Valley WSP area and Narok WSP area. Achievements from the project include: • Many of the WSPs under Tana Water Service Board established NRW unit during the project period. • The NRW reduction measures taken in the pilot projects were spilled over to other WSPs, for example, Narok WSP's experiences were passed on to Nakuru WSP. • Embu Water Service Provider prepared its NRW Reduction Plan. At the beginning of 2014, the NRW ratio was ranging between 7% and 38%compared to NRW ratio of 68% before the implementation of the project. • NRW of Narok WSP was 61% in March 2011 and in July 2014, the ratio had reduced to 34%. NRW ratio of Kapsabet was 63% in July 2012 which reduced to 40% in July 2014. (JICA, 2014) Funding: Unknown More information on the project is found on the project's website.	2,3
Climate Resilient Water Services (CREWS) 2018	UKAID	The project was designed to provide a strategy to improve climate resilience in arid and semi-arid land areas and urban water services. The project was implemented by SNV and introduced public-private partnership models, performance-based contracting and greater private sector involvement. Implementation involved using a market systems approach to water services delivery and addressed key barriers to systemic issues such as policy, pricing mechanisms, governance, accountability, and capacity. (SNV, 2018) Funding: Unknown More information on the project is found on the project's website.	3
NRW Audit of Water Service Providers (August-December 2017)	UKAID	The objective of the project was to conduct comprehensive NRW audit including component and cause for nine urban Water Service Providers (WSPs) and to contribute to the reduction of NRW in the water sector from 44% to 38% over a 3 years period. The intention was to inform their management on the need to development of Specific, Measurable, Accurate, Reliable and Timebound (SMART) and NRW response strategies in line with WASREB's NRW management standards. Recommended updates to WASREB's NRW management guidelines include (WASREB, 2018): • Engagement with customers/ water users on raising the profile of the need for water efficiency, reporting leakages and illegal use as an effective means of improving the supply/demand balance. • Effective leak repair technique: The NRW standards by WASREB highlight the importance of quality construction but not quality leak repairs. This is an important consideration in addressing physical losses. Funding: Unknown More information on the project is found on the project's website	2,3,5

Programme/ Project	Donor / Implementing Actors	Details on the initiative (where possible amount of funding allocated)	NCCAP 2018-2022 alignment
WaterAid- Mau-Mara Serengeti Sustainable Water Initiative (MaMaSe) Programme 2013-2017	Netherlands	The Mau-Mara Serengeti Sustainable Water Initiative (MaMaSe) Programme was funded by the Netherlands Embassy Kenya aimed at improving water safety and security in the Mara River Basin to support poverty reduction, sustainable economic growth, and conservation of the basin's world-renowned ecosystems. The development objectives of the project included (Water Action Hub, 2020): • Supporting formulation of new water management strategies. • Strengthen public, private, and civil society-actors responsible for implementing the strategies. • Pilot and support adoption of innovative and sustainable approaches to use water more efficiently and reduce pollution. • Create a water fund to support payments for ecosystem services and secure long-term financing for water management interventions. • Establish a regional knowledge centre for water and equip it with new tools and technologies to support continued water resources management. Funding: € 8million More information on the project is found on the project's website..	2,3,4,5
Performance Enhancement of water utilities. 2015-2019	Netherlands	The performance enhancement of water utilities project was a five-year project implemented by SNV and funded by the Sustainable Water Fund by the Netherlands Enterprise Agency. The project is aimed at improving performance of water service providers by benchmarking, collective learning and innovative financing. (SNV, 2020c) Funding: Unknown More information on the project is found on the project's website..	2,3,5

CAPACITY BUILDING

Table. D-5. Non-Governmental Institutions projects – Capacity Building

Programme/ Project	Donor / Implementing Actors	Details on the initiative (where possible amount of funding allocated)	NCCAP 2018-2022 alignment
Partnership for Capacity Building in Sustainable Development and Maintenance of Water Infrastructure (EU-WOP) 2012-2015	European Union, Germany	The project was implemented by Vitens Evides International, SNV and Sustainable Aid in Africa International. The project partners were supporting Kisumu Water and Sewerage Company (KIWASCO) and Nakuru Water and Sanitation Services Company (NAWASSCO)to improve asset management practices for (waste) water treatment facilities and (collection) distribution networks. KIWASCO and NAWASSCO were supported to: (SNV, 2020) • Develop and implement a strategy for expanding water and sanitation access to the peri-urban residents living within their service areas. • Introduce geographic information systems for asset mapping and MIS for monitoring NRW and implement NRW reduction strategy. Funding: Unknown More information on the project is found on the project's website..	2,3

