Isiolo County Water Strategy 2023-2035

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Finally, the County Government of Isiolo would like to extend its gratitude to all the development partners who supported the county in launching the strategy. These include CRS, World Vision, Action against Hunger, ACDI/VOCA LMS, LVIA, WFP, LAPSSET, USAID STAWI, USAID NAWIRI and Caritas Isiolo.

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Acronyms

ASAL	Arid and semi-arid lands
CIDP	County Integrated Development Plan
CRS	Catholic Relief Services
MWA	Millenium Water Alliance
NWMP	National Water Master Plan 2030
RAPID+	Resilient Arid Lands Partnership for Integrated Development Plus Program
ACA	Athi Catchment Area
BWRCs	Basin Water Resources Committees
CCCU	County Climate Change Unit
CCFs	Climate Change Fund
CCU	Climate Change Unit
CEC	County Executive Committee
CGI	County Government of Isiolo
CHIRPS	Climate Hazards InfraRed Precipitation with Station data
CIDP	County Integrated Development Plan
CIS	Climate Information Services
CMS	Catchment Management Strategy
ENNCA	Ewaso Ng'iro North Catchment Area
GOK	Government of Kenya
IWASCO	Isiolo Water & Sewerage Company
IWRMDP	Integrated Water Resources Management and Development Plan
KNBS	Kenya National Bureau of Standards
LUCC	Land Use Cover Change
LVNCA	Lake Victoria North Catchment Area
LVSCA	Lake Victoria South Catchment Area
MAP	Mean Annual Precipitation
MAR	Mean Annual Runoff
MCM	Million Cubic Metres (M3)
MCM/a	Million Cubic Metres (M3)/annum
MWI	Ministry of Water, Sanitation and Irrigation
NWP	National Policy on Water Resources Management and Development 1999
NWRMS	National Water Resources Management Strategy 2007-2009
RCP	Representative Concentration Pathways
RVCA	Rift Valley Catchment Area
SDG	Sustainable Development Goals
TCA	Tana Catchment Area
WASREB	Water Services Regulatory Board
WR	Water Resources
WRMA	Water Resources Management Authority
WRUAs	Water Resource Users Associations
WSI	Water Sanitation and Irrigation
WSTF-CEO	Water Sector Trust Fund-Chief Executive Officer

FOREWORD

H.E. Abdi Ibrahim Guyo
Governor of Isiolo County

Water scarcity and climate variability pose significant challenges to the social, economic, and environmental development of Isiolo County. To address these challenges, the Isiolo County Water Strategy aims to enhance water security and resilience for sustainable development by promoting sustainable water management practices, improving gender-sensitive water infrastructure, and fostering collaboration between stakeholders.

The Isiolo County Water Strategy addresses several key issues, including water scarcity, limited access to clean water, inadequate water infrastructure, and unsustainable water management practices, which have contributed to food insecurity, poverty, and environmental degradation, thus affecting the well-being and livelihoods of the local population and wildlife.

The Isiolo County Water Strategy aims to achieve the following objectives:

- Increase access to clean and safe water for people of all genders, livestock, and wildlife; with special attention to marginalized and vulnerable populations, including persons living with disabilities.
- Promote sustainable water management practices to ensure water security for future generations.
- Enhance water infrastructure and management systems to increase water productivity and efficiency.
- Foster collaboration between stakeholders, including neighbouring counties and other water users,so as to achieve a shared vision for sustainable water management.
- Strengthen the governance, management, and capacity of institutions and all water users.

The Strategy recognizes the importance of nature-based solutions in enhancing water security and resilience, which includes, restoration and protection of natural water storage areas, such as wetlands and catchment areas,, as well as the development of artificial recharge systems that mimic biological processes in wetlands, forests, and grasslands, including the promotion of agroforestry and conservation agriculture. This can enhance soil health and water retention, which are typically less costly to implement, and provide additional co-benefits such as biodiversity conservation, carbon sequestration, and climate regulation. Moreover, they can offer a sustainable and resilient water storage and regulation source, particularly in arid and semi-arid regions.

To enhance its utility and efficiency, the Isiolo County Water Strategy is designed with the following attributes:

- Integrated approach that recognizes the interdependence of water, food, energy, and ecosystems, promoting a nexus approach to water management.
- A gender-sensitive participatory process that involves all stakeholders, including the local community, NGOs, government agencies, and private sector actors, in the formulation and implementation of the strategy.
- Sustainable water management practices that are environmentally sound, socially equitable, and economically viable, ensuring long-term water security and resilience.
- Evidence-based, incorporating the latest scientific and technical knowledge to inform decision-making and support the achievement of the strategy's objectives.
- A result-oriented approach that prioritizes measurable outcomes and impact, ensuring accountability and transparency in the implementation of the strategy.

Above all, we recognise that it is imperative to implement robust knowledge infrastructures, that empower communities, and enhance the adaptability of institutions in order to fortify, reinforce, and strengthen household resilience and productivity.

Preface to the Isiolo County Water Strategy

Hon. Ali Wario Sarite,
CEC Water, Sanitation, Environment and Natural Resources

It is with great pleasure and a deep sense of responsibility that I introduce the Isiolo County Water Strategy. Evidence from the last 40 years of long droughts interspersed with acute floods, demonstrates that water is not only a fundamental human right but also our most vital resource, lying at the heart of our County's development and sustainability. In Isiolo County, where arid landscapes meet Kenya's fastest growing urban centers and rich biodiversity, water plays a pivotal role in shaping our future.

The Isiolo County Water Strategy is a roadmap, and a call to action. It emerges at a critical juncture when our County faces critical challenges and promising opportunities. The existential threats posed by climate change and environmental degradation are real and demand our immediate attention. These challenges jeopardise not only our water resources but also the very fabric of our society and ecological systems. The erratic weather patterns, prolonged droughts, and changing landscapes require adaptive measures that this policy seeks to provide. Inadequate, aging water and sewerage facilities, poor sanitation coverage particularly in our rural areas, as well as high level of contaminated and mineralised surface and groundwater, are also a major impediment to our ability to provide critical WASH services.

However, amidst these challenges, we find immense opportunities. Rapid urbanisation in our county, driven by the growth of emerging urban settlements, presents the potential for innovative water management solutions. The demand for food production, not only within our borders but also from neighbouring counties and beyond, opens doors for sustainable agricultural practices that optimise water use. Our diverse water resource base, encompassing local sub-catchments, low mountain catchments, and the water towers in Isiolo, but most importantly in Laikipia, Meru, Nyandarua, Nyeri, and Samburu, are critical sources waiting to be harnessed responsibly. Crucially, the Isiolo County Water Strategy recognises the importance of inclusivity and collaboration. It is designed to serve as the organising framework for cross-sectoral reforms that engage all social actors. We are committed to working hand in hand with our communities, non-governmental organisations, the private sector, faith-based organisations, conservancies, research, and public institutions like health centres and schools. Together, we will co-create and implement solutions that address water-related challenges at the grassroots level, ensuring equitable access for all.

The journey outlined in this policy is one of transformation. We envision a future where adequate water systems, both nature-based and modern grey infrastructure, support production and improved sanitation, and where

agile technology-based solutions usher in a new era of service delivery. Sustainability will be our guiding principle as we embark on this path, embracing Integrated Water Resource Management to protect our vital ecosystems while optimizing their availability for nature and development.

As the custodians of water resources in Isiolo County, we recognise the significance of cross-county collaboration, especially in the management of shared resources. Our commitment to cooperate with all of our county's neighbours is unwavering. Together, we shall safeguard these life-supporting ecosystems and ensure water security for our people.

I thank all stakeholders who have joined us on this transformative journey as we chart a course towards a sustainable, water-secure future for Isiolo County.

ACKNOWLEDGEMENT

CPA GODANA DIDA ABDUBA,
Chief Officer, Water Department

We extend our heartfelt appreciation to the visionary leadership, strategic guidance, and steadfast support of H.E. Governor Hon. Abdi Ibrahim Guyo, throughout the entire journey of developing the Isiolo County Water Strategy. His unwavering commitment and dedication to the welfare of our County have been instrumental in shaping this critical initiative. Under his guidance, we have charted a course towards a more water-secure and sustainable future for all residents of Isiolo County.

The water and sanitation department is immensely grateful for the continuous backing of H.E. the Governor, in our mission to provide clean and safe water to every corner of our county. His consistent support has been a driving force behind our efforts, motivating us to overcome challenges and strive for excellence in water service delivery.

Special recognition is extended to CEC Water, Sanitation, Environment, and Natural Resources, Mr. Ali Wario Sarite, whose leadership has been pivotal in advancing the goals of the Isiolo County Water Strategy. His unwavering commitment to environmental conservation and sustainable water management, has set a high standard for our department, and inspired us to reach new heights.

We also express our sincere gratitude to the dedicated water and sanitation technical team, including Director Water Mr. Bashir Jillo, Eng. Abdighaffar Ismail, Mr. Geoffrey Manene, Mr. Victor Adaka, and Mr. Mohammed Molu. Their collective expertise, tireless efforts, and collaborative spirit, have played an indispensable role in the development of this strategic plan. Their valuable insights and commitment to excellence, have significantly enriched our vision for water resource management in Isiolo County.

Furthermore, we extend our appreciation to our esteemed stakeholders, including our invaluable development partners. A special mention goes to Catholic Relief Services-Kenya, whose rapid response to our call for support, has been crucial in both financial and technical aspects of this strategic endeavour. Their partnership has demonstrated the remarkable impact that collaboration between governmental bodies and non-governmental organisations can achieve in addressing complex challenges.

Lastly, we are deeply thankful to the resilient and united people of Isiolo County. Their unwavering support, collective determination, and active engagement with the water and sanitation department and the government at large have been the driving force behind our progress thus far. It is their commitment to a sustainable and water-secure future that fuels our dedication to serving their needs.

Together, with the combined efforts of all stakeholders, we look forward to realizing the vision outlined in the Isiolo County Water Strategy, and making clean and safe water accessible to every resident of our county.

Executive Summary

The Isiolo County Water Strategy has been prepared with the aim of providing direction for the investment, development and management of Water and Sanitation in Isiolo County, and to give the County multiple benefits including health, agricultural production, livestock sector development and tourism. The water strategy secures the county's long-term water supply and sanitation development. The Isiolo County Water Strategy identified threats to water availability and quality, and developed protocols, legal frameworks, policies and actions, as well as the institutions that can manage and respond to the threats. In terms of spatial coverage, about 93% of the Isiolo County area lacks access to safe and clean water within five kilometres of reach. Over 175 villages (73%), rely on water sources that are unsafe and beyond five kilometres of reach. Some villages in Modogashe area are about 25 km from the nearest safe water source. Up to 58 % of the water sources are saline hence limiting the availability of potable water. Even though access to sanitation is a basic human right, 44.2% of the population in Isiolo County still uses open defecation, while 22.8%, 19.3% and 13.7% use improved, shared and unimproved sanitation respectively.

Isiolo County is one of the most vulnerable counties to climate change in Kenya. Impacts of climate change including extreme drought and flooding, erratic rainfalls, and the spread of waterborne diseases, pose challenges to Isiolo County. These coupled with deforestation, land degradation, and desertification pose a major threat to current and future water availability.

Over **175 villages (73%)**, rely on water sources that are unsafe and beyond five kilometres of reach and up to **58 %** of the water sources are saline hence limiting the availability of potable water.

44.2% of the population in Isiolo County still uses open defecation

Isiolo County Water Strategy has been prepared in line with the Constitution of Kenya 2010 which guarantees every Kenyan right to clean water. Devolution under Kenya's 2010 Constitution had a wide range of implications for the water sector. It assigned responsibility for water supply and sanitation provision to the established 47 Counties, Isiolo County being one of them. In addition, under the Water Act of 2016: Every person in Kenya has the right to clean and safe water in adequate quantities, and to reasonable standards of sanitation as stipulated in Article 43 of the Constitution. The strategy is aligned with the Water Act 2016, and it aims to conserve water resources. The strategy is also aligned with Vision 2030, the development blueprint of Kenya, with specific Targets on Water and Sanitation improvement, Agricultural production through irrigation, and protecting the environment.

Effective implementation of the devolved framework now requires the water sector to focus on the emerging opportunities, as well as to address several challenges including climate change, human-wildlife conflict over water resources, and competing usage of water in the catchment areas. Isiolo County legislated the Water Act 2013, water and sanitation policy, and water tariff regulation, to govern water resources use and development. Additionally, Isiolo County has established the Water Directorate, with the overall responsibility of regulating and overseeing the provision and management of water supply. Isiolo County also boasts of Isiolo Water & Sewerage Company-IWASCO, a limited liability company under the water sector reforms enshrined in the Water Act of 2016. Its main mandate is to provide high-quality water and sewerage services to the people of Isiolo County and its environs.

Isiolo County developed Isiolo County Strategy with the following objectives:

- To develop and manage County Water Works Infrastructure.
- To reduce the risks of climate change and manage floods and droughts.
- To mainstream cross–cutting issues on water resource and sanitation management.
- To strengthen and build the institutional capacity of Isiolo County on water and sanitation development and management.
- To enhance financial sustainability for Water and Sanitation development in Isiolo.

Development of the Isiolo Water Strategy

Isiolo County has never had a water strategy. The development of the Isiolo Water Strategy was based on an in-depth evaluation of water resources and meteorological conditions, to facilitate planning for the development and management of the available water resource. This was done by assessing and evaluating the availability, reliability, quality, and vulnerability of county water resources up to the year 2035–considering climate change and other factors. The strategy which includes preparation of both short-term and long-term investments needs to address gaps in water and sanitation; formulation of actions for water resources and catchment protection; and strengthening water and sanitation governance and financing.

Isiolo has three main rivers namely Ewaso Nyiro, Isiolo, and Bisan Adhi. Surface water availability varies with the seasons of the year. Additionally, Isiolo Central is characterised by volcanic areas around Isiolo town and the western parts of the county with high groundwater potential. In this area, the water supply technologies mainly used are boreholes, shallow wells and springs. The quality of groundwater in Isiolo town is shallow and deep aquifers, which are considered stable with no significant deviations in ionic concentrations. Isiolo County also has aquifers serving the County including the Isiolo-Nyambeni-Mount Kenya aquifer (SW) with high groundwater potential; Merti aquifer, Garbatulla-Modogashe aquifer (SE) with very low groundwater potential; and the Kachuru-Kula Mawe-Boji aquifer with low groundwater recharge due to surface water abstraction upstream. The total groundwater and surface water storage for Isiolo thus is 53.1 MCM/and 0 MCM respectively.

To meet future domestic and industrial demands in towns and rural settlements outside of the major urban centres, and to improve the reliability of supply to small-scale irrigation, new or additional storage dams, as well as significant local groundwater development should be implemented. This will also provide carry-over storage and meet supply deficits during dry years and/or the dry season, when the demand exceeds the availability of water in the rivers.

The Isiolo County Water Strategy

VISION

Achieve sustainable, equitable and secure water and sanitation for all for improved health, and wealth creation in Isiolo County.

MISSION

To realise the goals of the SDG 6, Kenya's Constitution 2010, and Isiolo CIDP 2023-2027, provision on right to safe and clean water for all, through responsive institutions within a regime of well-defined standards and regulation.

1.0
About the Isiolo County Water Strategy

1.1 Introduction

Devolution under Kenya's new 2010 Constitution has wide-ranging implications for the water sector. The Constitution recognizes that access to safe and sufficient water is a basic human right. It also assigns responsibility for water supply and sanitation provision to established 47 counties.

Under the Fourth Schedule of the Constitution, Isiolo County endeavours to:

i. ensure equitable and continuous access to clean water;

ii. promote soil and water conservation;

iii. promote water catchment conservation and protection;

iv. provide for the development, and management of county water services public works;

v. provide for regulation of county water and sanitation public works;

vi. ensure effective, efficient provision of water and sanitation services that are inclusive and gender sensitive;

vii. promote effective and efficient management of stormwater in built up areas; enhance sustainable management of water resources;

viii. promote public education and equality among water uses and users;

ix. promote interagency collaboration and public participation in water resource development and management.

Effective implementation of the new devolved framework now requires the water sector to focus on the emerging opportunities, and to address several challenges including climate change, human wildlife conflict over water resources, competing usage of water in the catchment areas. In March 2013, the newly elected government of Kenya committed itself to rapid transfer of devolved functions to the counties. This position marked by an allocation of funding to counties, signalled a hastened pace of devolution, compared to the earlier envisaged phased transfer of functions over a three-year period, which was contingent on whether counties were deemed to have the necessary capacity to take charge of a function. Henceforth, counties needed to make sure their budgets provide adequate financing for the recurrent and development costs of water service provision, in particular to personnel and operations and maintenance costs.

Isiolo County has enacted the Water Act 2020 and water tariff regulations to govern water resources use and development. The Water Act envisages the establishment of a Water Directorate, with the overall responsibility of regulating and overseeing the provision and management of water supply. Isiolo County also boasts of Isiolo Water & Sewerage Company (IWASCO), a limited liability company under the water sector reforms enshrined in the national Water Act of 2016. Its main mandate is to provide high-quality water and sewerage services to the people of Isiolo Town and its environs.

1.2 Objectives of county water strategies

County water strategies are an important instrument for making the connection between water resources development, social, health and economic well-being, and environmental sustainability through analysis, recommendations, and proposals for water sites, population, economy, housing, transportation, community facilities, and land use. They are ideally based on expert contributions, surveys, planning initiatives, existing developments, physical characteristics, and sex-disaggregated social and economic conditions.

The Water Act, 2016 aligns the water sector with the Constitution, 2010, that prescribes the right for every person to clean and safe water in adequate quantities, where everyone in Kenya is entitled to sufficient, safe, acceptable, physically accessible, and affordable water. It has particularly set up the institutional framework for the gradual realization of the right to water, as enshrined in the constitution. It also sets the centre stage towards strengthening the devolution process, as envisaged in the constitution that placed the primary responsibility for water services delivery, with the county governments.

Together with the National Water Policy, 2021, these legal documents and framework guide how each county is entitled to ensure that all legal documents are updated as per the national legislation, for those counties that lacked a water strategy, including Isiolo County.

The specific objectives of Isiolo County Water Strategy are:

- To develop and manage Water Works Infrastructure;
- To reduce the risks (mitigate the effects) of floods and droughts;
- To mainstream cross-cutting issues including gender and social inclusion on water resource and sanitation management;
- To strengthen and build the institutional capacity of Isiolo County on water and sanitation development and management;
- To enhance financial sustainability for Water and Sanitation development in Isiolo.

1.3 County water strategy consistency with other national plans and policies

The Water Act, 2016 aligns the water sector with the Constitution, 2010, that prescribes the right for every person to clean and safe water in adequate quantities: sufficient, safe, acceptable, physically accessible, and affordable. It has particularly set up the institutional framework for the gradual realisation of the right to water as enshrined in the constitution. It also sets the centre stage towards strengthening the devolution process as envisaged in the Constitution, which placed the primary responsibility for water services delivery with the county governments. Together with the draft National Water Policy, 2021, these legal documents and framework guide how each county is entitled to ensure that all legal documents are updated as per the national legislation. For Isiolo County there has not been an existing county water strategy.

1.4 Development of the Isiolo County Water Strategy

For Isiolo County, there has not been an existing county water strategy.

The county water strategy is based on an in-depth evaluation of water resources and meteorological conditions, to facilitate planning for development and management with the following objectives:

- To assess and evaluate availability, reliability, quality, and vulnerability of county water resources up to the year 2035 – in line with other existing

studies, and taking into consideration the effects of climate change. In addition, prepare both short-term and long-term investment needs to address gaps in water supply and water resources.

- To renew the water development plans towards the year 2035 taking into consideration effects of climate change.
- To formulate an action plan for activities of water resources and catchment protection up to 2035, with the aim of strengthening the capacity of water resources management through transfer of technology.
- To promote protection, governance and cooperation on shared waters and resources.
- Strengthening water and sanitation governance and financing.

2.0 Isiolo Water Situation Analysis

2.1 Water Resource Situation

Isiolo County has three main rivers namely Ewaso Nyiro, Isiolo, and Bisan Adhi.

1. **Ewaso Nyiro River** originates from the Aberdare ranges and north-western slopes of Mount Kenya, and drains into the Lorian Swamp. In the Ngare Ndare-Ngare Nything sub-catchment, the abstraction points are along Ngare Ndare and Ngare Nything Rivers. And within the Likiundu-Liliaba-Waso Mara sub-catchment, the abstraction points are along the Likiundu River, Waso Mara River, Liliaba River, and Kalibiuri Stream, among others. All the rivers from each sub-catchment drain into the Ewaso Nyiro North River which is the main drainage system in Isiolo County.

   The Ewaso Nyiro North River is the boundary between Isiolo and Samburu counties and runs for approximately 157 km along the common border, before going inland into the Isiolo County for a further distance of 174 km where it then exits the county and forms the boundary between Wajir and Garissa Counties.