Improved Capacity in Rainwater Management for Sustainable Development 2008-2011		The project was funded by the Netherlands Ministry of Foreign Affairs and was jointly implemented by the World Agroforestry Centre (ICRAF) Nairobi office and Centre for Science and Environment based in India. It focused on implementation of rainwater harvesting practices in the field. The programme demonstrated at scale rainwater harvesting interventions for increased agricultural production, improved domestic water supply and sanitation amongst the rural poor. (ICRAF, 2019) Funding: €1.9 million More information on the project is found on the World Agroforestry's website.	2,3,4,5
Project for Strengthening Capacity in NRW Reduction (2017-2021	Japan	The main goal of the project is to enhance NRW reduction by urban Water Service Providers. Some of the main activities are: • Cooperation with WASREB to produce NRW annual reports which include NRW reduction data. • NRW unit under the Ministry of Water and Irrigation NRW reduction sensitisation activities in the counties. • The Ministry conducts reviews of WASREB's NRW reduction activities. (JICA, 2019) Funding: Unknown More information on the project is found on NRW's website	2,3,5
Regional Centre on Ground Water Resources, Education Training and Research (Nairobi) (2010 – present)	United Nations Education Scientific and Cultural Organisation	The centre was established as a result of Resolution XIX-6 of the United Nations Education Scientific and Cultural Organisation (UNESCO) Intergovernmental Council of the International Hydrological Programme in 2010 which proposed the establishment of a category 2[28] centre within the auspices of UNESCO to be situated in Nairobi. The aim of the Centre is to promote regional cooperation on the 'Management of Groundwater Systems', train water professionals, support Member states in addressing regional needs. (RCGW, 2020) Funding: Unknown More information is found RGWC's website.	3

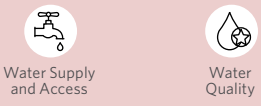
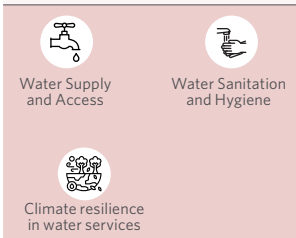
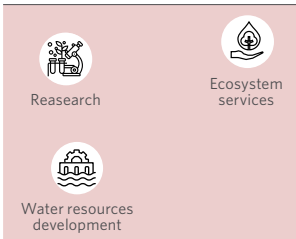
28 Category 2 institutes and centres are global network of institutions of excellence in the organisation's domain of competence. Although independent of UNESCO, they have access to UNESCO's logo and international and intergovernmental bodies and networks and may leverage UNESCO's international reach and convening powers. (UNESCO, 2020)

Photo by Adobe Stock (Wirestock) Baby Elephants

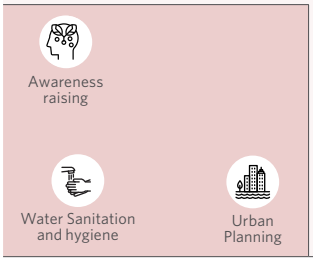
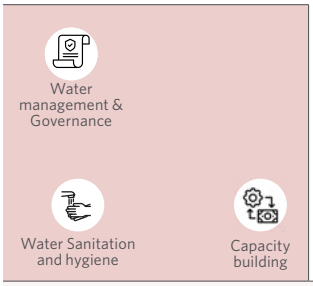
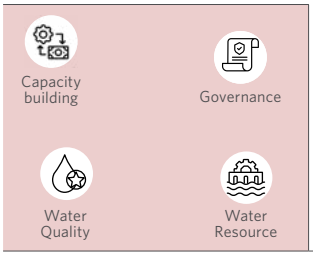
D.3. CIVIL SOCIETY AND NON-GOVERNMENTAL ORGANISATIONS AND RESEARCH INSTITUTIONS ACTIVE IN THE WATER SECTOR

Table D-6 outlines some of the Civil Society Organisation, and research institutions working in the country within the water sector[29].

Table. D-6. CSO, NGO and research institutions active in the water sector

Name of organisation and action	Overview of work
The Nature Conservancy (TNC) 	TNC are the main implementors of the Upper Tana-Nairobi Water Fund that was supported with GEF funding. TNC has also set up a Tree Fund, focussed on reforestation, sustainable charcoal and will have water benefits. The Tree Fund incentivises farmers by providing them with loans at an affordable rate, the trees planted act as collateral to the loan. (TNC, 2020) (Partnerships for Forests, 2020)
Netherlands Development Organisation (SNV) 	SNV works with both the national and local Government to develop in-country capacities and systems to meet water, sanitation and hygiene (WASH) challenges. They have implemented the following projects: • Initiative for Sustainable Landscapes (ISLA) project aims to restore and conserve 60,000 hectares of the Mau Forest by the year 2030 by establishing financially viable public–private partnership governance models for sustainable land and water management in the vulnerable landscapes South-West of the Mau forest. • Performance enhancement of water utilities was a five-year project (2015-2019) implemented by SNV and funded by the Sustainable Water Fund by the Netherlands Enterprise Agency. The project aimed at improving performance of WSPs in the Kenyan water sector by benchmarking, collective learning and innovative financing. • Sustainable approach to water service delivery – the Climate Resilience Water Services (CREWS) project scales up the successes of SNV's Market Assistance Programme in Kenya and addresses key barriers to systemic issues regarding improving access to WASH facilities and services. The programme was funded by DFID. (SNV, 2018) • Smart Water for Agriculture (2016-2019) aims to save water and energy, and to ensure sustainable resource use by promoting farmer-led and market-based smart water products and services. • The 'Partnerships for Capacity Building in Sustainable Development and Maintenance of Water Infrastructure in Kisumu and Nakuru, Kenya (EU-WOP)' project is a 48-month; 2012-2015, project funded by the European Union (EU)
CGIAR / International Water Management Institute (IWMI) 2015-2017 	The aim of the 'Water Infrastructure Solutions from Ecosystem Services Underpinning Climate Resilient Policies and Programmes' was to increase adaptive capacity through recognition and inclusion of ecosystem services provided by natural infrastructure in investment strategies for climate change adaptation. Baseline Review and Ecosystem Services Assessment of the Tana River Basin was conducted to (CGIAR, 2017); • Understand how ecosystem services support-built infrastructure operations. • Gain understanding of how ecosystem services are changing because of changes in climate. • Determine how the data and tools needed to incorporate ecosystem services into water resources development and climate change adaptation can be made available to policy makers and water resource managers.

29 This table may not include all CSO organisations/ implementing actors in the water sector; it includes the list of organisations identified during a literature review and stakeholder consultation process. Please therefore note that this list is not exhaustive

Name of organisation and action	Overview of work
International Development Research Centre (IDRC) 2007-2009 	The 'Integrated Water, Sanitation and Solid Waste Management in Small Urban Centres around Lake Victoria' (Kenya) project addressed research needed to inform the Lake Victoria Water and Sanitation (WATSAN) Initiative. The development objective of the WATSAN initiative was to support secondary urban centres in Lake Victoria region to enable them achieve water and sanitation related development goals. It focused on three towns; Kisii Homa Bay and Nyamira. The research assessed the status of water, sanitation and urban planning. (IDRC, 2016a) The 'Lake Naivasha Sustainability: Ecosystem Improvement for Health and Wellbeing' project sought to obtain better understanding of watershed hydrology, chemical pollution and health conditions among residents and floriculture workers. The overall goal was to make recommendations for sustainable management of natural resources in the basin to the benefit of both ecosystem and human health and well-being. (IDRC, 2016b).
Kenya Water and Sanitation Civil Society Network (KEWASNET) 	The KEWASNET's vision is on promoting good governance in the water, sanitation and hygiene sectors; it provides linkage with water users by creating partnerships between policy makers and stakeholders and encouraging equitable participation by all parties in governance and decision-making mechanisms. The network has formed Technical Woking Groups (TWGs) which are multidisciplinary and multi-sectoral think tanks comprising of competent professionals drawn countrywide; mainly from the private sector, non-state actors and with representation of key public sector stakeholders. (KEWASNET, 2020)
Bill and Melinda Gate Foundation (Upscaling of Basic Sanitation for the Urban Poor (SafiSan) 2011-2017 	The project objective was to improve the living conditions of the urban poor by offering access to basic sanitation and safely manage sludge treatment options for up to 400,000 residents of urban low-income areas in Kenya. (WaterFund, 2016) Funding: $7 million
Alliance for Water Stewardship (AWS, 2011) 	Exploring the value of water stewardship standards in Africa. Using Lake Naivasha as a case study it was concluded that by far the greatest challenge facing the basin at that time was effective governance as well as risk in terms of water quantity and flow arising from unsustainable levels of abstraction in the basin, from groundwater and from the lake itself and the potential for this to lead to excessive decline in lake levels which has widespread negative biophysical, reputational, economic and social impacts.