   Based on historical data on the Ewaso Ng'iro[1],the mean annual flow of the Ewaso Ng'iro at Archer's Post amounts to about 630 million m^3 (MCM), with a minimum of 163 MCM recorded in 1952 and a maximum of 2,780 MCM recorded in 1961. The flows of the river have gradually decreased due to an increase of water use in Laikipia District. In 1985 and 1986, the Ewaso Ng'iro dried up in a reach of about 50 km upstream of Archer's Post, clearly showing the limitations for further development potential.

   The annual river flow for 2018 was estimated at 160 MCM at the Archers Post Node 2 (5ED01 gazette RGS). The use of the Ewaso Ng'iro upstream in Laikipia District affects the development possibilities of this river for Isiolo District. For domestic supply purposes, the river is not a reliable source. For irrigation, further development is possible by using the flood water. However, due to the high flood levels and changes in the course of the river, siting of surface water intakes is very critical and very expensive structures are required.

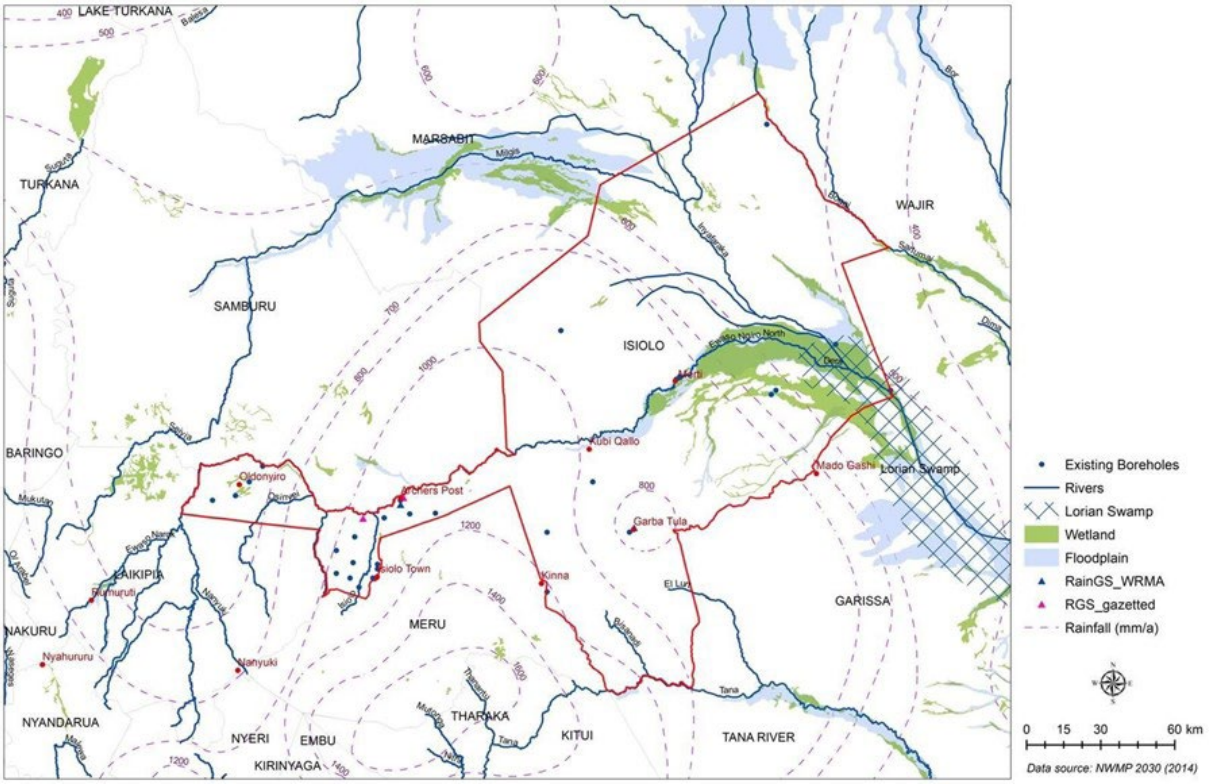
2. **The Isiolo River** originates from Mount Kenya and drains into the Ewaso Nyiro River. Within the Isiolo-Marania sub-catchment, abstraction points are along Isiolo River, East and West Marania Rivers, Ruguthu River, Kithima River and the Lewa River.

3. **Bisan Adhi River** originates from Nyambene ridges and drains into Tana River.

Surface water availability in Isiolo County varies with seasons of the year. The surface water sources include rivers, streams, springs and runoff from the Isiolo sub-catchment of the Middle Ewaso Ng'iro catchment. Surface water

1 Isiolo District Water Development Study. Water Resources Assessment And Planning Project (WRAP). Ministry of Water Development. June 1991.

Figure 1: Overall Water Resources Outlook



The major aquifers that serve Isiolo County include –

a. The Isiolo-Nyambeni-Mount Kenya aquifer (SW) that has high ground water potential;

b. Merti aquifer, Garbatulla-Modogashe aquifer (SE) that has very low ground water potential; and

c. The Kachuru-Kula Mawe-Boji aquifer which has fairly low groundwater due to surface water abstraction upstream.

Groundwater quality of alluvial aquifers is generally good, though prone to contamination since they are shallow and unconfined. The basement and volcanic formations have locally poor water quality, with predominantly slightly saline water at greater depths.

Isiolo sub-county (semi-arid)

- In Isiolo Central, there are volcanic areas around Isiolo town and the western parts of the county that have high groundwater potential, and the water supply technologies mainly used are boreholes, shallow wells and springs. The groundwater quality of the Isiolo town shallow and deep aquifers is considered stable with no major deviations in ionic concentrations.

- In the basement areas, sand dams, water pans, and rock catchments are the dominant water technologies, and most of these technologies cluster around Oldonyiro ward. It is estimated that the daily consumption is about 25 litres per capita, excluding livestock requirements.

- In Oldonyiro ward, ground water potential is poor; there are only three (3) operational boreholes. Groundwater is localised within the fractured zone of basement rocks, and borehole maximum depth is 150 metres.

Garbatulla sub-county (arid)

- In Garbatulla town, water is localised within the contact zone between sedimentary rock (Limestone) and basement.

The borehole yields range between 15-20 m^3 per hour and approximate borehole depths of 70 metres. The Waso Basin alluvial aquifer acts as a source of water for boreholes drilled along both sides of the river, from Malkadaka to Sericho in Garbatulla Sub County, and from Biliku-Marara to Merti centre in Merti Sub County. Boreholes on the Waso Basin may go to a maximum depth of 150 metres. The rest of Sericho ward has poor groundwater potential and of poor quality.

- Kinna Ward being on a volcanic formation, has fairly good quality ground water potential with boreholes average yields in the range of 3-8 cubic metres per hour, and maximum depth of boreholes drilled up to 250 metres.

Merti sub-county (very-arid)

- Boreholes in Cherab Ward of Merti Sub County that are drilled along the Merti aquifer have good yields, with average yields between 8-10 m^3 per hour and water quality is good, while those drilled off the Merti aquifer have low yields and low quality.
- The depths in this region range from 250-350 metres.

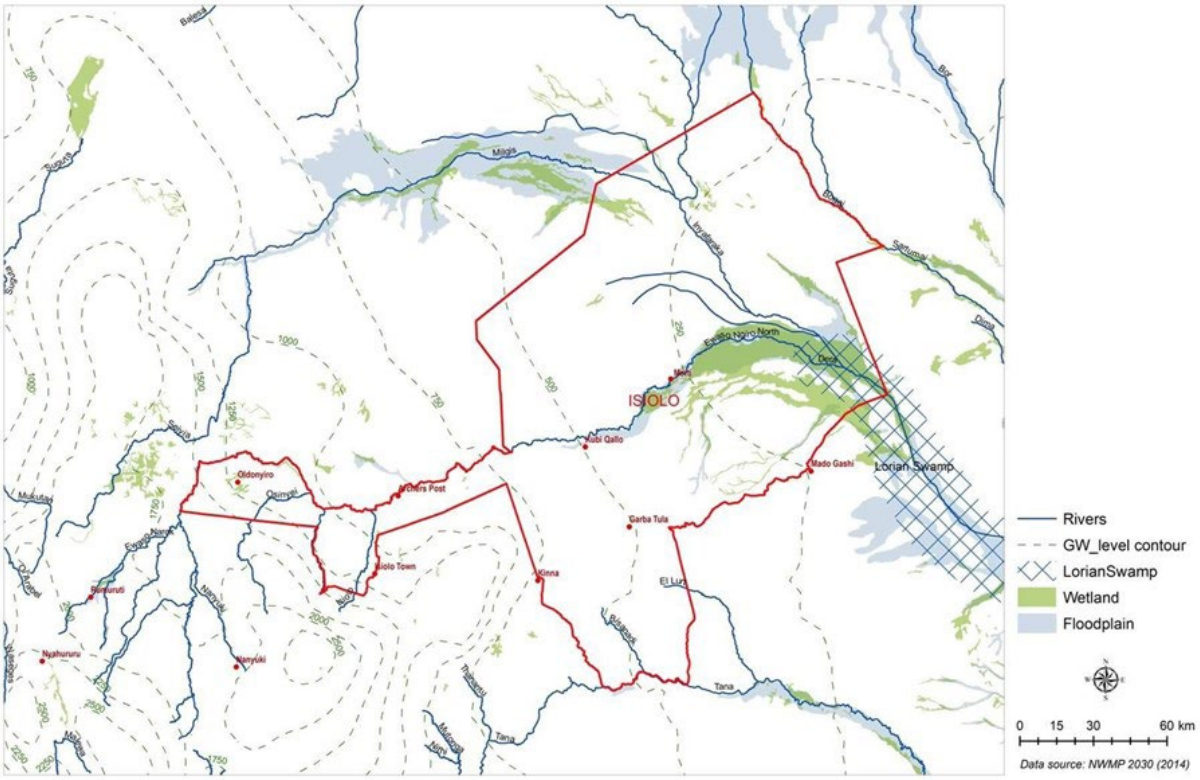
2.2 Surface Water Resources Assessment

The surface water resources analysis for Isiolo is based on the Ewaso Ng'iro North (ENN) Basin surface water analysis, undertaken to quantify the available surface water within the basin under natural conditions in both space and time[2].

Conceptual approach

The assessment involved the development of a water resources systems model of the basin, including a rainfall-runoff model. Based on the availability of historical rainfall data, a simulation period from 1960 to 2017 was used for the model

Figure 2: Groundwater potential



2 Aurecon AMEI Limited. 2020. Ewaso Ng'iro North Integrated Water Resources Management and Development Plan (IWRMDP). Final Report. Technical Report prepared for the Ministry of Water, Sanitation and Irrigation. Republic of Kenya by Aurecon AMEI Limited. Ebéne, Mauritius. 263 pp.

simulations conducted at a daily time-step. MIKE HYDRO Basin, which incorporates the NAM rainfall-runoff model, was used as the water resources systems model.

The water resources modelling task involved several sequential steps including the collection, review and quality control of hydrometeorological data, model sub-catchment delineation, model calibration and validation, the configuration of a system model, and hydrological assessment, through water resources simulation.

Hydromet data

The Water Resources Authority (WRA) rainfall database contains historical daily data at 76 rainfall stations in the Ewaso Ng'iro North Basin, with data availability ranging from 1950 up to 1989. Of these, 35 stations with good quality records were selected. As the majority of the WRA data only extended up to Dec 1989, the Climate Hazards Group InfraRed Precipitation with Stations data (CHIRPS) dataset, was used to extend the rainfall datasets at the selected stations from 1989 to 2010. A Mean Annual Precipitation (MAP) surface for the basin was then generated using the CHIRPS rainfall dataset.

Streamflow data

The Ewaso Ng'iro North Basin has historical daily water level records of varying quality and completeness for approximately 45 streamflow stations – all of which are in the upper section of the basin. After quality control, which involved graphical analysis, mass plots and statistical analyses, anomalies and inconsistencies in some of the station records were identified. Eventually, only 7 stations were selected (Table 1). Record periods at these stations vary between 15 and 50 years, and are of relatively good quality between 1965 and 1990 but deteriorated significantly from 1990 onwards. These stations were used for calibration and validation of the rainfall-runoff model. For Isiolo County, the station of importance is SED01 referred to as Node 1 at Archers Post.

Table 1: Selected streamflow gauges for model calibration and validation

Station ID	Name	Longitude (°)	Latitude (°)	Catchment Area (km^2)
5AA05	EQUATOR	36.363	0.020	157
5AC08	EWASO NAROK	36.867	0.529	4,561
5AC10	EWASO NAROK	36.724	0.438	2,590
5BC04	EWASO NG'IRO	36.905	0.090	1,870
5BE20	NANYUKI	37.030	0.147	860
5DC01	EWASO NG'IRO	36.863	0.508	3,290
5ED01	EWASO NG'IRO AT ARCHER'S POST	37.678	0.642	15,300

Source: ENN Integrated Water Resources Management and Development Plan, 2020

Surface water resources potential

The main surface water source for Isiolo County is the Ewaso Ng'iro North River, where 89% of the county forms part of the Ewaso Ng'iro North Catchment Area (ENNCA) catchment, consisting of the sub-basins listed in **Table 2**

Table 2: Isiolo ENN sub-basins

Basin	Basin Id	Type	River
Ewaso Ng'iro North	5EB	Sub-Basin	Bogai / Sartumai
Ewaso Ng'iro North	5FA	Sub-Basin	Dera
Ewaso Ng'iro North	5DA	Sub-Basin	Isiolo
Ewaso Ng'iro North	5DD	Sub-Basin	Ewaso Ngiro
Ewaso Ng'iro North	5DC	Sub-Basin	Ewaso Ngiro
Ewaso Ng'iro North	5DB	Sub-Basin	Osinyei
Ewaso Ng'iro North	5EC	Sub-Basin	Inyafaraka
Ewaso Ng'iro North	5ED	Sub-Basin	Ewaso Ngiro

Source: ENN Integrated Water Resources Management and Development Plan, 2020

Additionally, Isiolo is also part of the Tana Catchment Area (TCA), its southern-most part contributing to the TCA sub-basin listed.

Table 3: Isiolo TCA sub-basins

Basin	Basin Id	Type	River
Tana	4GB	Sub-Basin	El Lurt
Tana	4GA	Sub-Basin	Bisanadi
Tana	4FB	Sub-Basin	Tana

Source: ENN Integrated Water Resources Management and Development Plan, 2020

The simulated natural Mean Annual Runoff (MAR) for the Isiolo County sub-basins is shown in **Table 4. Fig. 3** shows river sub-basins, annual runoff, and river-rain gauge stations.

Figure 3: Sub-basins, annual runoff, and river-rain gauge stations

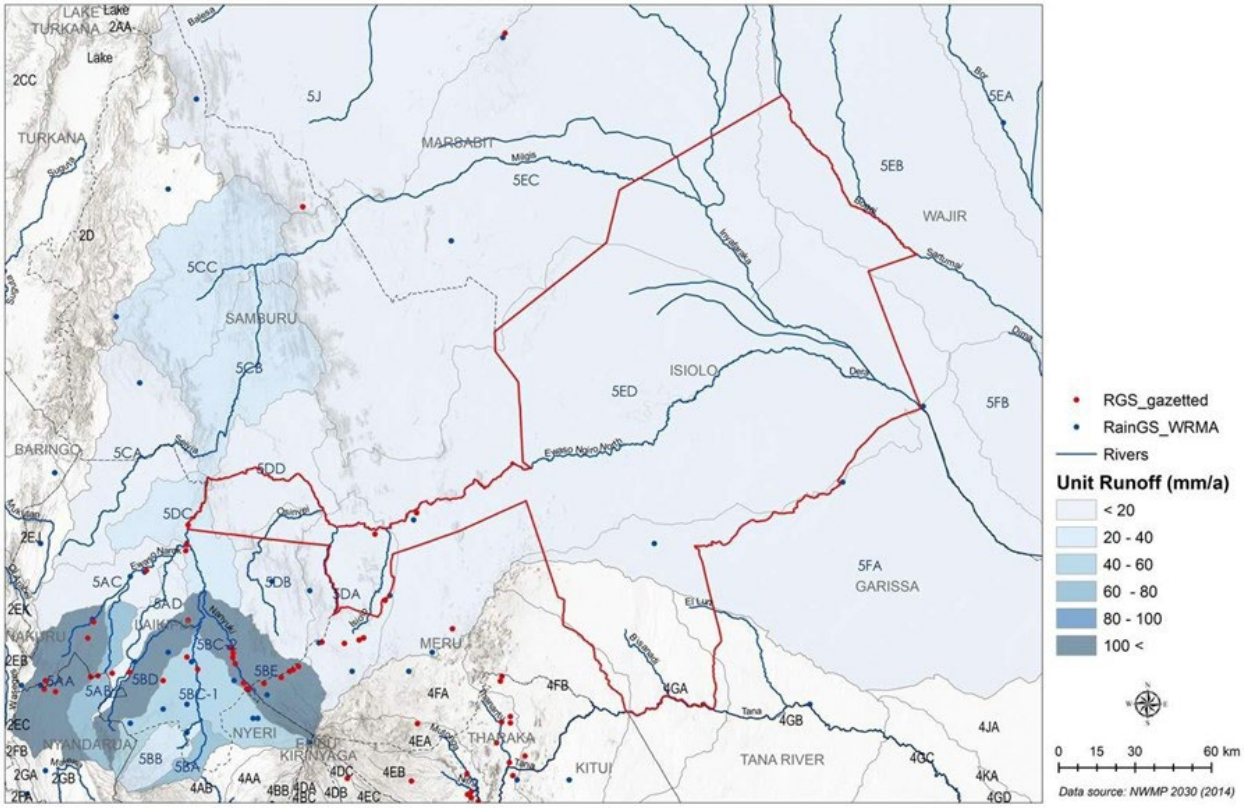


Table 4: ENN water availability, current water demands (2018) and water balance per sub-basin

*Isiolo County sub-basins highlighted in yellow.

Sub- basin	Area (km2)	MAP (mm)	Water resources potential (MCM/a)			Q95 (MC-M/a)	Current demand (MCM/a)					Water balance	
			Natural Surface Runoff (1)	Groundwater sustainable yield	Total		Irrigation	Domestic / Industrial	Livestock	Wildlife & Fisheries	Total	(MCM/a)	%
5AA	1,310	893	79	12	91	19.2	2.0	10.6	1.4	0.3	14	58	63%
5AB	555	805	11	4	15	2.2	0.7	1.2	0.5	0.3	3	10	67%
5AC	1,028	631	12	5	17	0.0	2.3	0.7	0.5	0.3	4	13	77%
5AD	510	605	2	3	5	0.0	5.8	0.4	0.3	0.3	7	0	0%
5BA	259	447	9	2	11	0.0	2.5	0.4	0.0	0.3	3	8	71%
5BB	432	593	7	3	10	1.1	6.9	0.8	0.4	0.3	8	0	2%
5BC-1	1,468	782	38	6	44	6.8	5.3	2.1	1.0	0.3	9	29	65%
5BC-2	144	684	9	6	15	1.5	6.6	0.0	0.0	0.3	7	7	44%
5BD	708	1,409	164	4	168	85.4	0.7	0.9	0.4	0.3	2	80	48%
5BE	1,216	1,520	67	11	78	47.1	23.5	8.7	1.0	0.3	34	0	0%
5CA	2,367	583	11	11	23	0.0	3.0	1.3	0.9	0.3	6	17	76%
5CB	2,261	555	27	4	31	0.0	0.0	0.5	0.3	0.3	1	30	96%
5CC	2,974	565	57	6	63	0.0	0.0	0.5	0.7	0.3	1	62	98%
5DA	2,186	394	11	9	20	0.0	32.5	11.7	1.3	0.3	46	0	0%
5DB	1,256	613	12	5	18	0.0	3.1	0.4	0.4	0.3	4	13	76%
5DC	1,273	574	27	4	31	1.5	2.7	0.3	0.5	0.3	4	25	83%
5DD	1,915	576	9	6	15	0.0	1.1	0.3	0.0	0.3	2	14	89%
5EA	26,734	343	272	63	335	2.2	0.0	4.2	8.1	0.3	13	320	96%
5EB	25,989	369	257	45	302	0.0	4.1	2.8	5.9	0.3	13	288	96%
5EC	21,877	596	31	45	75	0.0	5.9	1.8	2.2	0.3	10	65	86%
5ED	20,545	365	160	34	194	0.0	0.0	6.6	4.7	0.3	12	183	94%
5FA	17,169	254	156	40	196	0.0	0.0	3.5	5.6	0.3	9	187	95%
5FB	7,968	235	53	20	74	0.0	0.0	0.5	1.8	0.3	3	71	96%
5G	20,258	425	393	52	445	1.4	0.0	4.1	16.9	0.3	21	423	95%
5HA	3,263	235	29	5	34	0.0	16.7	1.0	3.8	0.3	22	13	37%
5HB	6,926	442	221	16	237	0.0	0.0	1.8	6.7	0.3	9	228	96%
5J	37,325	400	272	28	300	0.0	0.0	1.3	4.0	0.3	6	295	98%
Total	**209,918**	**-**	**2,398**	**449**	**2,847**	**168**	**125**	**69**	**70**	**9**	**272**	**-**	**-**

Note: (1) Excludes losses

MAP – Mean Annual Precipitation

Q95 – Water allocation based on 5-year permits determined in accordance with WRMA, 2010 guidelines; superseded by Draft 2018 Allocation Guideline.

Source: ENN Integrated Water Resources Management and Development Plan, 2020

Climate Analysis

The scale of future climate impacts varies based on the anthropogenic mitigation of factors responsible for currently experienced changes. The mitigation scenarios account for several variances of potential global economic and environmental development and are quantified as the Representative Concentration Pathways (RCP).

In line with industry standards, the scenarios considered for this analysis were the RCP4.5 (likely) and RCP8.5 (worst case) scenarios. These RCPs show the change from pre-industrial insolation watts per m² resulting from the emissions. RCP 4.5 – likely best case – emissions stabilise from 2040 and decrease thereafter. RCP 8.5 represents the very high greenhouse gas emission scenario – emissions don't stabilise, worst case scenario with a focus on economic advancement at the expense of environmental sustainability. These emission scenarios give light to the varying potential climatic futures based on human development goals in the present and near future[3].

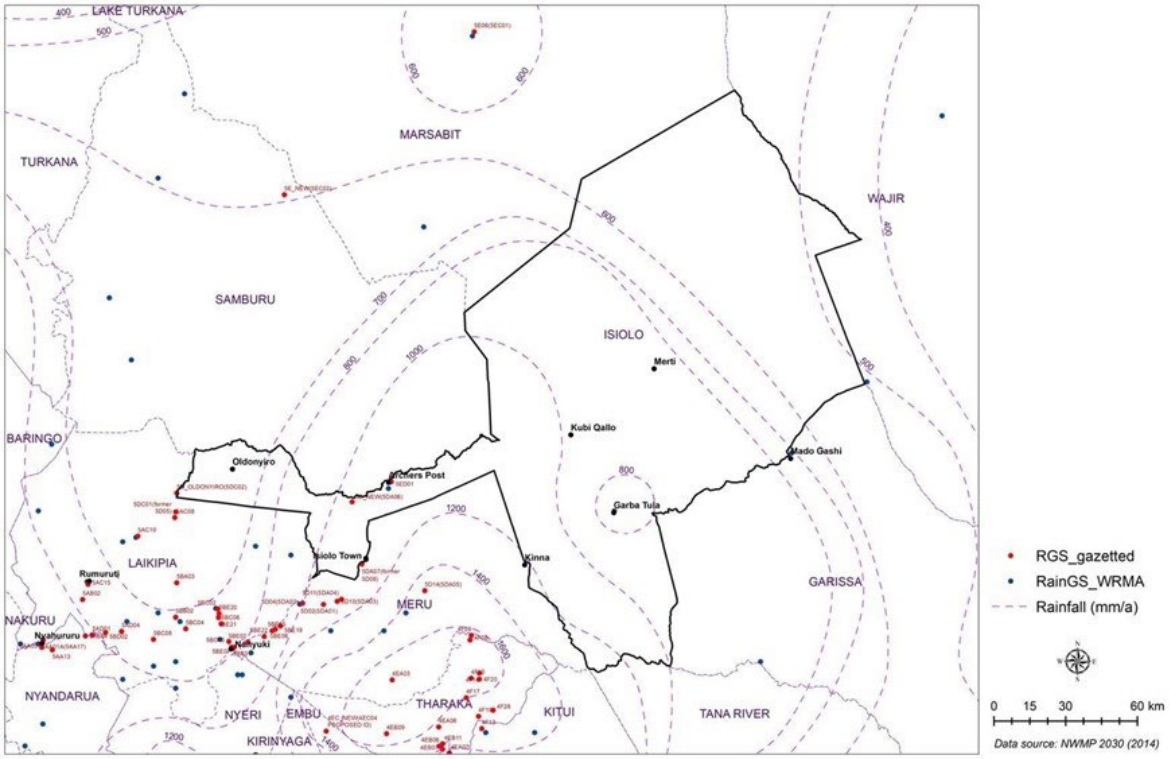
Precipitation and Temperature

The climate analysis showed a general increase (between 6% and 14%) in mean annual precipitation (MAP) across the ENN Basin by 2050, with the average MAP across the basin increasing from 431 mm to 478 mm by 2050 under RCP 4.5.

Day and night temperatures in the basin are expected to increase by up to 1.0°C and 1.2°C respectively by 2050 (RCP 4.5).

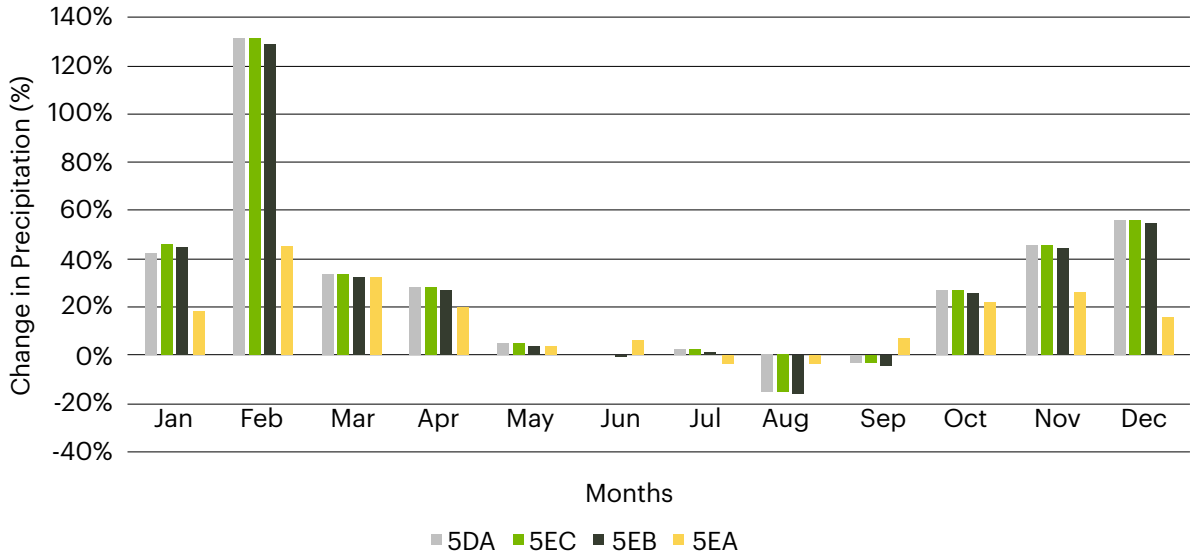
To assess the expected impacts on more localised precipitation in the ENN Basin as result of climate change, four sub-basins were selected for detailed analyses namely, 5DA, 5EA, 5EB and 5EC as shown in **Fig. 4**.

Figure 4: Precipitation potential



3 Ewaso Ng'iro North Integrated Water Resources Management and Development Plan. Kenya water security and climate resilience project. Implementation Support Consultancy (ISC) to Support Strengthening of Water Resources Management and Planning. World Bank. August 2020.

Figure 5: Change in monthly precipitation; 2040 to 2060 compared to 1980 to 2000 in four sub-basins

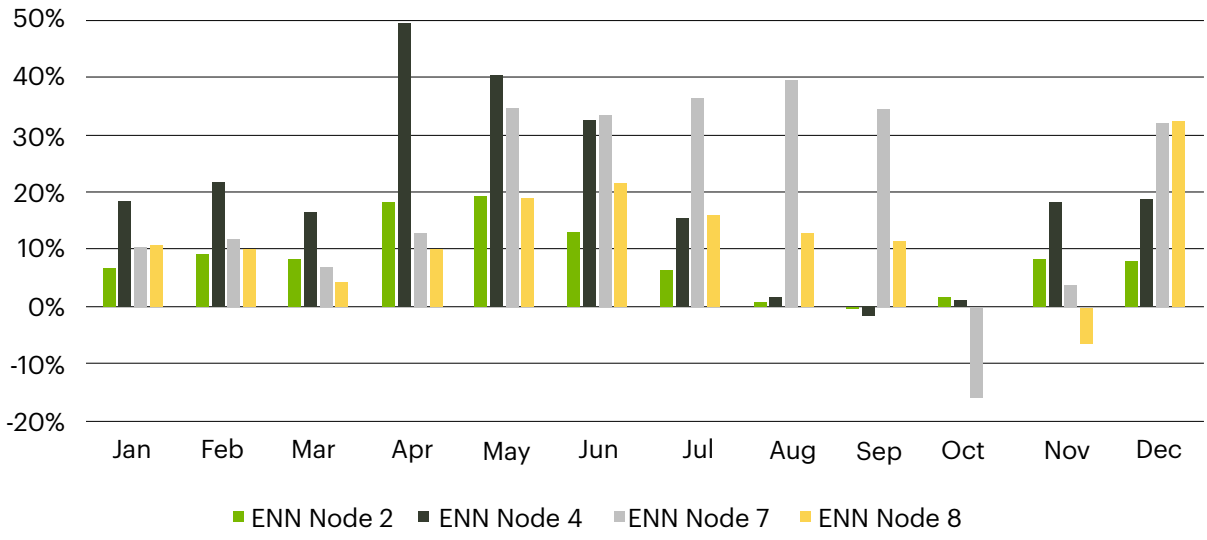


Source: ENN Integrated Water Resources Management and Development Plan, 2020

Stream Flow and Climate Change

Projected sub-basin precipitation and temperature changes under climate change scenario RCP 4.5 were superimposed on the hydrological model of the ENN Basin to assess the potential impacts on runoff. A simulation period of 1960 to 2017 was used. The analysis showed that natural runoff in the basin is expected to increase in most sub-basins by between 10% to 20%. The total surface water runoff from the ENN Basin is projected to increase with 9% by 2050 under RCP 4.5.

Figure 6: Change between historical naturalised flow and naturalised flow with climate change



Source: ENN Integrated Water Resources Management and Development Plan, 2020

To assess the expected impacts on stream flow in the ENN Basin as a result of climate change, four river nodes were selected: ENN Node 2 (5ED01), Node 4, Node 7 and Node 8. **Fig. 6** shows the percentage change in monthly average natural flow under climate change at each river node. The flow is expected to decrease for the north eastern catchments in October, and then increase during November and December, as well as over January and February. Furthermore, the flow increases during the long rainy season between March to May. And generally, increases in the dry season from June to September. Note that the high percentage increase in precipitation (Figure A2-2) during January to February, results in a smaller percentage increase in flow (Figure A2-11).

Water to supply basin-wide domestic, irrigation, and livestock demands by 2040

In order to meet future domestic and industrial demands in towns and rural settlements outside of the major urban centres, and to improve the reliability of supply to small-scale irrigation, new or additional storage dams as well as significant local groundwater development should be implemented to provide carry-over storage, and to meet supply deficits during dry years and/or the dry season when the demand exceeds the availability of water in the rivers.

The ENN IWRMDP water resources model, in conjunction with the groundwater availability assessment model, was used to determine surface water storage requirements and groundwater development per-sub-basin. The total additional storage volume (as local dams and pans) in the ENN Basin, which will be required to meet 2040 demands, amounts to 14 MCM, while the total volume of additional groundwater development which will be required was estimated at 163 MCM/a. **Table 5** provides estimates of additional surface water storage requirements, as well as estimates of groundwater development per sub-basin. The surface water storage should be provided in dams and pans.

Table 5: Additional storage requirements and groundwater development to meet 2040 demands

Sub-basin	Groundwater (MCM/a)	Surface Water Storage (MCM)
5AA	1.5	0.0
5AB	2.6	0.0
5AC	3.3	0.0
5AD	1.6	0.0
5BA	1.3	0.3
5BB	1.8	3.4
5BC-1	4.4	0.9
5BC-2	4.2	0.0
5BD	1.6	0.0
5BE	5.0	2.8
5CA	4.5	0.0
5CB	0.7	0.0
5CC	1.0	0.0
5DA	1.4	0.0
5DB	3.1	0.0
5DC	3.8	0.0
5DD	1.0	0.0
5EA	17.4	0.0
5EB	12.0	0.0
5EC	8.3	0.0

Sub-basin	Groundwater (MCM/a)	Surface Water Storage (MCM)
5ED	14.7	0.0
5FA	8.8	0.0
5FB	2.8	0.0
5G*	32.0	0.0
5HA	1.6	2.4
5HB*	16.1	4.4
5J*	6.0	0.0
Isiolo sub-total	***53.1***	***0***
Total	**162.5**	**14.2**

Source: ENN Integrated Water Resources Management and Development Plan, 2020

The total **groundwater** and **surface water storage** for Isiolo thus is 53.1 MCM/a and 0 MCM respectively. *Table 6 highlights the future water demands per sub-basin for sectors considered in analyses as per WRMA guidelines.*

Table 6: Future (2040) water demands per sub-basin

Sub-basin	Future water demand (MCM/a)				
	Irrigation	Domestic / Industrial	Livestock	Wildlife & Fisheries	Total
5AA	1.4	20.1	3.6	0.3	25.4
5AB	3.4	1.0	1.8	0.3	6.5
5AC	1.5	0.4	1.8	0.3	4.0
5AD	4.1	0.3	0.3	0.3	5.0
5BA	23.3	0.3	0.0	0.3	23.9
5BB	108.3	0.7	1.0	0.3	110.2
5BC-1	0.4	1.4	2.7	0.3	4.8
5BC-2	13.9	0.0	0.0	0.3	14.2
5BD	1.8	0.6	1.0	0.3	3.7
5BE	0.0	17.0	2.7	0.3	20.0
5CA	0.0	1.3	1.9	0.3	3.5
5CB	46.0	0.6	0.3	0.3	47.3
5CC	1.9	0.6	0.7	0.3	3.5
5DA	1.6	35.5	2.9	0.3	40.3
5DB	0.6	0.3	1.0	0.3	2.2
5DC	0.0	0.5	1.8	0.3	2.5
5DD	2.4	0.5	0.0	0.3	3.2
5EA	3.5	9.6	10.1	0.3	23.6
5EB	0.0	3.4	7.6	0.3	11.3
5EC	0.0	3.9	2.6	0.3	6.8
5ED	0.0	8.7	9.2	0.3	18.2
5FA	0.0	3.4	7.3	0.3	11.0
5FB	9.9	0.9	2.2	0.3	13.4

Sub-basin	Future water demand (MCM/a)				
	Irrigation	Domestic / Industrial	Livestock	Wildlife & Fisheries	Total
5G	0.0	14.0	21.0	0.3	35.3
5HA	0.0	2.6	5.0	0.3	7.9
5HB	0.0	13.6	8.8	0.3	22.8
5J	0.0	2.0	4.8	0.3	7.1
Isiolo sub-total	***4.6***	***56.2***	***32.4***	***2.4***	***95.5***
Total	**224.0**	**143.2**	**101.9**	**8.5**	**477.5**

Source: ENN Integrated Water Resources Management and Development Plan, 2020

The future total demand for Isiolo County (shaded rows) is thus 4.6, 56.2, 32.4, and 2.4 MCM/a respectively for the Irrigation, Domestic / Industrial, Livestock and Wildlife & Fisheries sectors respectively.

The current water needs for Isiolo County with a total surface area of 25,700 km2 (2,570,000 ha) for the sectors considered in analyses as per WRMA guidelines is summarised as follows: [Ewaso Ng'iro North IWRMQP, p52]

Irrigation

The irrigation potential county-wide is estimated at more than 2,000 ha. However not more than 30% of this is under irrigation. The county's agricultural activities largely depend on irrigation since rain fed agriculture is not sufficient in most areas. Irrigated farming is practised along Ewaso Ng'iro River, Isiolo central and Kinna along Bisan Adhi, Kinna and Ewaso Ng'iro rivers. The Ewaso Ng'iro irrigation clusters falling on both sides of the river have had challenges, for instance: -

- The **Malka Daka, Merti** and **Gafarsa** schemes initiated with FAO assistance, collapsed due to floods in 1982.
- **Gafarsa** scheme was re-constructed in 1984 and supported by the French Embassy in 1986 and again collapsed in 1996 as result of floods during El-nino.
- **Merti** irrigation implemented with support from CEFA in 1998 also collapsed in 2002 due to floods.
- The major challenge was the river banks have alluvial deposits which are highly unstable, making it a problem for any irrigation infrastructure to be put in place except for the **Kubi Qallo** site. The **Kubi Qallo** site, if developed, can give a permanent solution for Ewaso Ng'iro irrigation clusters and hence enhance food security in the region.

Crops produced include maize, sorghum, beans, green grams, nerica rice, cowpeas, dolicos, kales, tomatoes, onions and watermelons. The fruit trees grown include pawpaw, avocados, citrus, mangoes and guavas, both for subsistence and commercial purposes.

There are currently seventeen irrigation schemes in the county (**Table 7**). Drought and unpredictable rainfall impact negatively on crop production leading to reduced crop yield and low productivity.

Table 7: Isiolo current status of irrigation schemes

Name of scheme	Location/ Ward	Size	Remarks
Iresaboru	Garbatulla	60 acres	With an estimated cost of 10 million, two 200m^3 masonry tanks were constructed, generator purchased, and done, and borehole drilled. Floods covered the area making operations impossible.
Malkadaka	Garbatulla	120 acres	With Phases 1 and 2 at an estimated cost of 140 million. Solar system installed and 3 diesel engine generators in place to supplement water.
Rapsu	Kinna	172 acres	With an estimated cost of 200 million, and consisting of a gravity canal with a weir across Bisan Adhi River. 3 km canal rehabilitated. During dry spells upstream users abstract all the water seriously affecting farmers.
Kinna	Kinna	80 acres	Consists of a weir constructed across Abduwab river. With gravity flow canals. However, water is not adequate.
Guba Diba	Kinna	100 acres	Uses Milla spring in the Bisan Adhi NR. A community initiative, which requires design for BOQ preparation. Operational with a hazard canal construction in place.
Kakili		40 acres	Weir constructed across Lewa river and piping done. Worth 5 million.
Kilimani / Galana	Burat	Pilot 100 acres	Dam constructed on Lewa river, funded by DRSLP at a cost of 400 million. Infrastructure tanks and piping done. The dam has been vandalised.
Akore	Burat	60 acres	Once operational but due to poor management and water scarcity abandoned. Vandalism by the community played a role.
Akadeli		50 acres	
Bulesa Dima		30 acres	
Oldonyiro	Oldonyiro	Pilot 80 acres	With an estimated cost of 250 million, and consisting of a weir across Ewaso Ng'iro river. Consists of a turbine to pump water, and piping in place but not complete.
Parkuruk dam	Oldonyiro	30 acres	Funded by KCSAP and has cost 80 million so far. Works ongoing.
Merti	Cherab	100 acres	The Merti electric grid is very costly for the farmers. Solar system installed to pump water from the borehole.
Chari irrigation clusters	Chari	50 acres	Farmers using portable pumps to do irrigation along Ewaso Ng'iro river
Kayo farm	Chari	200 acres	Laying of pipes targeting 300 farmers to be supported by DRSLP
Sukuma Borehole	Ngaremara		Solarised.
Attir Borehole	Ngaremara		Operational

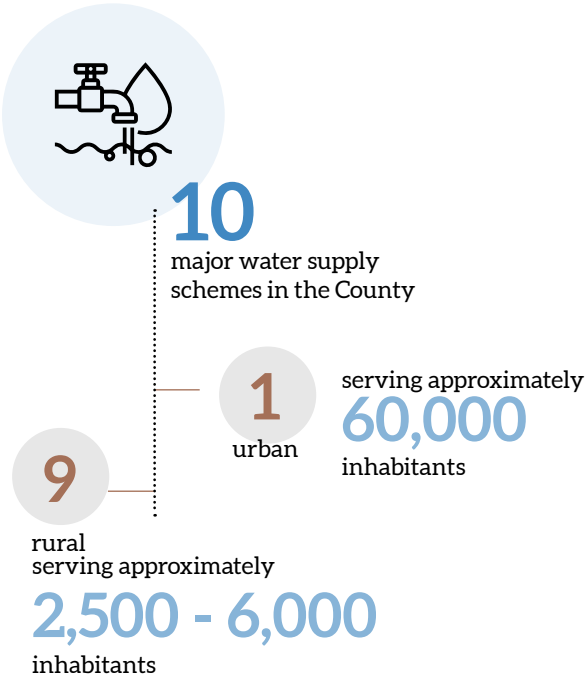
Source: WRA, Isiolo Sub regional Office

Domestic and Industrial

As per 2009 census Isiolo, Merti and Garbatulla sub-counties had a population of 79,835, 20,341 and 43,118 respectively. There are 10 major water supply schemes in the County, 1 urban and 9 rural serving approximately 60,000 and 2,500 to 6,000 inhabitants respectively. In terms of spatial coverage, about 93% of the county area lacks access to safe and clean water within five kilometres reach. Over 175 (73%) villages rely on water sources that are unsafe and beyond five kilometres reach. Up to 58"% of the water sources are saline hence limiting the availability of potable water.