D.4. PRIVATE SECTOR INVOLVEMENT IN THE WATER SECTOR

With increase in water shortages in the country, the private sector has an essential role to play in conserving and protecting the Kenyan water sector. Some private sector organisations are already delivering or deploying water efficient technology innovation adoption. Table D-7. outlines some of these private sector initiatives[30].

30 This table may not include all private sector support focussing on sustainable practices in the water sector; it includes the list of initiatives

Table. D-7. Private organisations involved in the water sector (directly or indirectly)w

Area of focus	Name of organisation	Brief description
Sustainable ground water management / Industrial water use efficiency / Surface water quality management	Kenya Industrial Water Alliance (KIWA) (Ongoing)	The KIWA is a partnership made up of public, private and civil society organisations. They work towards achieving socially acceptable, economically favourable and environmentally sustainable management of water resources in Kenya. KIWA's project work is focused on three thematic areas: • sustainable ground water management, • industrial water use efficiency, and • surface water quality management. The partnership provides a platform to discuss and implement activities aimed at increasing sustainable access to water. (KAM, 2020)
Financing water projects	Kenya Innovative Finance Facility for Water (KIFFWA) (Ongoing)	KIFFWA aims to reduce the risk of water sector projects so that they are more attractive for private sector/finance. They provide early-stage capital, as well as technical and water-finance expertise to support the creation of viable water investment opportunities that are "investment-ready", to attract (private) providers of finance. KIFFWA invests in initiatives pertaining to all water sub-sectors, ranging from drinking water to desalination, for infrastructure and green ports development. Services provided by the company include: • Direct investments in the development phase of water initiatives. • Transaction advisory services. • Technical support • Fundraising support. If the project reaches financial close (i.e. securing investment), it will be required to repay KIFFWA's investment; there are three typical modes of re-payment. • pay off what they have received from KIFFWA (including a premium) • convert to debt, which can be agreed with the project; • convert to an equity stake in the project. If the project is not successful, the support provided by KIFFWA will be converted to a grant that does not need to be paid back.
	Bulk water supply project (Unknown)	KIFFFWA and the lead developer have formed a project for integrating of various irrigation and bulk water supply projects and agribusiness ventures. It is aimed at meeting the bulk water supply needs of domestic, livestock and land irrigation for agriculture. The project will have three main components: • Bulk water supplies complete with 140km trunk pipeline to deliver nominal 72 Mega Litres a day (ML/D) for domestic and Irrigation consumption. • Irrigation in-field infrastructure to irrigate an area of 4,100Ha (circa 10,130acres) at Taveta Complete with commercial Grain cultivation. • Build own and operate red meat production facility. Expected impact of the project includes: • Supply of clean drinking water to approximately 170,000 residents (about 50% of the population). • Poverty Alleviation – The value adding commercial components (irrigation and livestock farming) will contribute to sustainable incomes to both local farmers and private parties. • Improvement in food security – Irrigation will enable managing seasonality thereby ensuring year-round availability of water and access to food. • Reduction of human-wildlife conflict – This is a perennial issue in this area of project development, often with human and wildlife casualties; majorly caused by difficulties in access to water and farming land. The project will address this by providing enough water and better utilisation of available land resources. • Health Improvements – Access to clean water and sanitation. (KIFFWA, 2018)
	Kenya Pooled Water Fund (KPWF) (2018)	KPWF is an initiative that develops and finances bankable proposals for water utilities (WSPs). The initiative's concept draws in and combines donor guarantees and local capital markets (bonds issuance) to lend the required finances to utilities at affordable rates. This long-term local currency financing will enable water and/or sanitation access to about 700,000 additional people across Kenya. (KIFFWA, 2018)

identified during a literature review and stakeholder consultation process. Please therefore note that this list is not exhaustive.