Isiolo County has one major town (Isiolo), the county's administrative headquarters. The other upcoming urban centres are: Garbatulla, Modogashe, Kina, Merti and Oldonyiro. There are no manufacturing industries despite a huge potential in livestock product-based industries. Related industrial activities (pet food, hides, feeds) are expected with completion of the implementation of the Isiolo Export Abattoir. Currently, there are only 10 Juakali associations and several unorganised artisanal groups.

The main traded goods in urban centres and local markets are livestock, fruits, vegetables, maize, beans, wheat, and millet. Most of the maize and beans, fruits and vegetables come from other counties.



In Isiolo County, 44.2% percent of the population still use open defecation while 22.8%, 19.3% and 13.7% use improved, shared and unimproved sanitation respectively. Human and animal waste are the major pollutants of water. Open defecation is a challenge that leads to pollution of surface water sources in the rural areas, especially when it floods.

Urbanisation and population increase, coupled with poor drainage system in Isiolo town has resulted into disastrous flooding during rainy seasons in recent times, with devastating impact on health and livelihoods of the population. Storm floods often mix with sewage from overflowing latrines and sewers, causing pollution and problems associated with the increased risk of waterborne diseases. In rural areas, flooding occurs mainly along Ewaso Ng'iro River which drains into Lorian swamp, except for isolated cases of high seasonal flooding that affects pockets of settlements.

Isiolo's major towns face challenges of coordinating proper collection of solid waste; there are few waste disposal and collection sites with only one dumpsite located in Isiolo town. There is a need for development of legislation on solid waste management.

Livestock

The livestock sub-sector is the backbone of the County's economy with over 80 percent of the inhabitants relying on livestock for their livelihoods. Nomadic pastoralism defines the lifestyle of most of the county's inhabitants. It has had a negative impact on the environment due to the tendency of overgrazing caused by overstocking.

Key livestock breeds include Zebu and Boran (cattle), Galla--the small East African goat, Saanen, Toggenberg, and the Swiss Alpine (goats), the black head Persian breed (Sheep), the Somali, Turkana and the Rendille/ Gabra breeds (camels). Poultry breeds include the local chicken and to a small extent, exotic broilers and layers in urban areas.

Isiolo County has no ranches. However, the neighbouring **Lewa Wildlife Conservancy** in Laikipia and nine NRT facilitated community conservancies (**Nakupratt-Gotu, Leparua, Biliqo-Bulesa, Nasulu, Kina, Sericho, Cherab, Garbatulla** and **Oldonyiro**) are used as fattening grounds and migration areas for livestock bought from Isiolo County.

In 1987, there were 149,127, 181,172, 124,814, 25,500 and 89,224 indigenous cattle, sheep, goats, camels and donkeys respectively in Isiolo County[4]. By 2009, Isiolo had 248,577 indigenous cattle, 854,725 sheep, 1,030,005 goats, 148,859 camels and 33,692 donkeys. For cattle, this translates to considerable demands on the natural resource base, calling for innovation in pasture, fodder and water management.

Table 8: Distribution of Livestock Population by Type, Fish Ponds and Fish Cages in Isiolo County

	Number							
County / Sub-County	Farming	Exotic cattle -Dairy	Exotic cattle - Beef	Indigenous cattle	Sheep	Goats	Camels	Donkeys
ISIOLO	**24,271**	**12,900**	**10,121**	**248,577**	**854,725**	**1,030,005**	**148,859**	**33,692**
GARBATULLA	9,264	8,338	5,811	121,522	491,857	607,921	82,312	17,531
ISIOLO	8,600	2,076	1,384	46,839	111,613	175,883	21,728	6,739
MERTI	6,407	2,486	2,926	80,216	251,255	246,201	44,819	9,422

[Cont'd]

	Number							
County / Sub-County	Pigs	Indigenous Chicken	Exotic Chicken -Layers	Exotic Chicken -Broilers	Beehives	Rabbits	Fish Ponds	Fish Cages
ISIOLO	**158**	**52,192**	**11,439**	**7,456**	**2,227**	**242**	**288**	**51**
GARBATULLA	-	22,180	429	207	218	17	163	41
ISIOLO	157	22,567	10,662	7,127	1,501	219	98	2
MERTI	1	7,445	348	122	508	6	27	8

Source: 2019 KPHC, Vol IV – Distribution of population by socio-economic characteristics

Drought and unpredictable rainfall impact negatively on the livestock sub-sector leading to low livestock productivity, high livestock mortality, and loss of income for farmers, famine, and malnutrition. These impacts will be exacerbated by unsustainable use of water resources.

4 Isiolo District Water Development Study. Water Resources Assessment And Planning Project (WRAP). Ministry of Water Development. June 1991.

Wildlife and fisheries

Isiolo has three game reserves, namely; Shaba, Buffalo Springs, Bisanadi. Samburu and Meru national park also border the county, forming part of the northern tourist circuit. Wildlife species found in the county include the African wild dog, giraffe, elephant, ostrich, monkeys, antelopes, impala, giraffe, leopard, waterbuck, lesser kudu, greater kudu, hippo, grevy zebra, buffalo, lion, beisa oryx, and over 300 species of birds.

These wildlife populations in the County are being decimated by poaching and pastoralist encroachment to wildlife habitats. Two types of fisheries production that are practised in Isiolo County i.e. aquaculture (tilapia and African catfish) and river line capture (clarias, common carp, lungfish, tilapia, barbus and labeo along river Ewaso Ng'iro). The production system is semi-intensive and mainly for subsistence.

2.3 Current Water Sources and Access

In terms of spatial coverage, about 93% of the County area lacks access to safe and clean water within five kilometres reach. Over 175 (73%) villages rely on water sources that are unsafe and beyond five kilometres reach. Some villages in Modogashe area are about 25 km from the nearest safe water source. The maximum distance cattle can walk without stressing them is 10 km yet 74% of the pastoralists walk over 15 km to the nearest water source for livestock. Most people rely on piped water 39% followed by borehole 34%, river 10%, water pans 4%, rain water 2% and 11% on any other means of getting water during dry seasons as compared to the wet season where 37% is from piped water, borehole 25%, river 11%, rain water 10%, water pans 7% and the remaining 10% is sourced from any other source[5].

Up to 58% of the water sources are saline hence limiting the availability of potable water, especially for human consumption. Three in every five households (59%) use drinking water from improved sources but only 12% treat the water using improved methods, and 8% reported using untreated water irrespective of the source. These disparities are higher in rural settings as compared to urban population, with rural coverage estimated at 37% while urban coverage is estimated at 85%.

There are 10 major water supply schemes in the county, 1 urban and 11 rural serving approximately 140,000 and 2,500 to 6,000 inhabitants respectively. In terms of spatial coverage, about 93% of the county area lacks access to safe and clean water within five kilometres reach. Over 175 (73%) villages rely on water sources that are unsafe and beyond five kilometres reach. Up to 58% of the water sources are saline hence limiting the availability of potable water.

3 in every 5 households

(59%) use drinking water from improved sources, **12%** treat the water using improved methods, and **8%** reported using untreated water.

5 Isiolo CIDP, 2018-2022

Table 9: Major Water supply schemes in the County

Sub County	Type	Name	Sources	Licence status	Management Structure	Coverage (km^2)	Population served
Isiolo	Urban	Isiolo water and Sewerage company (IWASCO)	Isiolo River, two Springs and 21 Boreholes	Gazetted Urban Water service provider	Public Company with Directors and Management team	23.5	75,000
Garbatulla	Rural	Garbatulla town water supply	5 Boreholes (Waliyana, Matagari, Taiboto, Range, Aba Garo) and 2 institutional	Non- gazetted	Community / WUA	8	14,000
Garbatulla	Rural	Sericho water supply	2 No. Boreholes (Sericho Old and Sericho New KRCS)	Non- gazetted	Community / WUA	12	4,500
Garbatulla	Rural	Eresaboru Water supply	1 No. Borehole (but always affected by floods due to river changing course hence not operational)	Non- gazetted	Community / WUA	15	3,700
Garbatulla	Rural	Kulamawe water supply	2 No. Boreholes	Non- gazetted	Community / WUA	6	2,500
Garbatulla	Rural	Kina Water supply	1 Spring (Kanchoradi Spring) and 3 Boreholes (Roqa, Jillo Dima, CDF borehole)	Non- gazetted	Community / WUA	6	6,500
Garbatulla	Rural	Gafarsa water supply	2 Boreholes	Non- gazetted	Community / WUA	3.5	2,500
Merti	Rural	Merti Water Supply	4 No. Boreholes	Non- gazetted	Community / WUA	12	9,000
Merti	Rural	Dadachabasa water supply	Borehole (1. No Saline borehole not operational and major source at Alango borehole collapsed) hence not operational	Non- gazetted	Community / WUA	9	6,000
Merti	Rural	Bisan Biliqo water supply	Ewaso Ng'iro River (Not operational) and 1. No. Borehole	Non- gazetted	Community / WUA	6	4,000
Merti	Rural	Bulesa water supply project	2 Boreholes	Non- gazetted	Community / WUA	10	5,000
Merti	Rural	KOBIRSAMA water supply project	2. No Boreholes (drilled in Merti Town)	Non- gazetted	Community / WUA	10	8,000
							140,000

Source: Water & Sanitation Department, Rural Water Services 2023

Sanitation

In Kenya, access to sanitation is a basic human right but still 16 million people do not have access to adequate sanitation. For Isiolo County, 44.2% percent of the population still use open defecation, while 22.8%, 19.3% and 13.7% use improved, shared and unimproved sanitation respectively. Human and animal wastes are identified as the major pollutants of water. Open defecation is a challenge that leads to pollution of surface water sources in the rural areas. Therefore, there is a need to extensively address sanitation issues of 44.2% of the population while improving the existing sanitation facilities.

Storm water

Poor drainage system in Isiolo town has resulted in disastrous flooding during the rainy season in recent times and has a devastating impact on health and livelihoods of the population. Storm floods often mix with sewage from overflowing latrines and sewers, causing pollution and a wide range of problems associated with the increased risk of waterborne diseases. In rural areas, storm floods are mainly along Ewaso Ng'iro River which drains into Lorian swamp except for isolated cases of high seasonal flooding that affects pockets of settlements.

Sewerage

The provision of sanitation facilities in urban areas of the county is inadequate especially sewer systems. Household domestic sewage is channeled to sewerage treatment ponds. Where the sewer system is lacking, on-site sanitation facilities are provided through use of septic tanks and pit latrines. In rural areas, pit latrines dominate households and septic tanks serve institutions.

Table 10: Households with Access to Water and Sanitation, 2014 – 2016

Households with Access to Water and Sanitation	Number		
	2014	2015	2016
Registered Households with Piped Water	6,859	7,285	7,435
Active Households with Piped Water	5,651	6,074	6,314
Households with Access to Main Sewer/Septic tank	1,499	1,589	1,652

Isiolo CIDP 2018-2022

2.4 Climate change outlook and implications on Isiolo Water Resources

Isiolo is one of the most vulnerable counties to climate change in Kenya[6]. Some of the key vulnerabilities emanating from climate change include drought and unpredictable rainfall, floods, the spread of water- and vector-borne diseases, intra and extra conflict among the agro-pastoralist and the pastoralist, wildlife-farmer conflict, loss of forests and wetland ecosystems, land degradation, desertification, and scarcity of potable water. These factors negatively impact the County's economy, leading to reduced crop yield, low livestock productivity, high livestock mortality, loss of income for farmers, famine, and malnutrition.

As of May 2021, almost half of the County's accessible grazing lands had poor pasture conditions, attributed to poor regeneration of natural vegetation as an impact of the poor performance of the long rains season. The condition has also been worsened by the depletion of palatable grass species and accidental bush fires. The amount of pasture in traditional grazing areas is very poor, unable to sustain lactating herds, for more than three months. However, significant amounts of pasture are available in dry season grazing reserves such as Kom, Yamicha and neighbouring areas where most livestock have migrated.

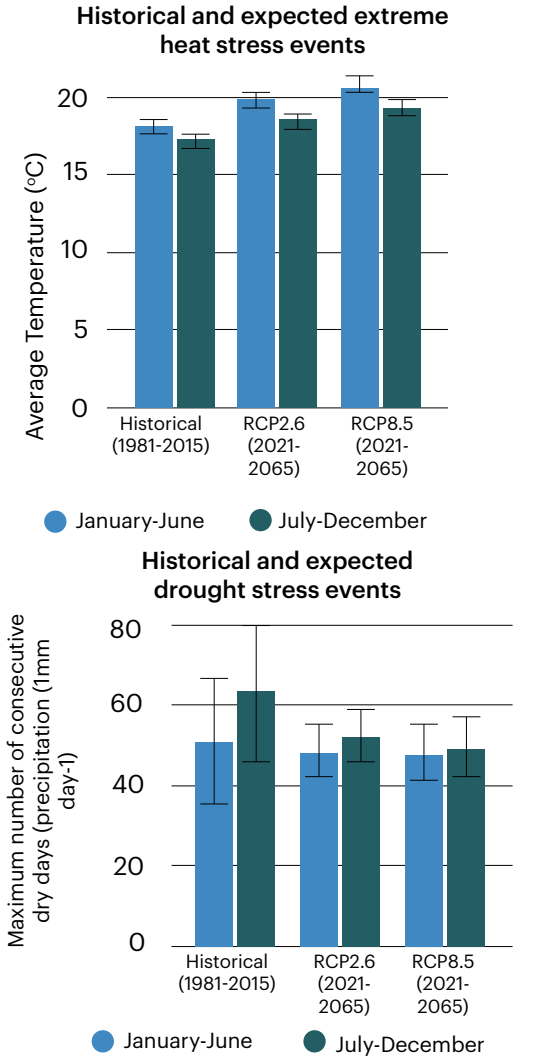
During this same period, household milk production was low and expected to deteriorate further into the long dry spell. Further, there were increased conflicts in Kom, and the situation is expected to escalate further as the drought situation gets worse.

According to the World Bank, analysis of temperature trends in the County over 25 years (1980 to 2005), showed an increase of about 0.5°C in the mean temperatures of both seasons. On the other hand, analysis of rainfall, measured over a 35-year period (1980-2015), showed little change in rainfall amount, with average first season rainfall remaining constant and average second season rainfall increasing only moderately (≤25mm). The combination of the moderate increase in temperatures and the relatively unchanged precipitation has resulted in an increase in the number of heat stress days in both seasons and an increase in drought risk for the first season.

Looking ahead to the period 2021-2065, climate projections based on two representative concentration pathways (RCP2.6 and RCP8.5) indicate that temperatures in both seasons is expected to continue to increase, increasing under the high emissions scenario.

While heat and drought stresses have been indicated as the main hazards for Isiolo, under both scenarios, the number of heat stress days, compared to the historical average, is expected to reduce, while the maximum number of consecutive dry days are expected to remain reasonably constant for both seasons.

Figure 7: Historical and expected heat stress and drought stress effects



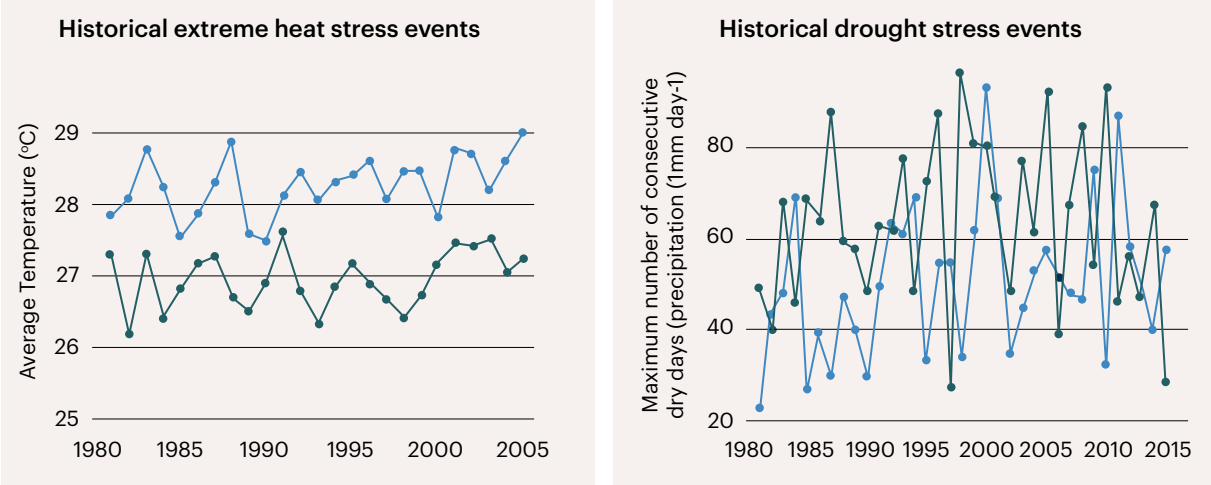
Source: MoALF. 2017. Climate Risk Profile for Isiolo County[7].

Under the high emissions scenario, rainfall is expected to reduce and moisture stress is expected to increase, particularly in the second season. Under the conservative emissions scenario, a decrease in rainfall intensity for both seasons is expected, although both moisture stress and dry spell duration are also expected to reduce in the first and second season, respectively. An increase in season length is also expected for both seasons under the conservative GHG emissions scenario, although a reduction in length is expected under the high emissions scenario.

6 Isiolo CIDP, 2018-2022

7 MoALF. 2017. Climate Risk Profile for Isiolo County. Kenya County Climate Risk Profile Series. The Ministry of Agriculture, Livestock and Fisheries (MoALF), Nairobi, Kenya.

Figure 8: Historical extreme heat and drought stress event



Source: MoALF. 2017. Climate Risk Profile for Isiolo County

2.5 Climate change implications for the water sector in Isiolo

Some of the key vulnerabilities emanating from climate change include drought and unpredictable rainfall, floods, the spread of water and vector-borne diseases, loss of forests and wetland ecosystems, land degradation and desertification, and the scarcity of potable water.

Drought and unpredictable rainfall impact negatively on the economy of the County leading to reduced crop yield, low livestock productivity, high livestock mortality, loss of income for farmers, famine, and malnutrition. These impacts will be exacerbated by the unsustainable use of groundwater. The county's most arid areas of Merti and Sericho are likely to be affected by famine and malnutrition in the absence of mitigation measures against climate change.

Some areas of the county experience increased precipitation in some seasons as a result of climate change. The County is expected to be adversely affected by flash floods with negative impacts such as sediment pollution, loss of fertility, landslides, erosion, disruption of hydropower systems, and destruction of other physical infrastructure. The anthropogenic amplifiers of floods include deforestation, unsustainable land use practices, and ill-placed infrastructure.

Much of Isiolo County is an arid and semi-arid area, characterised by devastating droughts and flash floods over the past years, leading to losses of human and animal lives, displacements, destruction of livelihoods, and loss of food. The 2006 floods displaced approximately 3,000 people; in 2015, over 200 goats and 25 houses in Oldonyiro division were swept away. The increasing temperatures and low rainfall, coupled with land degradation and poor soil fertility, have a negative impact on the productivity of the various crops and pastures. The crops become more vulnerable to pest attacks and disease-causing microorganisms that lead to reduced crop yield, poor quality produce, and sometimes contribute to total crop failure. Dwindling pasture resources have affected livestock production and productivity. In this regard, the identification of long-term solutions to recurrent climate hazards is essential for ensuring livelihood resilience for the population in the County (MoALF).

3.0 Water Sector Planning in Isiolo

3.1 National and regional background

WASREB's National Water Master Plan 2030 was launched on 26th March 2014. It is a product of an intensive study of Kenya's water resources and meteorological conditions to facilitate planning for development and management of the same.

The objectives of the JICA supported project were:

- To assess and evaluate the availability, reliability, quality, and vulnerability of country's water resources up to around 2050, taking into consideration climate change,
- To renew the National Water Master Plan towards the year 2030 taking into consideration climate change,
- To formulate an action plan for the activities of WRA up to 2022 to strengthen their capability, and
- To strengthen the capacity of water resource management through the transfer of technology

As a follow-up to the 1992 National Master Plan also supported by JICA, the plan is structured around six main river basins, including: -

i. Lake Victoria North Catchment Area (LVNCA)

ii. Lake Victoria South Catchment Area (LVSCA)

iii. Rift Valley Catchment Area (RVAC)

iv. Athi Catchment Area (ACA)

v. Tana Catchment Area (TCA)

vi. Ewaso Ng'iro North Catchment Area (ENNCA)

The National Integrated Water Resources Management and Development Plan (IWRMDP)[8], 2020 was developed under the World Bank supported Kenya Water Security and Climate Resilience Project Phase 1 (KWSCRP-1), with two components as follows: -

a. **Component 1:** Water Resources Development. This component supports climate resilience and water security for economic growth by financing water investments and building a longer-term investment pipeline.

b. **Component 2:** Effective Water Sector Institutions. This component aims to support the current water sector institutions as well as the preparation, implementation, and full function of the new and proposed legal and institutional framework resulting from the alignment with the 2010 Constitution.

Under Sub-component 2.2 was the development of six Basin Plans for the six main river basins in Kenya, namely Lake Victoria North, Lake Victoria South, Rift Valley, Athi, Tana and Ewaso Ng'iro North.

The **Ewaso Ng'iro North Integrated Water Resources Management and Development Plan**[9] is referred to in this document, especially on sub-basin water resource modelling. The Ewaso Ng'iro Plan makes mention of planned water resource development projects including the Isiolo Multipurpose Dam, to supplement water resources in the county.

8 Aurecon AMEi Limited. 2020. National Integrated Water Resources Management and Development Plan, Final Report. Technical Report prepared for the Ministry of Water, Sanitation and Irrigation, Republic of Kenya, by Aurecon AMEi Limited, Ebene, Mauritius, 212 pp

9 Ewaso Ng'iro North Integrated Water Resources Management and Development Plan. Kenya water security and climate resilience project. Implementation Support Consultancy (ISC) to Support Strengthening of Water Resources Management and Planning. World Bank. August 2020

3.2 County planning process

County Government Integrated Development Plans (CIDPs) are meant to provide an overall framework for development in each county. The plans aim to coordinate the work of both levels of government in a coherent plan to improve the quality of life for all the people, and contribute towards devolution. The first plans cover the period 2013 to 2017, the second plans over 2018 to 2022, and the third over 2023-2027 period. An evaluation of CIDP 2018-2022 goals as a basis for CIDP 2023-2027 and other county planning is highlighted in the table below, extracted from the Water, Environment, Natural Resources, Energy and Climate Change sector Section.

Figure 9: Subsector Development needs, Priorities and Strategies, CIDP 2018-22

Sub-sector	Development needs	Priorities	Baseline: 2018[10]	2022[11] Status	Enablers	Achievement
Water and sanitation	• Increase coverage and access to safe water in urban and rural areas	Strengthen synergies in integrated water resources management Increase water sourcing and storage capacity Expand the water distribution network Expand the water treatment capacity Strengthen rural water supply governance	Isiolo town (urban) population accessing clean and safe drinking water was 60% (9,734 households) Target increase: 80% of 111,470 population	74,540 persons representing 67% (14,908 households) plus an additional 3,882 urban households.	last mile connectivity projects: Northern Water Works Development Agency (NWWDA)	83% of target
			37% rural population accessing clean water (11,041 households). Target: 52"%	44.5% or 13,280 rural population households		89% of target
	• Increase water for livestock		8,476m^3	10,769m^3	CGI partnership with development partners and GOK projects such as DRSLP RPLRP, KCSAP.	27% increase

10 From Isiolo CIDP 2018-2022

11 From Draft Isiolo CIDP 2023-2017

Sub-sector	Development needs	Priorities	Baseline: 2018[10]	2022[11] Status	Enablers	Achievement
	• Increased sanitation services in urban and rural areas	Expand sanitation facilities Expand the sewerage distribution network Expand the wastewater treatment capacity	Households accessing the Isiolo town sewer: 1,100 Target: 2,100 households	2,323 households		10% over target last mile connectivity project - 12km sewer pipeline in Isiolo town
Environment, Natural Resources & Climate Change	• Improve protection and conservation of the environment	Reduce environmental degradation Strengthen natural resources management Improve vegetation cover Reduce environmental pollution	No baseline data on forest cover	5.21% cover (KFS data) against the recommended 10% national coverage. 24,000 indigenous trees across the county. rangeland vegetation and invasive species such as Prosopis juliflora (Mathenge).		Half of recommended coverage
	• Reduce adverse effects of Climate change	Strengthen Climate resilient livelihoods	2018 Isiolo County Climate Change Fund Act was enacted.	Institutions to coordinate CC issues at the County; ; 2% county development funds for interventions towards mitigating against effects of climate change.	Enabling environment for accessing multilateral donor funding, and funding from the Financing Locally Led Climate Action (FLLOCA) program.	Fund for CC interventions is very good achievement

Sources: Isiolo CIDP 2018-2022 and Draft Isiolo CIDP 2023-2027

4.0 Legal and Institutional Framework

4.1 International overarching commitments

The 2030 Agenda for Sustainable Development, adopted by all United Nations Member States in 2015, provides a shared blueprint for peace and prosperity for people and the planet, now and into the future. At its core are the 17 Sustainable Development Goals (SDGs), which are an urgent call for action by all in a global partnership.

The SDGs build on decades of work by countries and the UN, including the 1992 Earth Summit in Brazil, with key outputs including:

- Agenda 21, a non-binding action plan of the United Nations with regard to sustainable development;
- the 1992 Climate Change Convention (UNFCCC), an international environmental treaty to combat "dangerous human interference with the climate system," in part by stabilising greenhouse gas concentrations in the atmosphere; and
- the 1992 Biodiversity Convention (CBD), for the conservation and sustainable use of biological resources and the fair and equitable sharing of the benefits arising out of the utilisation of genetic resources.

The 1994 Desertification Convention (UNCCD) is the sole legally binding international agreement linking environment and development to sustainable land management.

The 1976 Ramsar Convention is a framework for national action and international cooperation for the conservation and wise use of wetlands and their resources.

SDG 6 seeks to ensure safe drinking water and sanitation for all, focusing on the sustainable management of water resources, wastewater, and ecosystems, and acknowledging the importance of an enabling environment. In the 2030 Agenda for Sustainable Development, countries, including Kenya, have committed to engaging in systematic follow-up and review of progress towards the goals and targets, using a set of global indicators.

SDG 6 aims to ensure the availability and sustainable management of water and sanitation for all, with the following targets:

6.1	By 2030, achieve universal and equitable access to safe and affordable drinking water for all.
6.2	By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations.
6.3	By 2030, improve water quality by reducing pollution, eliminating dumping and minimising the release of hazardous chemicals and materials, halving the proportion of untreated wastewater, and substantially increasing recycling and safe reuse globally.

6.4 By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity.

6.5 By 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate.

6.6 By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes.

6.7 By 2030, expand international cooperation and capacity-building support to developing countries in water- and sanitation-related activities and programmes, including water harvesting, desalination, water efficiency, wastewater treatment, recycling and reuse technologies.

6.8 Support and strengthen the participation of local communities in improving water and sanitation management.

4.2 National Policy and Legal Framework

4.1.1 National Policy on Water Resources Management and Development (NWP) 1999

The NWP 1999 aims to achieve sustainable development and management of the water sector by providing a framework in which the desired targets/goals are set, outlining the necessary measures to guide the entire range of actions and to synchronise all water-related activities and sectors. The NWP 1999 set the following specific policy objectives, covering the four basic areas of water resources management, water supply and sewerage development, institutional arrangements, and financing of the water sector:

1. Preserve, conserve, and protect all available water resources and allocate them in a sustainable, rational, and economical way;
2. Supply of water of good quality and in sufficient quantities to meet the various water needs, including poverty alleviation, while ensuring safe disposal of wastewater and environmental protection;
3. Establish an efficient and effective institutional framework to achieve systematic development and management of the water sector; and
4. Develop a sound and sustainable financing system for effective water resource management, water supply, and sanitation development.

4.1.2 The Water Act, 2016

This is an act of Parliament to provide for the regulation, management, and development of water resources, water, and sewerage services, and for other connected purposes. The Water Act, 2016 provides for:

- Use of water in relation to a water resource includes, without any limitation, abstraction, obstruction, impoundment, or diversion of water forming part of a water resource.
- The discharge of materials or substances into a water resource; or any activity of a kind prescribed by Regulations under this Act, in relation to a water resource;

The Water Act, 2016 is cognizant of the need to conserve water resources as it provides for water resource management, which means conservation, including soil and water conservation, protection, development, and utilisation of water resources. Under the Water Act, 2016, there is a provision for water services, which entails:

- Every person in Kenya has the right to clean and safe water in adequate quantities and to reasonable standards of sanitation, as stipulated in Article 43 of the Constitution.
- Development of a water strategy.

The object of the Water Strategy shall be to provide the Government's plans and programmes for the progressive realisation of the right of every person in Kenya to water. The Water Strategy shall contain, among other things, details of;

- existing water services. the number and location of persons who are not provided with a basic water supply and basic sewerage services.
- standards for the progressive realisation of the right to water; and
- a resource mobilisation strategy for the implementation of the plans.

Under the Water Act, 2016, the Cabinet Secretary shall, in consultation with county governments, provide a national water sector investment and financing plan aggregated from the county government plans, which shall include, among other details, the timeframes for the plans and an investment programme based on the investment plans.

4.2.1 Water Works Development Agencies

The Water Act, 2016, mandates the water works development agency to enter into an agreement with the county government, the joint committee or authority of the county governments within whose area of jurisdiction the water works are located, jointly with the water service provider within whose area of supply the water works are located for the use by the joint committee, authority, or water services provider, as the case may be, of the water works to provide water services.

4.2.2 The Water Services Regulatory Board

The Water Service Regulatory Board was re-established under the Water Act, 2016, with the principal objective to protect the interests and rights of consumers in the provision of water services. A county government shall establish water service providers. In establishing a water services provider, a county government shall comply with the standards of commercial viability set out by the Regulatory Board. Water services provider shall be responsible for:

- the provision of water services within the area specified in the licence; and
- the development of county assets for water service provision.

The policy and strategy documents related to water resource management are highlighted below.

NWRMS 2007-2009	In Water Act, 2002, Section 11 (1) states that following the guidelines on public consultations, MWI shall formulate and publish in the gazette, the NWRMS, in accordance with which the water resources of Kenya shall be managed, protected, used, developed, conserved, and controlled. Moreover, Section 11 (2) states that MWI shall periodically review and publish the NWRMS in the gazette. Section 11 (3) states that the NWRMS shall prescribe the principles, objectives, procedures, and institutional arrangements for the management, protection, use, development, conservation, and control of water resources. The first edition of the NWRMS was issued in January 2007. The overall principles adopted in the formulation of NWRMS are as follows: 1. To achieve equitable access to water, that is, equity of access to water services, to the use of water resources, and to the benefits generated from the use of water resources; 2. To achieve sustainable use of water by making progressive adjustments to water use with the objective of striking a balance between water availability and legitimate water requirements, and by implementing measures to protect water resources; 3. To achieve efficient and effective water use for optimum social and economic benefits; 4. To effect the catchment management strategies; and 5. To enhance cooperation in the management and utilisation of transboundary water resources (shared waters).

NWRMS 2007-2009	Based on the above principles, the following ten strategies are provided in NWRMS (2007-2009): 1. Improving water resources assessment (classification of water resources, reserve water, etc.); 2. Putting in place mechanisms to promote equal access to water for all people (legal and institutional provisions, water allocation, etc.); 3. Gender mainstreaming in water resources management (role, responsibility, participation, etc.); 4. Mechanisms for an integrated approach to land and water resources management (integrated catchment planning, legislative measures, pollution prevention approaches, control of invasive alien vegetation, etc.); 5. Measures that would enhance the availability of water resources of suitable quality and quantity (market-based strategy, technology-based strategy, mandatory strategy, public awareness, etc.); 6. Production of accurate data on water use and demand for both surface water and groundwater (data acquisition, monitoring and information arrangement, national system, etc.); 7. Providing guidelines for water sector financing (government financing, commercialisation of water utilities, money market financing, external financing, etc.); 8. Developing effective water pricing policies and mechanisms that recognise water as an economic good (average cost pricing, targeted subsidies, levies, and fees); 9. Developing policies and mechanisms for disaster management (flood, drought, landslide, etc.); and 10. Promoting integration of sectoral and regional water policies (transboundary waters).
Water Resources Management Rules (WRMR) 2007	The WRMR 2007 have been promulgated and gazetted by MWI in 2007 as enabling provisions to the Water Act, 2002. The key issues addressed by the rules are as follows: 1. Catchment destruction; 2. Enforcement of standards; 3. Permitting/water allocation; 4. Pollution control; 5. Protection of water bodies; 6. Stakeholders' participation; and 7. Decentralisation of services.
WRMA Strategic Plan 2009-2012	The second WRMA Strategic Plan 2009-2012 was prepared taking cognizance of the CMSs formulated for six WRMA catchment areas. Furthermore, the following eight strategic objectives were set with emphasis on the core functions of WRMA: 1. To develop and implement water allocation plans for equitable and sustainable water resource use; 2. To strengthen the institutional capacity of WRMA to effectively discharge its mandate; 3. To establish efficient water resource monitoring networks and improve the water resource information systems;

	4. To streamline and strengthen legislative provisions for enhancement of water resource management; 5. To implement policies and develop mechanisms that will improve water availability; 6. To develop and strengthen financing policies and mechanisms to ensure sustainable WRMA operation and plough back for catchment management; 7. To restore degraded water catchment areas and guard against water pollution; and 8. To develop and implement mechanisms that mainstream cross cutting issues (climate change, curbing corruption, HIV/AIDS, and gender parity).
WRMA Catchment Management Strategy (CMS)	The CMS was prepared for six WRMA catchment areas namely; (i) Lake Victoria North (LVNCA), (ii) Lake Victoria South (LVSCA), (iii) Rift Valley (RVCA), (iv) Athi (ACA), (v) Tana (TCA), and (vi) Ewaso Ng'iro North (ENNCA). The CMSs presented the consolidated strategic actions for the Integrated Water Resources Management (IWRM) Plan together with the framework for stakeholder participation in accordance with the NWRMS.

The Water Act, 2016 aligns the water sector with the Constitution, 2010 which prescribes the right for every person to clean and safe water in adequate quantities: sufficient, safe, acceptable, physically accessible, and affordable. It has particularly set up the institutional framework for the gradual realisation of the right to water as enshrined in the constitution. It also sets the stage for strengthening the devolution process as envisaged in the constitution, which places the primary responsibility for water service delivery with the county governments. Together with the draft National Water Policy, 2012, these legal documents and framework guide how each county is entitled to ensure that all legal documents are updated as per the national legislation.

4.1.3 The Constitution, 2010

The Constitution of Kenya 2010 is the basis for water resources management at the national level. The key influential reform by the Constitution on water resources management covers the sovereignty of the people (Chapters One and Two); the fundamental human rights (Chapter Four); and the land, water resources, and environment (Chapter Five). The sovereignty of the people at the national and county levels is so-called localization: the demolition of provinces and devolution to 47 counties (refer to Chapter Eleven and the First Schedule). The distribution of functions between the national government and the county governments is stipulated in the Fourth Schedule.

The right to water entitles every person to have access to sufficient, affordable water and sanitation of acceptable quality for personal and domestic use. Water resources are treated as part of public land (Section 62).

4.1.4 Vision 2030

The GOK published Kenya Vision 2030 in 2007, which is the country's new development blueprint covering the period from 2008 to 2030. The Vision 2030 aims to transform Kenya into a newly industrialised, "middle-income country providing a high quality of life to all its citizens by the year 2030".

The Vision 2030 is based on three pillars of development, namely, economic, social, and political. The **economic pillar** aims to achieve an average GDP growth rate of 10% per annum beginning in 2012. The **social pillar** seeks to build a just and cohesive society with social equity in a clean and secure environment. The political pillar aims to realise a democratic political system, and protect the rights and freedoms of every individual in Kenyan society.

The national development targets for the water sector in Vision 2030 are as follows:

- Water and sanitation - to ensure that improved water and sanitation are available and accessible to all by 2030,
- Agriculture - to increase the area under irrigation to 1.2 million ha by 2030 for increased agricultural production,
- Environment - to be a nation that has a clean, secure, and sustainable environment by 2030, and
- Energy - to generate more energy and increase efficiency in the energy sector.

Under the Vision 2030, more concrete targets were proposed as flagship projects for the period 2008-2012 for water and sanitation, which will be taken into account in this study.

4.1.5 The Climate Change Act, 2016

The Climate Change Act, 2016, is key legislation guiding Kenya's climate change response, setting the legal basis for mainstreaming climate change considerations and actions into sector functions. The Act seeks to provide the "framework for enhanced response to climate change and to provide for mechanisms and measures to achieve low carbon climate development." The Act promotes a mainstreaming approach that includes integrating climate change in all sectors and at all levels. The Act applies to all sectors of the economy and at national and county levels. Specific objectives of the Act that relate to water resources planning and development include:

- mainstream climate change responses into development planning, decision-making, and implementation;
- build resilience and enhance adaptive capacity for 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 the strategies and actions of public and private entities.

4.1.6 Forest Conservation and Management Act, 2016 (No. 34 of 2016).

This Act makes provision for the conservation and management of public, community, and private forests and areas of forest land that require special protection, defines rights in forests, and prescribes rules for the use of forest land. It also makes provision for community participation in forest lands by community forest associations, the trade in forest products, the protection of indigenous forests, and the protection of water resources.

4.1.7 Kenya Climate Smart Agriculture Strategy - 2017-2026, 2017

Climate Smart Agriculture is defined as agriculture that "sustainably increases productivity, enhances resilience, reduces or removes greenhouse gas emissions, and enhances the achievement of national food security and development goals" (FAO, 2010). The strategy advocates for the following: promotion of water harvesting and storage, irrigation infrastructure development, and efficient water use. This entails the incorporation of components that enhance resilience (irrigation of crops, aquaculture, livestock watering, and agroforestry). The design and development of water harvesting and storage structures; the development of appropriate irrigation infrastructure and technologies (including the use of clean energy as per the prevailing farming and pastoral systems, and the promotion of effective and efficient agricultural water use, including wastewater management.

4.1.8 The Community Land Act, 2016

AN ACT of Parliament to give effect to Article 63 (5) of the Constitution; to provide for the recognition, protection, and registration of community land rights; management and administration of community land; to provide for the role of county governments in relation to unregistered community land; and for connected purposes. With respect to subsection (1), the communities shall establish (c) measures

to facilitate the access, use, and co-management of forests, water, and other resources by communities that have customary rights to these resources.

4.1.9 The National Water Policy, 2021

The Sessional Paper No. 1 of 2021 (the National Water Policy, 2021) was developed in line with the mandate, vision, and mission of the Ministry responsible for water affairs in Kenya. In particular, the Sessional Paper builds on the achievements of the water sector reforms that commenced with the enactment of the Water Act, 2002, which was based on the principles outlined in the Sessional Paper No. 1 of 1999 on National Policy on Water Resources Management and Development. The provisions and spirit of the Constitution of Kenya promulgated in August 2010, particularly provisions on devolution of government functions, obligation to establish and maintain a durable system of sustainable development, and the twin human rights to clean water in adequate quantities, and to reasonable standards of sanitation; **Sessional Paper No. 10 of 2012 on Kenya Vision 2030**; and the lessons that have been learnt since 1999, have necessitated the urgent need for a review of the water sector policy framework, to enhance the delivery of the Ministry mandate. The Sessional Paper aims at moving the water sector to the next level of development in order to contribute to the National Goals, and the realisation of the Sustainable Development Goals.

The devolution of water sector mandates for county governments has been addressed by this Sessional Paper. Consequential actions intended to finalise the devolution of functions, and realignment of mandates across the national government, are addressed through a transition and transfer plan, for the water sector.

In Kenya, water is a finite resource, with an annual national water availability per capita of about 452 m^3. There is a decreasing trend in water availability due to increasing population, expanding economic activities, and increasing degradation of catchment areas.

There is therefore a need for Kenya to review its policies, institutions, and other approaches for governing and managing the entire water sector, and it is for this reason that this Sessional Paper was developed. This Sessional Paper was

prepared within the framework of the 2010 Constitution of Kenya. The Sessional Paper is further intended to guide national and county governments in implementing sustainable actions in water resource management.

With respect to devolved mandates, this Sessional Paper forms the basis upon which county governments will prepare their policies and strategies to effectively and efficiently discharge their respective mandates on water service delivery. Envisaged devolved actions as per the **National Water Policy, 2021's** implementation matrix are highlighted in **Table 11**.