Area of focus	Name of organisation	Brief description
Sustainable forestry with links to water conservation and efficiency	**Unilever Tea Kenya Limited** **(Ongoing)**	The company is involved in the Dutch Sustainable Trade Initiative's 'Sustainable Landscapes Initiative' to stop and reverse deforestation to increase water quantity in the area. The company has also committed financial and technical resources towards rehabilitating two water springs; Susumwet and Kipyieta. The two springs have been drying up, increasing the risk of conflict among different stakeholders in the area. Unilever Tea Kenya has also restored the riverbank areas by planting indigenous trees, fencing off the spring area and providing watering points for the animals. (Unilever, 2020)
	James Finlays Kenya Limited **(2018)**	Seretut Spring The project was implemented under ISLA, bringing together different partners; James Finlays, GIZ-IWaSP, ISLA, Water Resources Authority and Bellagio Construction Ltd. In June 2018 the water system was designed to efficiently deliver and distribute adequate water to meet the water demand for the entire area. The water was abstracted by constructing an eight metre-long retaining wall across the spring eye, a spring box to ensure the water was delivered to the collection point eighty metres downstream through a gravity system. Sinei and Kipchobos Springs As part of the water security within the landscape, Finlays together with other partners, has rehabilitated the two community springs, providing up to 15,000 people with access to clean water daily. (Finlays, 2018)
Clean Water and Sanitation	**AfricAqua** **(Ongoing)**	AfricAqua is a social enterprise company focused on innovative solutions for delivering clean water to low-income communities in Kenya. The company through its One Safe Drop Initiative has a commitment to provide 20,000 Kenyans with access to safe drinking water through 100 water shops water outlets. AfricAqua's water distribution model involves establishing community water hubs, which not only provide safe, treated water, but incorporates space for pharmacists, solar, health and hygiene products as well as water-related merchandise. The initiative offers clean water through the application of reverse osmosis technology to its water shops and water kiosks in densely populated areas. AfricAqua's first Water shops in Kajiado, Machakos and Narok are being piloted along with community water kiosks. These communities were chosen because of their acute water demand. AfricAqua has provided communities members in these locations with 1 litre, 10 Litre, 20 litre and 25 litre reusable cans for easy water collection and disinfects the cans each time they are refilled. The company has committed to scale up to 100 Water shops by the end of 2020. This expansion is being made possible by partnerships with Government of Kenya, Water.org and Coca-Cola among others, which are providing financing as well as technical assistance and expertise in business innovation and growth. (BCtA, 2017)
Clean Water	**Maji Milele Ltd** **(Ongoing)**	Maji Milele is a Swahili word meaning Water Forever. The company is a subsidiary company of Water Forever International, a for-profit social enterprise with a mission for providing safe water for all Kenyans through a pre-paid water points concept. People pay a small amount of money ($0.02-$0.08) per 20litre can. In return, communities get a full service (preventive maintenance, repairs and replacement of infrastructure at the end of lifetime, all free of charge). The prepaid concept is partly based on the success and wide cultural acceptance of prepaid services. (Water Forever, 2020)
SIMTANK H20	**SilAfrica**	This is a smart water storage solution which utilizes the Internet of Things to monitor water level and give a live visual representation to the owner through a mobile application. A sensor unit installed on the top of each tank periodically monitors and sends the water level data using a dedicated IoT Network; Sigfox. The app also allows the user to request for a tank refill as easy as one would request for a ride. Several SIMTANK H2O Hand Wash stations have been installed in schools and dense population areas to support with hygiene services during the COVID-19 period (SilAfrica, 2020).

D.5. INDUSTRY ASSOCIATIONS INVOLVED IN THE WATER SECTOR

There are also industry associations[31] involved in the water sector in Kenya. These are outlined in Table D-8[32].

Table. D-8. Industry associations involved in the water sector

Name of Industry Association	Area of focus	Brief Description of water work involved in
Kenya Association of Manufacturers (KAM)	Industrial water efficiency	KAM engages its member organisations and other businesses directly by supporting resource efficiency (energy, water and wastewater) and development through feasibility studies, matchmaking, business plans and access to finance and subsidy programs to support sustainable growth. The country programme planned for 2020 include 700 additional audits (650 energy audits; 50 water and wastewater audits) (KAM, 2017)
Water Service Providers Association (WASPA)	Water Association/ networking and membership	WASPA provides a forum for the water companies to network and learn from each other. Presently, there are 58 members in the association. The association also conducts trainings to its members such as trainings on NRW management and energy efficiency. (WASPA, 2017)
Kenya Water Industry Association (KWIA)	Water resources improvement	The Association is a private sector business management organisation aimed at improving access to water in order to spur socio-economic development. KWIA carries out advocacy with the Government on behalf of its members on key issues pertinent to their businesses. Membership for this association is predominantly to businesses in the water industry. (KWIA, 2016)

31 These industry associations are a group of private companies that have membership with the institutions listed in the first column.
32 Please note that the list of industry association involved in the water may not be exhaustive.