Table 11: NWP 2021 Policy implementation actions for counties

Policy Direction	Key Policy Outcomes	Evidence of Action	Regular Reporting Modality	Reporting Frequency	Entity & Position Responsible	Reports to whom?
1. Ensure that water resources, wetlands, riparian and catchment areas are well mapped, protected, rehabilitated, conserved and managed, by all levels of government.	Water resources, wetlands, riparian and catchment areas are protected and conserved	Coordination framework, Annual national SCMP financing status fact sheets, National SCMP implementation reports	Financing and Resource mobilisation status reports for catchment conservation and protection	Semi-annually, annually	1.WSTF-CEO 2. County WR CEC	Ministry-Water Resources Director
GENDER MAINSTREAMING						
2. Require all water sector institutions and county governments to investigate, monitor, and take corrective actions to remedy gender and social safeguards inequity and inequalities.	Gender and social safeguards data and information available for the water sector	Gender and social safeguards integration review checklist for the water sector, gender officers' induction training on gender discrimination audits, gender reporting tools, gender fairness study report	National sector wide Gender and social safeguards integration Progress Report	Semi-Annually, Annually	WSIs and Counties-Gender focal point for water sector	Ministry-Gender focal point
3. Put in place affirmative action guidelines to enhance the recruitment, training and advancement of women as water sector professionals.	Affirmative action for women in the water sector initiated and operational	Inter-sectoral collaboration on scholarship awards for women for the sector, women and girl child technical internship opportunities in WSIs, checklist on gender in human resource management and development for water sector	National sector wide Gender and social safeguards integration Progress Report	Semi-Annually, Annually	HR and Gender focal points-WSIs and counties	Ministry-Gender focal point

Policy Direction	Key Policy Outcomes	Evidence of Action	Regular Reporting Modality	Reporting Frequency	Entity & Position Responsible	Reports to whom?
AFFIRMATIVE ACTIONS TO ENHANCE EQUITY FOR VULNERABLE POPULATIONS AND THE YOUTH IN THE WATER SECTOR						
4. Undertake investment planning and resource mobilisation to support enhanced access to clean drinking water and reasonable standards of sanitation for the urban poor, including last mile connections.	Last mile water service for urban poor increased countrywide	County needs assessment report, county water service investments pipeline and budget, investment delivery contracts per county, Household water service access reports	Technical reports	Annually	County CECs	WASREB CEO
5. Develop and implement a mechanism to encourage the establishment of community water service providers for the urban poor, with governance frameworks and regulations.	SSSP for urban, poor, developed and regulated	Mapping of urban SSSPs, participants list on consultations for the regulatory regime, regulations and standards for SSSPs, county level compliance reports	Technical reports	Annually	County CECs	WASREB CEO
6. Prioritise and finance, in consultation with county governments, affirmative actions for both urban and rural populations.	County government financing towards realisation of HRW increases access to water and sanitation services in all counties increased	Annual development financing report of counties on HRW and sanitation, HRW and sanitation status conference for the water sector	County affirmative action water service report	Annually	County CECs	Intergovernmental secretariat (to be constituted)
7. Undertake a vulnerability and implement redress action steps to mainstream the special needs of the vulnerable persons in the water sector.	Operational process and public policy review for VMG and action plan.	VMG participation tools	Affirmative action reports	Annually	Head WSIs, County CECs	Principal Secretary, Intergovernmental Secretariat
8. All agencies in the water sector, at all levels of government, to progressively eliminate disparities that exist in investments in water and sanitation services on the basis of geography or administrative boundaries.	Water works investments and financing inequity reduced in the sector	water works equity baseline report, water service supply and needs gap report, progressive water works equity implementation reports, Water works investments and financing equity plan	Equalisation status report	Semi-Annually , Annually	Heads WSIs, County Governments	Cabinet Secretary

Policy Direction	Key Policy Outcomes	Evidence of Action	Regular Reporting Modality	Reporting Frequency	Entity & Position Responsible	Reports to whom?
9. Put in place and implement requirements that all processes of planning, decision-making and implementation in the water sector provides room for special participation of the youth, and mainstream the needs of the youth.	Youth policy integrated into the water sector and regularly reported on	Youth integration checklist, youth policy water sector staff inductions, reporting templates with sections on youth policy integration in WSIs, youth policy integration plan for the water sector	Youth Integration report	Semi-Annually, Annually	Youth Integration focal point-WSI and County government	Ministry-Youth Integration focal point
INSTITUTIONAL FRAMEWORK FOR WATER SECTOR MANAGEMENT						
10. Publicise and report on the performance and status of the water sector in each county.	County water sector data and information performance data and information annually updated and available	County data and information acquisition guidelines, data and information system	County water sector performance report	Annually	CEC	Intergovernmental secretariat (to be constituted)
11. Establish and operationalise a county-level water sector forum with civil society, development partners, community water organisations, the public and other relevant stakeholders.	County water sector forum established operational and effective	TOR for county water sector forum, appointment letters for county water sector forum, forum schedule of events, forum meeting minutes and reports	Activity report	Per Activity	CEC, county	Intergovernmental secretariat (to be constituted)

Source: NWP 2021

4.3 County Legal Framework

The 2019 Isiolo Water and Sanitation Bill, set the stage for the development of rules and regulations in the water sector. The devolution process in Kenya, as envisaged in the Constitution 2010, placed the primary responsibility for water services delivery with the county governments, including the enactment of relevant legislation (Water Policy, Water Act, etc.).

Isiolo County has developed regulations to implement Climate Change Act, 2016 in enacting legislation and setting up County climate change Fund (CCCF), all aimed at fostering climate change resilience including water resource issues and climate change disasters such as floods and droughts. These include: -

a. Isiolo Climate Change Act, 2016. (Operational).

b. Isiolo Climate Change Fund Act, 2018 (Operational).

c. Isiolo County Climate Change Finance Regulation (2019) (Operational).

The Isiolo CCCF was officially launched on January 31, 2019.

4.4 Institutional Framework

Relevant institutions

The roles and responsibilities of the relevant organisations are tabulated below:

Figure 10: Institutional framework

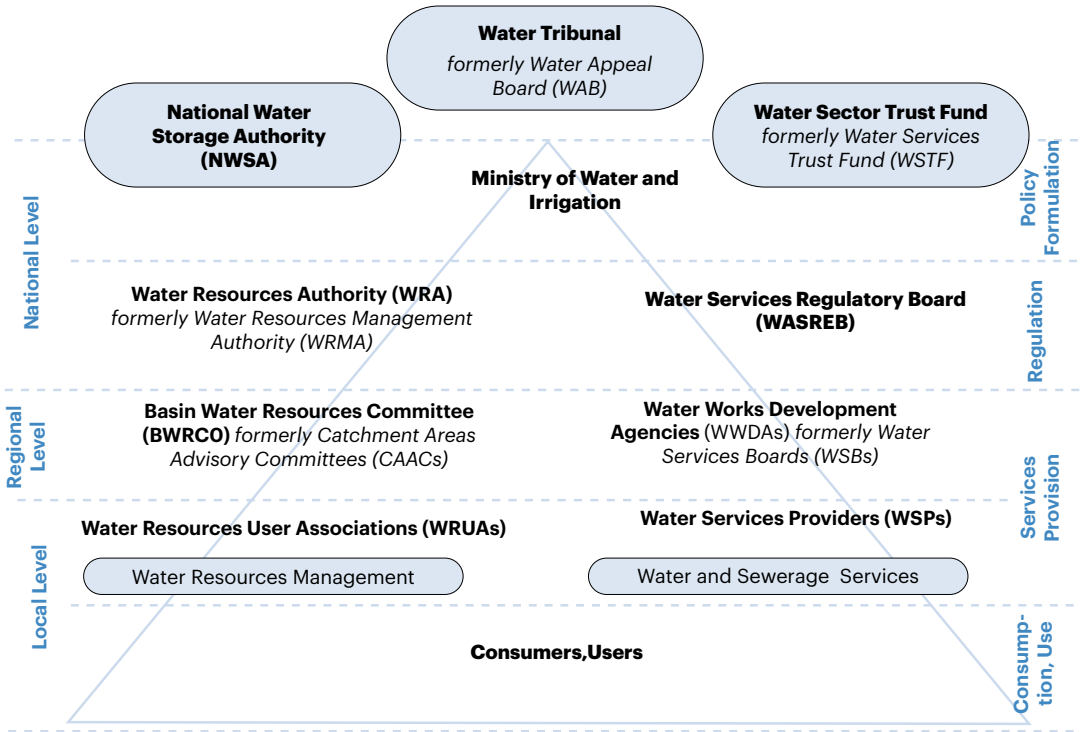
Institution	Roles and Responsibilities
Ministry of Water, Sanitation and Irrigation	Development of legislation, policy formulation, sector coordination and guidance, and monitoring and evaluation.
Water Resources Management Authority (WRMA)	• Planning, management, protection, and conservation of water resources. • Planning, allocation, apportionment, assessment, and monitoring of water resources. • Issuance of water permits.
	• Water rights and enforcement of permit conditions. • Regulation of conservation and abstraction structures. • Catchment and water quality management. • Regulation and control of water use. • Coordination of the IWRM Plan.
Catchment Area Advisory Committees (CAACs)	Advising the WRMA on water resources issues at catchment level.
Water Resource Users Associations (WRUAs)	• Involvement in the decision-making process to identify and register water users. • Collaboration in water allocation and catchment management. • Assisting in water monitoring and information gathering. • Conflict resolution and cooperative management of water resources.

Institutional Arrangements according to the Water Act 2002 are shown in Figure 11.

Kenya Water Institutions as per the Water Act, 2016

- **Ministry of Water, Sanitation and Irrigation (MoWSI)** as the sector leader and coordinator, taking responsibility for policy development.
- The **Water Resources Authority (WRA)**: mandated to protect, conserve, control and regulate the management and use of water resources and to support the Cabinet Secretary in policy formulation and the establishment of a National Water Resource Strategy. Their role includes the formulation and enforcement of procedures/ regulations, water abstraction permitting and collecting of water use fees, flood mitigation and advising the Cabinet Secretary generally on the management and use of water resources. The Act requires the development of water resources allocation plans at basin level, and the WRA needs to permit the development of any water source (surface or groundwater).
- **National Water Harvesting and Storage Authority** for major water infrastructural development,

Figure 11: Institutional arrangements as per Water Act, 2016



Source: Understanding the Kenya 2016 Water Act

- **Water Tribunal** for dispute resolution,
- **Water Sector Trust Fund** for water services development towards the un-served and poor segments of the society in peri-urban and rural areas,
- **Water Works Development Agencies** to replace the Water Service Boards. The Water Act provides the Cabinet Secretary for Water with the power to establish an undefined number of Water Works Development Agencies to manage such national public water works, thus replacing the current Water Services Boards.
- **Basin Water Resources Committees** to replace Catchment Advisory Committees (CAACs).
- **Water Services Providers (WSPs)** who, with the county governments, provide water and sanitation services in the counties. Operations must be in accordance with a Service Agreement entered between each WSP and WASREB.
- In rural areas where services are not commercially viable, **counties** are now responsible for facilitating access to services, for developing the required infrastructure for distribution, and for contracting community associations, public benefit organisations or private operators to manage such systems (KEWASNET, 2017)
- The **Water Resource User Associations (WRUAs)**: provide community-based management of water resources and resolution of associated conflicts.

5.0
Key Water Sector Challenges in Isiolo County

The Isiolo NDMA brief of September 2022[12] offers a snapshot of Isiolo County's water challenges, listed as follows:

- Main water sources were boreholes, rivers, shallow wells, traditional river wells dug along riverbeds and sand dams, and piped water is still a dream to many residents of Isiolo County.
- There was relief for pastoralists and households that rely on River Ewaso Ng'iro which had a significant flow experienced for the better part of the month after heavy rains were received in Aberdare ranges and Mt. Kenya regions. However, other rivers in the region did not have significant recharge.
- Approximately 31% and 24.9% of the population utilised groundwater to meet domestic and intermediate water needs respectively during the month of September, majority of whom reside in Isiolo South sub-county.
- Over the 2022 dry season, nearly 26% of the population in the county is expected to experience high groundwater use during at least one month in the season.
- Modogashe in Sericho ward, Garbatulla sub-county, Malkagalla, Biliqi, Dadachabassa, Lakole in Cherab ward, Merti sub-county and Lpusi, and Tuale experienced acute water shortages.
- The proportion of boreholes on normal usage was 31% in the month under review. However, the proportion of boreholes reporting no use was 27.6% while the fraction of offline ones was 42.5 percent. The rate of boreholes breakdown is increasing due to long duration of use.

As an ASAL county, key challenges in Isiolo County are highlighted below.

5.1 Scarcity of potable water

Isiolo is an ASAL county with scant vegetation cover. This makes it particularly vulnerable to the effects of climate change, including scarcity of potable water. About 93% of the county lacks access to safe and clean water within five kilometres reach, resulting in a lot of stress for both humans and livestock. Additionally, up to 58% of the water sources are saline, further limiting the availability of potable water, especially for human consumption[13].

5.2 Drought, unpredictable rainfall and floods, and disaster management

Isiolo County is vulnerable to various disasters and hazards, such as recurring drought, floods, livestock, and human disease epidemics. The most prevalent disaster is drought, which results in the loss of human life and livestock deaths and causes frequent migration of affected communities. Such migrations often lead to conflicts due to the scarce resources.

About **93%** of the county lacks access to safe and clean water within five kilometres reach, resulting in a lot of stress for both humans and livestock.

12 Water Sources (NDMA, Sept, 2022)

13 Isiolo CIDP, 2018-2022

Isiolo County has had significant infrastructure challenges due to floods in the Ewaso Ng'iro irrigation clusters in 1982, 1984, 1986, 1996, and 2002, causing various schemes to collapse. It seems that the issue lies with the alluvial riverbanks being highly unstable. There has also been an increase in flash floods across the county, which increases the sedimentation of reservoirs.

In 2006, a severe flood led to the loss of human lives and livestock and the massive destruction of property. Areas in the county like Gafarsa, Iresaboru, Sericho, and Isiolo Town experience increased water flows and flash floods.

Unpredictable rainfall within the county can be harvested using various structures like rock catchments, water pans for roads and other surface run-off, sub-surface & sand dams,

Climate Change has exacerbated unreliable and unpredictable rains, high temperatures, and wind movements, which have interfered with bimodal rainfall patterns known to the communities. Anthropogenic amplifiers of climate change are deforestation and unsuitable land practices. The most arid areas of Isiolo County—Merti and Sericho—are likely to be affected by famine and malnutrition in the absence of mitigation against climate change. Anthropogenic amplifiers of climate change are deforestation, unsuitable land practices, and poorly placed infrastructure.

Efforts to curb disasters in the county include work on the **Draft Isiolo County Disaster Risk Management Bill, 2019**, the Isiolo Climate Change Policy, 2018, and the **County Climate Change Fund Act, 2018**. The proposed intervention for Isiolo by the NDMA is highlighted in Annex 2(4).

Table 12: Unpredictable weather patterns and DRR challenges and opportunities

Challenges	Opportunities/Solutions
Climate change - Climate information for decision making has become unreliable	• Strengthen collection and timely dissemination of climate information and appropriate responses for better decision making by communities and decision makers & implementers • Integration of traditional and scientific climate predictions and advisories (data collection, analysis and dissemination)- bulk SMS, local radio stations, fliers, community meeting points (religious) • reduction of environmental degradation like deforestation for charcoal production and opening up of new farm lands, overstocking that lead to overgrazing and encroachment of catchment areas and wetlands, unsustainable agronomic practices
Unpredictable rainfall within the county and water flows from upstream counties	• strengthen water harvesting and storage using various structures like tanks (roof rock catchments), small and large Water Pond/pans/ dams from roads and other concrete grounds and other surface run-offs, sub-surface & sand dams- for use and recharge of ground water reservoirs • incorporate soil and water conservation measures to maximise on in situ water harvesting (green water) for pasture and crop production • alternative pasture production & livestock production systems- feedlots and water utilisation technologies
Conflict over resource uses in fragile ecosystems	• County Legislation that defines the various land use systems • Rangeland resource use and management structures including traditional / customary and scientific methods and approaches • County Spatial Plan.
Disaster management	• Strengthening DRR committees for them to effectively play their roles in River bank protection. • Management of stagnant waters like water pans to prevent waterborne diseases • Disaster preparedness. • National disaster management structures (NDMU, NDMA) working together with county administration.

5.3 Spread of vectors and waterborne diseases

The most prevalent water-related diseases in Isiolo County are

1. Cholera is a bacterial infection that is spread through contaminated water and food. Symptoms include severe diarrhoea, vomiting, and dehydration.

2. Typhoid fever is caused by the Salmonella typhi bacteria and is also spread through contaminated food and water. Symptoms include fever, headache, and abdominal pain.

3. Hepatitis A is a viral infection that is spread through contaminated food and water. Symptoms include fever, fatigue, and jaundice.

4. Dysentery is a bacterial infection that causes diarrhoea and is spread through contaminated water and food.

5. Guinea worm disease: Guinea worm disease is a parasitic infection that is spread through drinking contaminated water. Symptoms include a burning sensation in the affected area and the emergence of a long, thin worm.

6. Kalazhar disease in the lower parts of Ewaso Ng'iro is due to drying riverbeds and the presence of shallow wells or scoop holes. The vector is sandflies hosted by wild dogs and jackals along the river,

7. Malaria is spread by Anopheles mosquitoes, which breed in stagnant waters, pit latrines, and water pans. A new vector discovered in Marsabit (Stephanie mosquito), breeds in open grounds.

8. Yellow Fever is spread by the Aedes mosquito county-wide during the rainy season, and Trachoma is found in Ngaremara and Oldonyiro, and its spread is increased by the lack of sufficient water.

The majority of cases of diarrhoea and stomach aches are associated with the use of contaminated water, especially during the wet seasons. The water sources in Isiolo County exhibited high levels of contamination with microbial pathogens, attributed to poor sanitation, open defecation, and a lack of access to improved sanitation facilities. The list of diseases affecting humans in Isiolo County includes:

Other diseases related to water include:

Kidney problems, fragile bones, and dental fluorosis, associated with excess minerals in water, including highly saline water, high sodium levels leads to chemical imbalance and may lead to diarrhoea cases. Polio and Hepatitis A and B are attributed to a contaminated environment, food, and water.

The majority of cases of diarrhoea and stomach aches are associated with the use of contaminated water, especially during the wet seasons.

Major causes of the spread of vectors and waterborne diseases include water scarcity in both urban and rural settings; flooding during rainy seasons; water contamination from agricultural activities; solid waste disposal in water sources; a poor sewerage network in urban areas – is nonexistent in rural areas; asbestos from rainwater harvesting; and water salinity, mostly in rural settings.

The county government has proposed mitigation, including:

- The provision of proper waste disposal and sewerage systems for a clean environment for the residents, to reduce the occurrence of waterborne diseases;
- Planning around flood plain areas, to reduce loss of life, infrastructure, and goods and services; and
- Early warning and Disaster Risk management.

There is an urgent need for collaboration among water sector agencies, and compliance with and enforcement of water source and service regulations, including those pertaining to the development of boreholes for water quality, control of car washes, water vendors, sewerage emissions, and solid waste disposal.

The development of Water Safety Plans for both rural and urban communities would ensure regular water quality (chemical and bacteriological) analysis. Additionally, planned mass vaccinations can also reduce the waterborne disease scourge.

5.4 Environmental degradation

5.4.1 Land use introduction

Land ownership and registration is very low in Isiolo County, with less than 1% of the land registered. The low registration of titles, particularly in the rural areas, means that 99% of the land is owned by the community but it is held in trust by the government.

Consequently, the burden currently lies with the county government of Isiolo, in ensuring that activities that take place on the land don't lead to degradation.

Isiolo is one of the 24 counties in the country with community lands, often associated with resource use and ethnic conflict. The 2010 Constitution created a new land law, and established an adjudication procedure for disputed lands, by enacting the Community Lands Act - 2016. The Act was created specifically for community lands for a reason, most community land had no registered owner and had been occupied by pastoral but never registered. Promulgated in 2018, the Act was meant to put in place the systems and procedures to register community land to its rightful owners; the local communities. County governments had until April 2019 to produce an inventory of all their community lands. Lands Cabinet Secretary took a very different path and on September 3, 2019, issued a legal notice moving Isiolo's community lands out of the process defined by the Community Land Act, and over into the Lands Adjudication Act process instead.Discussions with the Lands CS are still ongoing on community land registration and titling exercise[14]. Additionally, there are no developed spatial plans in Isiolo County.

Population growth

The total population of Isiolo District in 1979 was 43,478 (11,331 for Isiolo town). It is estimated that this increased to about 64,000 in 1988 (15.000 for Isiolo town) [15]. The county's population stood at 143,294 in 2009[16]; and at 268,002 in 2019[17]. The County average growth rate between 2009 and 2019 was about 2.8% which is higher than the national average of 2.08%. Today, the population consists largely of Cushites Communities (Oromo-speaking Borana and Sakuye) and Turkana, Samburu, Meru, Somali and other immigrant communities from other parts of the country[18].

The increase in population coupled with the ASAL conditions in the county have repercussions that merit grave consideration in water resource use planning.

Communal systems in natural resource management

In reference to the major ethnic group in Isiolo - the Borana are organised into a clan leadership system composed of customary officers who govern through the use of their own customary laws and the legal statutes of Kenya[19].

Total population of Isiolo District

County average growth rate between 2009 and 2019 was about **2.8%**

2019	**268,002**
2009	**143,294**
1988	**64,000** (15.000 for Isiolo town)
1979	**43,478** (11,331 for Isiolo town

14 State has failed Isiolo residents on community land. By Abshiro Halake.People Daily .Tuesday, March 3rd, 2020.

15 Water Resources Assessment Study and District Water Development Study. Water Resources Assessment and Planning. Project. Ministry of Water Development. 1991.

16 Population Distribution by Sex, Number of Households, Area and Density by County and District. Kenya Burea of National Statistics, 2014.

17 2019 Kenya Population and Housing Census Volume I: Population by County and Sub-County. Kenya Burea of National Statistics, 2019.

18 Isiolo CIDP 2023 -2027.

19 Ewaso Ng'iro North Integrated Water Resources Management and Development Plan. Kenya water security and climate resilience project.

Customary law covers the digging, maintenance of hand dug wells, and these traditional water sources are under the control of an *aba hirega*, [leader of an administrative committee] who allocates access time and sequence to the various herds using a water source, and maintains orderliness and cleanliness.

The same management principle applies to boreholes. In principle, there is controlled management of dams, including the enforcement of herdowners removing animal dung from the banks up to high water levels, but in practice, control is seldom possible owing to undefined ownership or responsibility. The Ewaso Ng'iro has particular access points known as *malkas* for stock watering. No particular customary laws govern the use of a *malka*, but no problems over their use normally arise.

The neighbourhoods that use the same pasture or other common resources, share the same clan leaders, children attend the same school, reserve the same grazing area for the milk herds that supply the school children, are known as **dedowan** (in transformational grammar - **dedha**). **Dedha** areas have wet and dry grazing areas and it is within the dry grazing areas that population centres have been established. In contrast to the **dedha** areas, with their stable communities, are the common grazing areas adjoining many of the district boundaries. These are areas with no permanent or habitual camps and are used opportunistically by herds from various **dedhas** as well as by large numbers of stock from the adjacent districts.

5.4.2 Loss of forest and wetland ecosystems

Isiolo County is hot and dry in most months, leaving the vegetation cover low and scattered. Overgrazing and overstocking in most parts of the county have been depleting this vegetation cover, leaving soils exposed to soil and wind erosion[20]. The main challenge in the county remains poor management of natural resources and consequent land degradation[21]. There is no effective management of grazing lands, spread of settlements, and protection of water points. Furthermore, no mechanisms exist to ensure equitable sharing of benefits from the natural resource base, which in turn has intensified community conflicts over natural resources.

Equally important for Isiolo County, is the loss of forest upstream (catchment areas), as highlighted in a land use cover change analysis for the period 1990-2010 (**Fig. 13**). This will require planning across counties to ensure catchment health and provision of inherent services.

Uncontrolled charcoal burning and trade has further led to massive environmental degradation, leading to decreased vegetation cover and an increase in environment-related disasters. The depleted vegetation cover exposes affected areas to the threats of floods and strong winds. The county's main source of energy is wood fuel, where 85% of the households rely on firewood as their main source of energy, mainly for cooking.

The county's main source of energy is wood fuel, where **85%** of the households rely on firewood as their main source of energy, mainly for cooking.

20 Implementation Support Consultancy (ISC) to Support Strengthening of Water Resources Management and Planning. World Bank. August 2020

21 Isiolo CIDP 2013-2017.

This has led to over-harvesting of trees and contributed to a decline in tree cover.

Of the 31,326 households in the county, only 2,500 households have access to electricity; 85% of the trading centres and the majority of schools and health facilities are also connected to electricity; and 9% of the residents use petroleum products for cooking[22].

Ewaso Ng'iro River is subjected to rampant sand harvesting along the riparian edge in most parts of the county, with commercial activities concentrated in Burat, Ngaremara and Kina[23].

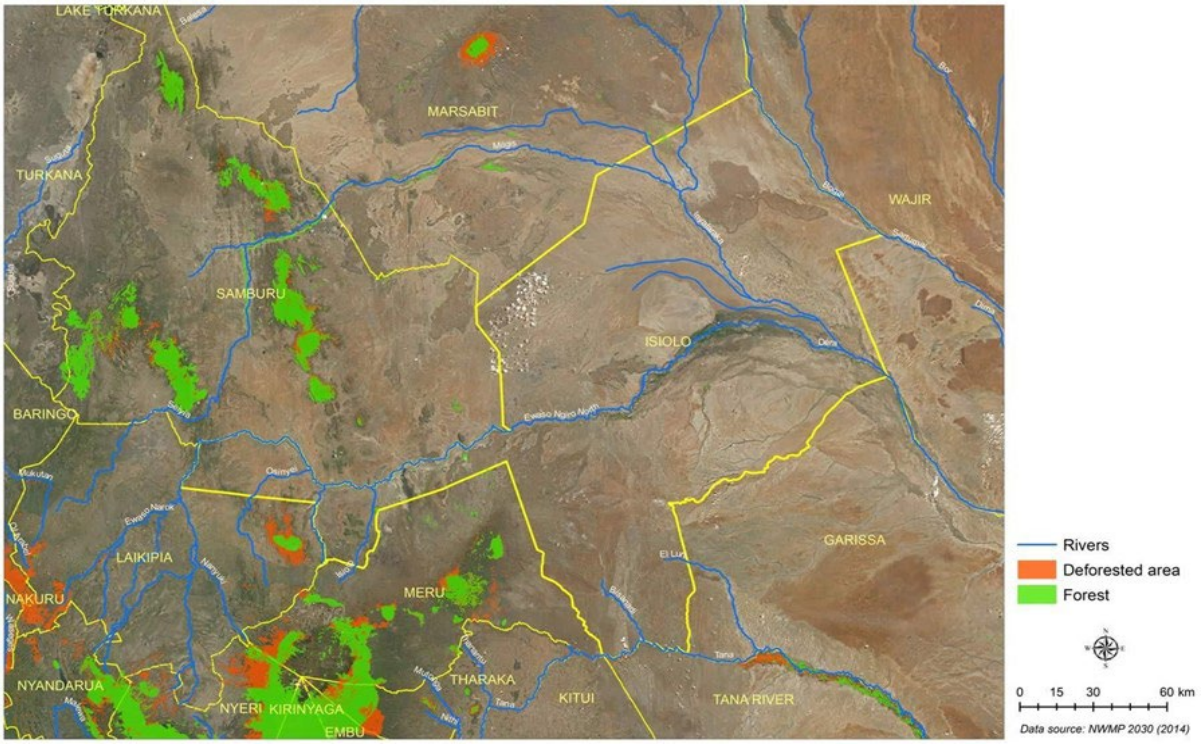
Sand is harvested for commercial purposes and is a major source of income and livelihood. Garba Tula Sub County is witnessing overgrazing, timber and sand harvesting, which are threats to groundwater recharge and retention of surface water.[24]

Environmental degradation has not only led to decreased vegetation cover, but also to an increase in environment-related diseases such as Kalaazar, eye infections, and respiratory problems.

During the windy season, visibility becomes very poor due to the huge amount of dust. Land pressures in the rangelands are increasingly becoming acute due to the influx of pastoralists from the neighbouring counties, leading to an increase in degradation of much of the dry-season grazing areas on which the locals depend.

Climate change is exacerbating resource-based conflicts including water and rangelands in Isiolo County, leading to human-wildlife conflicts due to water scarcity[25]. Isiolo with very few water sources, is highly concerned about land degradation, and deforestation upstream and has to prioritise cross-county interventions. Poor land use management, rangeland management and deforestation also contribute to the high sediment loads in rivers.

Figure 12: Deforestation in upstream areas and neighbouring counties: LUCC 1990-2010



22 Isiolo CIDP 2018-2022

23 Ibid.

24 Alio, M. A. (2018). Land use changes and human-wildlife conflict in Garba Tula Sub-County, Isiolo County, Kenya

5.4.2 Upstream over-abstraction and degradation

The drying up of wells, rivers, and boreholes in Isiolo County is a major risk arising from climate change. Places that used to have water are now dry for extended parts of the year. This is evidenced by the drying up of rivers such as Bisanadi.

The main perennial river, the Ewaso Ng'iro North, has its catchment area in the Aberdares and drains into the Lorian Swamp. There is considerable abstraction of water upstream of Node 2 (Archers Post), in the neighbouring Laikipia county, mostly from the Ewaso Ng'iro North tributaries, including the Ewaso Narok, Suguroi, Ewaso Ngare, Naro Morui, and Sinyai.

Laikipia County has three major towns – Nanyuki, Rumuruti and Nyahururu, all upstream of Isiolo County. The Ewaso Ng'iro North Integrated Water Resources Management and Development Plan (2020) reports that Nanyuki Town uses predominantly surface water, supplemented with groundwater. According to the Nanyuki Water and Sewerage Company's Strategic Plan, current water production is 16,482 m3/d, which includes 2,300 m3/d from four boreholes. Private water users in the town also make significant use of groundwater; borehole yields can exceptionally reach 50 m3/hr (Nanyuki Sports Club) but are usually lower than this. According to the 2019 census, the population of Isiolo County was 268,002 and Laikipia county 518,560.

By comparison, Isiolo Town utilises both surface and groundwater to meet demands. The Isiolo Water & Sewerage Company IWASCO) relies on three water sources: the Isiolo River (itself extensively springfed), the Rugusu River, and 18 boreholes. The utility produces an average of 5,000 m3/d (and up to 9,000 m3/d in the rainy season) from all sources.

Long-term planning of Ewaso Ng'iro North water resources will require planning across riparian counties. Mapping of boreholes from the National Water Master Plan 2030 database, shows a significantly higher number of boreholes in Laikipia County, upstream of Node 2 - Archers Post, taking into account private boreholes (Figure 14). Of particular concern in water resource planning are the following issues:-

1. The permitting process for the abstraction of water from the rivers needs to be reviewed. Many farmers upstream are given permits to abstract water, which compromises the stream flow.

2. Isiolo has not invested in the protection of the sources of the rivers in Nyambene, Mt. Kenya, and the Aberdares. Isiolo considers engaging in the Payment of Ecosystem Services. There should be a collaboration framework between the counties that share a common resource with the support of national agencies to promote the protection of the upstream resources.

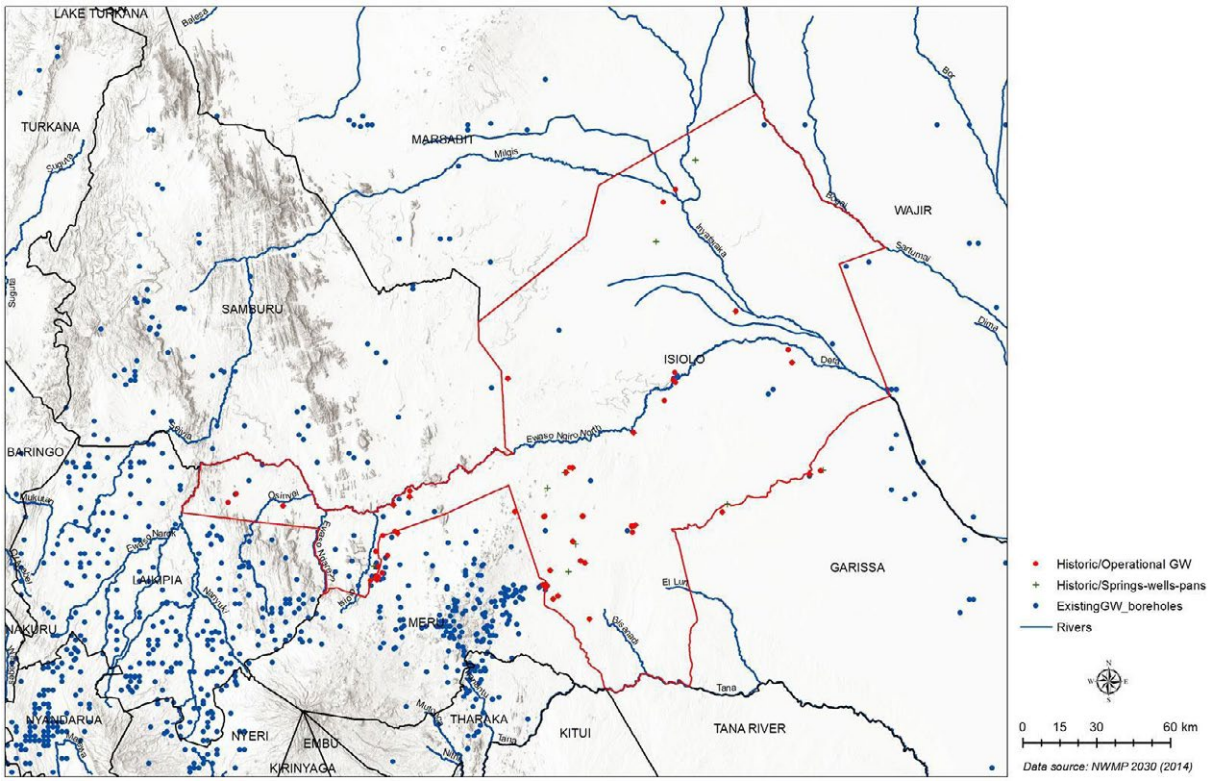
3. Water development, in particular the drilling of boreholes by NGOs, communities, and the private sector, is not done according to laid down procedures and regulations, and is thus not reflected in official inventories, which is crucial for water balance modelling and management. There is a need for enforcement of borehole development procedures, as WRA borehole completion reports have important water management data.

4. Water pollution in the Ewaso Ng'iro North Basin is caused by human activities, including agriculture, industrialization, and urbanisation, which have significant environmental problems with far-reaching impacts on human health, aquatic ecosystems, and economic activities such as agriculture and tourism. The use of agrochemicals such as fertilisers and pesticides, the discharge of untreated effluent and toxic waste into rivers and streams from industries, and solid waste disposal in urban areas, are the major contributors to water pollution in the basin. The upstream catchments provide water for

25 Guyo, S. S. (2019). Assessment Of The Dynamics Of Resource-Based Conflict On Human Security In Kenya: A Case Study Of Isiolo County.

domestic, agricultural, and industrial uses that are critical for Isiolo's economic and social development. The contamination of the river with agrochemicals, untreated effluent, and solid waste from upstream areas can cause waterborne diseases such as cholera, typhoid, and diarrhoea, adversely affecting public health and resulting in increased healthcare costs and reduced crop yields in Isiolo, leading to increased healthcare costs and reduced agricultural productivity from poor crop yields and degraded soil quality due to the contamination of water sources used for irrigation. There is a need to adopt sustainable water management practices, implement pollution control measures, and establish policies and regulations to ensure compliance with environmental standards. Sustainable agricultural practices, such as the use of organic fertilisers and pest control methods that do not harm water sources, can be adopted to reduce water pollution from agriculture. The establishment of treatment plants to treat effluent before discharge can help control pollution from industries, while solid waste management systems can prevent waste disposal into water sources in urban areas. Increased public awareness campaigns on the impacts of water pollution, and the need for sustainable water management practices and the implementation of policies and regulations to ensure compliance with environmental standards and regulations can go a long way in reducing water pollution in the Ewaso Ng'iro North Basin and ensuring that the basin's vital water resources are protected for future generations.

Figure 13: Upstream water abstraction - boreholes



5.4.3 Downstream over-abstraction and degradation

The population of Isiolo County has quadrupled since 1988, from 64,000 inhabitants to 268,002 in 2019. The considerable increase in livestock over time, and the increase of population both exert pressure on water resources in Isiolo County. As an example, goat numbers have increased by over 800% over time, with figures of 124,814 and 1,030,005 for 1987 and 2019, respectively. Assuming this is based on the same resource base, and coupled with the effects of climate change, it is challenging even for the traditional dedha systems.

IWASCO is fed by the Isiolo River, and its stream tributaries, and boreholes. Over abstraction in the tributaries poses challenges for water provision for downstream users. In other parts of the county, there are competing uses for water, including irrigation, domestic use, and water for livestock.

Invasive species – The Prosopis juliflora (mathenge) case

Prosopis juliflora creates a habitat for mosquito breeding, and each tree can consume up to 36 litres of water per day, depending on shoot diameter and habitat[26]. In Isiolo County, *Prosopis juliflora* dense stands are found along the river from mid-Ewaso Ng'iro River all the way to the Lorian Swamps, hindering mobility and reducing access to pasture for instance in the Merti area, where people can no longer access stretches of the river.

Wetland Ecosystem Challenges

The Lorian Swamp is a large wetland that is maintained by seasonal flow, which supports acacia woodlands along the course of the Ewaso Ng'iro River floodplain. Sedge and grass species populate the swamped floodplains, providing grazing for the large fauna including buffalo and African elephant, as well as habitat for the Vervet monkey and the Nile crocodile. It is also an important source for groundwater recharge in the Merti aquifer. These systems are being threatened by catchment degradation, which results in increased sediment loads, land use changes, encroachment and pollution[27]. The results of a study[28] that evaluated the effects of upstream abstraction on the Lorian Swamp, a wetland used by pastoralists downstream, suggest that benefits from surface water for domestic use and forage production are vulnerable to abstractions upstream, whereas the benefits from the aquifer with significant fossil water, are likely to be affected in the long run, but not the short term. The other key wetland area in Isiolo County is the Oldonyiro wetlands, with serious soil erosion challenges threatening the wetlands' service provision.

5.4.4 Surface water and run-off capture

The Ewaso Ng'iro North River Basin is emblematic of the increasingly prevalent problem in Kenya of population pressure leading to excessive abstraction of river water in the humid highlands, hence leaving little water for downstream consumers in the arid and semi-arid plains.

The Upper Ewaso Ng'iro basin has experienced decreasing river flows for the last two decades. Poor distribution of water is a major issue for socio-economic development in the Upper Ewaso Ng'iro, as excess water during the rainy season is followed by severe water scarcity during the dry season.

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26 Shiferaw et al., Sci. Reports 2019; 2021. Water use of Prosopis juliflora and its impacts on catchment water budget and rural livelihoods in Afar Region, Ethiopia. www.nature.com/scientificreports.

27 Ewaso Ng'iro North Integrated Water Resources Management and Development Plan. Kenya water security and climate resilience project. Implementation Support Consultancy (ISC) to Support Strengthening of Water Resources Management and Planning. World Bank. August 2020

28 Jan De Leeuw et. al. Water 2012, 4, 1009-1024. Benefits of Riverine Water Discharge into the Lorian Swamp, Kenya. www.mdpi.com/journal/water\

The Ewaso Ng'iro North River and its tributaries have experienced decreased water flows along the majority of their lengths as a result of a combination of factors, including increasing water extraction by commercial growers in the upper reaches, smallholder farmers in the middle catchment and deterioration in the vegetative cover of the upper watershed. Along a number of tributaries, violent clashes between downstream and upstream water users have regularly erupted for over three decades, and the problems have already reached a critical stage. The necessity to regulate river recharge upstream in order to lessen the severity of floods and droughts downstream, has grown more critical because of the increased demand for water.

To achieve a more effectively regulated flow, it is necessary to improve both the management of forested land (both for wood and for grazing) and the amount of tree cover in the upper catchment area. Strong demands for timber, fuelwood, and fodder are one of the primary causes of ongoing forest degradation; nevertheless, better catchment including forest management will lead to increased availability of all three of these commodities.

There is a need to capture every drop of rainfall and flood waters especially in the upper parts close to Mt. Kenya and the Aberdares, and Isiolo will need to work with the upstream counties to jointly invest in increased storage of runoff, catchment restoration, and protection, as well as strengthening the management of allocation for water resources upstream.

5.5 Strengthening governance, management and monitoring systems

Currently, water related legislation in Isiolo County includes the Water and Sanitation Act, 2020. There is a need for formulation and updating of legislation, rules and regulations to implement the Act.

Water-sector issues identified in CIDP 2018-2022 include:

- Need for an integrated water resources management,
- Comprehensive water resources mapping and feasibility studies,
- Develop long term county water master plan, and
- Infrastructure development (water development, storage, metering, sewage pipes, pumping stations)

Challenges

The water services sector faces numerous challenges that affect the development and management of water systems. These challenges include low capacity of service management bodies, mismanagement of water supply schemes, lack of coordination between counties (Laikipia, Meru, and Samburu), and insufficient coordination between county departments and development partners on water systems development and governance. Additionally, the unavailability of data (information) and low uptake of modern water governance, management, and monitoring approaches, conflicts between upstream and downstream water users, low levels of stakeholder engagement in the planning, development, and management of water systems, and a lack of clear roles for the various actors in the water services sector further exacerbate the situation. Furthermore, the low levels of investment in water services, inappropriate approaches and investment in water systems development and management, lack of water services provision master plans (foresight) to facilitate appropriate development and management of water services, political interference on technical and development issues, and insecurity hindering access all contribute to the challenges facing the water services sector.

To address the challenges facing the water sector, several solutions to ensure the provision of sustainable and reliable water services to communities need to be implemented.

These include:

- The formation of an intercounty water governance, management, and monitoring council and the creation of user-based water service providers with clear regulations and guidelines and representation from key stakeholders (county, users, and WRA) working under the proposed Rural Water Services Cooperation are critical steps.

- Enhancing the technical, financial, and management capacity of IWASCO and the proposed Isiolo Rural Water and Sanitation Corporation to improve service delivery, accountability, and capacity to respond to modern challenges is also essential.

- Determination and projection of water demands for agriculture, household, commercial, and livestock to guide water resources planning and development; the creation of an inter-departmental forum to improve coordination, management, and monitoring systems on multi-user water systems should be prioritised.

- Establishment of a Water and Sanitation Investment Council to mobilise resources for water infrastructure, a county government-led water systems development and management technical forum to guide the development of water supply systems, and awareness creation and strengthening of water users on water governance management and monitoring are necessary.

- Promotion of modern approaches to water management and monitoring systems based on GIS and online-based platforms, and providing an enabling policy and legal framework to facilitate the above are crucial steps. The opportunities for addressing these challenges include the availability of ample development partners, a legal framework (Water and Sanitation Bill, 2019, CIDP, etc.), and capable leadership. By leveraging these opportunities and implementing these solutions, the water services sector can address its challenges comprehensively, and provide sustainable and reliable water services to communities.

6.0 Responding to the Challenges (Strategic Response)

6.1 Introduction

Water is a crucial natural resource that must be managed effectively and sustainably to promote growth and development for Isiolo. However, doing so in a fragile ASAL environment requires strategic interventions to build effective governance capacity and implement developmental initiatives to enhance livelihoods. To address the challenges that hinder progress, there is a need for a structured and strategic approach to take action. This comprehensive approach must recognize the interconnectedness of various sectors, such as agriculture, livestock production, and disaster management, to facilitate integrated planning and development.

6.2 Mission and Vision

VISION

Transform Isiolo into a Model County with Equitable, Sustainable, and Secure Access to Water Resources and Sanitation; Enabling Health, Wealth, and Well-Being for People and Nature."

MISSION

Empowering communities in collaboration with all stakeholders, we strive to secure water resources for people, nature, and livelihoods; Through sustainable systems and development, we promote health and well-being for all in Isiolo County."

6.3 Goals and Objectives

The goal of water security in Isiolo is to ensure access to safe and reliable water, building resilience to drought, promoting sustainable water management practices, and investing in appropriate water infrastructure and nature-based solutions to support the needs of communities, ecosystems, and livelihoods over the long term.

The specific objectives include:

- Access to reliable and safe water sources for people, livelihoods, and ecosystems .
- Drought resilience and risk reduction through the development and management of water resources and infrastructure, such as dams, boreholes, water storage facilities, and nature-based solutions like soil and water conservation, reforestation, and wetlands restoration.
- Sustainable management of water resources to ensure long-term availability and equitable distribution of water for all users. This includes the development of different nature-based and grey infrastructure storage methods to capture and manage runoff, such as check dams, rock bunds, and other rainwater harvesting techniques.
- Improved governance and institutional capacity to manage water resources and address water-related challenges effectively.
- Climate change adaptation by implementing adaptive water management strategies and investing in climate-resilient water infrastructure, including nature-based solutions, to enhance water availability and quality.

- To increase sustainable access to safe water complying with Kenya's standards on drinking water quality by formal service provision and to reduce the time taken to the nearest public/communal outlet and in rural areas to below 30 minutes by 2030.
- To reduce unaccounted for water due to both economic and technical losses to below 30% by 2027.
- To reduce all forms of water related disease burden in Isiolo County below 20% by 2027.
- To increase access to sewage collection, treatment, and disposal from 20% to 50% in the urban setting and from just under 5% to 10% in the rural setting by 2027.
- To ensure all effluent discharge meets the relevant standards.
- In collaboration with the other implementing agencies, particularly the Ministry of Health, increase the access to basic sanitation from 55% to 77.5% in the urban setting and from 45% to 72.5% in the rural setting by 2027.

6.4 Key Principles of the Isiolo County Water Strategy

Due to chronic water scarcity and extended droughts in Isiolo, with a limited number of technical officers, it is necessary to integrate water resource management with water services based on well-defined standards and regulations while prioritizing demand management.

There is a need to ensure environmental and social sustainability of water resources and sanitation services, strengthen private sector participation in development, enhancing human dignity, gender mainstreaming, and social inclusion.

The guiding principles for the Isiolo County Water Strategy are:

1. Enhancing water security through protection, conservation of water resources and cost-effective storage.
2. Integration of water resource management with water supply to optimise use of limited technical staff and protection of water sources.
3. Water and sanitation service provision as basic sanitation as a human right in accordance with the Constitution 2010 and Water Act 2016 with well-defined standards and regulations for service delivery
4. Water is a social and economic good – water and sanitation service provision for the poor shall be enabled by society and users shall pay according to consumption – user pays principle.
5. Demand management - improving the efficiency of current water use, reducing physical losses and non-revenue water- a higher priority than investing in new infrastructure
6. Private sector participation in the development and management of water services
7. Linkage between water services and economic development.
8. Linkage between water services, human dignity, gender mainstreaming, and inclusion of vulnerable or marginalised peoples.
9. Environmental and social sustainability of water and sanitation services – polluters shall pay for environmental damage.
10. Isiolo water service provision responds to cross-cutting issues such as gender and HIV/AIDS, pro poor provision.

Noting that the aggregated key challenges in Isiolo County comprise the following:

1. Drought, unpredictable rainfall and floods, and disaster management
2. Spread of vectors and water-borne diseases
3. Environmental degradation
4. Scarcity of potable water

5. Inadequate governance, sector management and monitoring systems that fail to include gender and pro poor dimensions

Each challenge is then a strategic area with themes and related strategies, as highlighted in **Table 13**.

Table 13: Strategic areas, themes and strategies for Isiolo water sector

Theme	Strategy	10-Yr Budget (Million KSH)
Strategic Area 01: Water Resource Protection		
1. Classification of water resources	Surface and groundwater assessments at appropriate scales inform the classification of water resources in the county. • Surface and groundwater assessments • Classification of water sources.	40
	Determine the class of water.	5
2. Ecological Reserve	Reserve determination	10
	Reserve compliance	40
3. Determine Resource Quality Objectives	Set Resource Quality Objectives	0.5
	Set Resource Quality Objectives- water quality testing lab, sampling	30
	Investment in water treatment technologies both small and large scale	200
	Development and operationalization of water regulation	50
4. Conservation and protection of ecological infrastructure	Integrate environmental considerations into basin development and planning	5
	Ground and surface water protection e.g. enclosing or encroaching of water points , control drilling of boreholes.	100
	Riparian areas protection.	50
	Ecosystem services protection.	30
	Encourage community-led total sanitation.	50
	Green energy adoption in water infrastructure.	100
5. Water resources assessment, allocation, regulation	Groundwater assessment – assess groundwater availability in terms of quantity	40
	Ground water assessment – groundwater quality and use	20
	Surface water assessment – quality and use	40
	Update and improve the permit database	2
	Groundwater allocation	20
	Surface water assessment – assess availability in terms of quantity	10
6. Ground and surface water development	Aquifer recharge	40
	Local groundwater development - reconciliation of water demands and groundwater availability and implementation of groundwater schemes	500
	Large scale groundwater development - reconciliation of water demands and groundwater availability and implementation of groundwater schemes	500
	Conjunctive use - reconciliation of water demands and groundwater availability	20

7. Groundwater asset management	Develop an asset inventory	2
	Develop an asset management plan, particularly for existing and non-operational facilities	2
8. Conservation and protection of groundwater	Groundwater source protection	20
	Rehabilitation of polluted aquifers, springs, and wells	200
Strategic Area 02: Flood and Drought Management		
9. Flood management	Undertake a flood risk assessment • Mapping of flood prone areas	5
	Flood prevention/mitigation Measures • Construction of mega dams for harvesting and storage of flood water to utiliseIsiolo's annual 663 million cubic metre potential. • Undertake riparian area demarcation and protection that should be incorporated in the spatial plans of Isiolo and upstream counties • Construction of climate proof drainage systems • Rehabilitation of existing drainage systems	1000
	Flood preparedness measures • Cleaning of all drainage systems before the floods • Timely dissemination of advisories to all concerned communities • Prepare alternative transport corridors • Prepare holding/relief centres and infrastructure inspection	20
	Formalise institutional roles and partnership collaborations. • Hold coordination/collaboration forums • Engage National Institutions e.g. lapsset corridor development authority	20
	Develop flood preparedness measures • Cleaning of all drainage systems before the floods • Timely dissemination of advisories to all concerned communities • prepare alternative transport corridors • Prepare holding/relief centres • Infrastructure inspection	20
	Develop and Implement Integrated Flood Management Plans	100
	Implement flood response protcols • Consistently develop protocols graded on severity and provide related advisories • Implementation of advisories • Evacuation plan • Repair of destroyed infrastructure	20
	Capacity development • Human capacity fot flood management • Equipment • Infrastructural development to support flood management • Skill development activities	100
	Formalise institutional roles and partnership collaborations • Signing of agreements e.g PPPs, MOUs	5

10. Drought management	• Develop a drought response protocol graded to show severity with budgets.	10
	Improved drought preparedness • Servicing of boreholes • Desilting of surface water harvesting & storage structures e.g. pans, ponds, dams, rock catchments • New Water Supply system in an area underserved by water sources • Construction of a dam across the Isiolo river to harness flood water- ensure water availability (IWASCO) and replenish river flows during drought times	100
	• Strengthen existing drought early warning systems with timely dissemination	20
	Capacity development • Staff training workshops, • Knowledge sharing and exchange	12
	Downscaling of climate information (forecasting / prediction and relevant advisories per sector) • Support participatory scenario mapping • Support timely dissemination of climate information and related advisories	40
	• Enforcement of legislation and actions implemented under GFFLOCA funding	500
Strategic Area 03: Urban Domestic Waste Water Management		
11. Town physical planning	Allocation of land for sewerage plant expansion for downstream users	600
	Proper siting of the sewerage treatment plant	
	Capacity development in the management of rural sewers	
	Plan/allocate water for sewer systems	
12. Infrastructure development	Design and construct sewerage treatment works for an expanded population	300
Strategic Area 04: Climate Change Adaptation and Preparedness		
13. Addressing impacts of climate change on water resources at appropriate spatial scales	Promote the understanding of the impacts of climate change on water resources at an appropriate spatial scale • Conduct research on the effects of climate change on the water resources of Isiolo • Conduct extensive awareness creation at the community and county government levels	200
	• Promote climate resilient infrastructure • Household level preparedness for storage. Households should have storage tanks. • Conduct catchment protection activities like use the of dykes, terracing, • Elimination of poor farming practices like flood farming. • Promoting the use of Drip technologies. • To ensure that we have sufficient vegetation cover, we need to diversify our energy sources from wood fuels to solar power. • WRA needs to closely monitor abstraction to ensure there is no proliferation of illegal intakes i.e meter the intakes. • Promote community based rainwater harvesting in seasonal streams and construct sand-dams.	300

	• Climate-related disaster risk management planning and implementation in each ward, including simulation exercises to enhance preparedness, • Early warning systems that incorporate community leadership and indigenous knowledge, use of sms, and local FM radios.	400
	Promote agroecology and agroforestry • Plant trees at homestead, on farm lots and in gazetted forests. • Have woodlots for certain communities that they can use.	500
	Mainstream climate change adaptation in water resources strategy, planning,and management at basin and catchment levels • Water reuse/recycling needs to be upscaled.	200
	Enhance the resilience of the agriculture sector through climate resilient and sustainable agriculture • Improving farming methods • Conservation agriculture promotion • Drip irrigation to reduce water waste	400
14. Promote improved and sustainable catchment management	Promote sustainable land development and planning • Develop spatial plans for the management of land. • Clarify on land ownership across Isiolo County.	200
	Strengthen participatory approaches • Create platforms for stakeholders in a watershed. • Promote intra and inter-catchment forums for discussing catchment protection activities.	50
	Strengthening of WRUAs so that they can implement their catchment protection activities • Develop spatial plans for the management of land. • Clarify on land ownership across Isiolo County.	100
	Support the development of BWRCs • Create platforms for stakeholders in a watershed. • Promote intra and inter-catchment forums for discussing catchment protection activities.	50
	Strengthen the WRA office in Isiolo • Develop spatial plans for the management of land. • Clarify on land ownership across Isiolo County.	50
	Promote integrated catchment management • Create platforms for stakeholders in a watershed. • Promote intra and inter-catchment forums for discussing catchment protection activities.	50
15. Sustainable water and land use and management practices	Conduct Rangeland Restoration. • Identify and cultivate indigenous and other useful fodder trees to stabilise and enrich the soil through their root systems and leaf litter, provide windbreaks, and improve water percolation for soil moisture • Identify and cultivate drought tolerant, nutrient dense indigenous grasses	600

16. Natural resource management for the protection and sustainable use of natural resources	Conduct a robust and detailed mapping, and reorganise all natural resources data in a geographically referenced database to improve information access for enhanced natural resources monitoring, spatial planning, and agricultural land use planning	300
	Improved wetland management • Fencing of the wetlands • Supporting the host management committees to preserve the wetlands.	100
	Promote alternative livelihoods consistent with sustainable management and utilisation of land and water resources	200
	Improved solid waste management • low-cost behavioural interventions that encourage residents to change waste disposal practices, • identify opportunities for recycling, reusing and reducing waste • Identify and deploy low-cost technical options for safe management • Identify and develop waste disposal sites taking into account the location away from surfaces, groundwater, livestock, and wildlife	100
	Improved forestry management • Tree planting on degraded land or areas that have been deforested. • Ecological restoration including removal of invasive species, the reintroduction of native plants and animals, and the restoration of natural water cycles. • Forest management including practices such as thinning, prescribed burns, and selective harvesting. • Protecting, restoring and conserving soil health including mulching, composting, and cover cropping to improve soil quality. • Conservation of biodiversity by using indigenous plant species and providing habitats for wildlife. • Community engagement: Community participation is critical for the success of forest restoration and afforestation. Local communities should be involved in planning and implementing restoration projects. • Monitoring and evaluation to ensure that they are achieving their goals and to identify any issues that may arise. • Sustainable forestry with selective harvesting and reforestation to maintain healthy forests while also providing economic benefits to local communities. • Agroforestry- the integration of trees into agricultural systems to improve soil health, provide shade and wind protection for crops, and increase biodiversity. • Education and outreach to raise awareness about the importance of forest restoration and afforestation and encourage people to get involved.	100
	Removal of alien invasive species • Management of Prosopis Juliflora, opuntia, lantana camara, and red cedar by eradication or management in areas where the growth is excessive.	

	Improved fisheries management • Habitat restoration of wetlands and riverine forests to improve fish populations by providing breeding, feeding, and nursery grounds. • Reducing pollution from agricultural and industrial sources to improve water quality and prevent fish kills. • Stocking fish in rivers and lakes can help supplement wild populations and recreational fishing. • Introducing aquaculture practices to supplement wild fish populations and provide an alternative source of income for local communities.	
	Improved energy management • Promote the uptake of green energy to reduce the pressureon wood fuel. • Developing and utilising mini-hydropower and solar pumps to support water management infrastructure by providing reliable and sustainable sources of energy for water treatment, distribution, and irrigation systems to improve water efficiency and reduce reliance on expensive fossil fuels and grid electricity	
	Improved sand mine management • Creation of required legislation/policies to regulate sand mining • Estimating safe yields and limiting the amount of sand that is extracted, • Monitoring the impact of mining on the environment	
17. Rehabilitation of degraded environments	Rehabilitation and restoration plan and implementation for degraded forests, soils and rangelands	100
	• Land restoration and rehabilitation of specific priority areas	
	• Site specific rehabilitation of degraded riparian areas	
	• Site specific rehabilitation of degraded wetlands	
	• Site specific rehabilitation of degraded rangelands	
	• Rehabilitation of degraded areas from sand harvesting to promote natural regeneration, restore water recharge, and buffer capacity	
Strategic Area 05: Institutional Strengthening and Enabling Environment		
18. Promote improved and sustainable catchment management	Strengthen WRA's regulatory role	60
	Strengthen BWRCs	
	Strengthen county government engagements in WRM in the basin	
	Strengthen WRUAs through capacity building and training, establishment, operationalization and strengthening of existing Sub-catchment Management Plans (SCAMPs)	
	Improving awareness and participation of communities in catchment management	
	Creation and operationalization of intercounty coordination mechanisms in catchment management	
	Promote multi-sectoral coordination (at the county level) on sustainable catchment management	

19. Guidelines, codes or practice and manuals	Develop policies	5
	Develop guidelines for specific water resource management activities	
	Develop codes of practice	
	Develop manuals	
	Develop master plans for infrastructure, management, and monitoring	
20. Development of institutional capacities to support improved water resource management and development.	Strengthen policies and regulatory instruments	50
	Development of technical and management capacity across key county departments (water, environment, crop, livestock, wildlife, fisheries)	
	Strengthen partnerships with local, national, and international institutions, NGOs, service providers, vendors etc	
	Improved research on appropriate approaches based on environmental friendliness, sustainability, social acceptability, and technical feasibility	
	Identify and adapt innovative financing approaches (PPPs, crowdfunding, microfinance, green bonds, water funds similar to the Upper Tana initiative	
	Innovative financial resource management (use of prepaid and mobile phone payment systems) -to reduce financial mismanagement	
	Gender mainstreaming and social inclusion in the management, development, and monitoring of water resources	
21. Improved monitoring network	Surface water monitoring: River flow monitoring involving community scouts	50
	Monitoring of waterbodies, including pans, wetlands, and dams	
	Groundwater monitoring	
	Water quality monitoring: Surface water and groundwater	
	Meteorological monitoring and information sharing with communities	
	Flood early warning monitoring network	
	Metering of water use and abstractions	
	Adoption of modern water systems management and monitoring approaches (technologies)	
22. Improved data and information management	Development and updating of GIS based mapping of pipe networks	50
	Mapping of water resources (ground water, surface water, and rock catchments)	
	Development and maintenance of water storage infrastructure	
	Development and maintenance of surface water systems	
	Development and maintenance of rainwater harvesting systems	
23. Water Services Management	Operation, preventive maintenance, and rehabilitation of treatment works and pipe network for water supply and sewerage[29],	720

24. Protection and improvement of water catchment areas within the county	Improving forest cover (Agroforestry)	100
	Wetland protection (Gambela, Lorian Swamp, Merille, Kanchordi)	40

Potential innovative financing that can be considered in funding proposed activities includes the following approaches:

a. **Public-Private Partnerships (PPPs):** PPPs involve collaboration between the public and private sectors to finance, design, construct, and manage water infrastructure projects. Private sector partners bring in expertise, technology, and funding, while the public sector provides regulatory oversight and ensures that the project meets the public interest.

b. **Green Bonds:** Green bonds are fixed-income securities that are issued to finance environmental projects, including water infrastructure projects. Green bonds are designed to attract socially responsible investors who are interested in funding sustainable initiatives.

c. **Microfinance:** Microfinance involves providing small loans to individuals or groups who cannot access traditional banking services. Microfinance can be used to finance water infrastructure projects and improve access to safe water for underserved communities.

d. **Impact Investing:** Impact investing involves investing in companies or projects that have a positive social or environmental impact. Impact investors can support water infrastructure projects that improve access to safe water and sanitation.

e. **Crowdfunding:** Crowdfunding involves raising small amounts of money from a large number of people through online platforms. Crowdfunding can be used to finance water infrastructure projects, particularly in developing countries where traditional financing may be difficult to access.

f. **Water Funds:** Water funds are multi-stakeholder partnerships that mobilize funding to support watershed conservation and restoration projects. Water funds can be used to finance water infrastructure projects that improve water quality and quantity.

6.5 List of prioritized actions for all identified challenges

The list of prioritised water sector actions for Isiolo County is presented as follows:

1. To assess and evaluate the availability, reliability, quality, and vulnerability of county water resources up to the year 2040, taking into consideration the effects of climate change

2. To renew the water development plans for the year 2040 taking into consideration the effects of climate change

3. To formulate an action plan for activities involving water resources and catchment protection up to 2040

4. To strengthen the capacity of water resource management through the transfer of technology

5. To increase access to sustainable safe drinking water through the preparation of water demand projections for Isiolo County up to the year 2040 and explore any relevant demand management options

6. Prepare both short-term and long-term investment needs to address gaps in water supply and water resource

7. Prepare a sequence of development for the preferred water resources and supply

29 From WSTF O& M manual, updated, estimate 11,000 m^3 water, 3,000m^3 sewerage per day

schemes based on the recommended development strategies

8. Increasing access to sustainable safe drinking water and sanitation services and promoting key hygiene behaviours

9. Protecting freshwater resources and water catchment areas

10. Promoting cooperation on shared waters and resources

11. Strengthening water governance and financing

6.6 Commitments and obligations

A commitment and obligations (Action Plan) for the Isiolo water sector is highlighted in Table 14.

Table 14: Commitment and obligations

Commitment / Strategic objective	Action Plan	Strategic Action
Equitable, participatory, and accountable water governance for the development	Set-up a County integrated water resources monitoring and Information Management System	• Collection, storage, elaboration, and management of integrated data on water resources • GIS-based knowledge and information management system • Expand and upgrade the knowledge base on groundwater resources and aquifers • Hydromet stations on key rivers
	Water Allocation and Water Demand Management	Metering and token-based supply systems
	Water Supply Infrastructure Development and Management	• Investment in water infrastructure • Capacity building staff to develop the infrastructure • Partnership for resource mobilization
	Water Resource Management and Environmental Protection	• Monitoring catchment protection • Implementing an Integrated Water resource management plan
	Public engagement and capacity development	Awareness campaign and public engagement meetings
To assess and evaluate availability, reliability, quality, and vulnerability of county water resources up to the year 2040 taking into consideration the effects of climate change	Set-up a County integrated water resources monitoring and Information Management System	• Collection, storage, elaboration, and management of integrated data on water resources • GIS-based knowledge and information management system • Expand and upgrade the knowledge base on groundwater resources and aquifers • Hydromet stations on key rivers

Commitment / Strategic objective	Action Plan	Strategic Action
To renew the water development plans for the year 2040 taking into consideration effects of climate change	Modelling water resources considering the impacts of climate change	• GIS-based knowledge and information management system • Water balance studies and investment • Reviewing the strategic plan
To formulate an action plan for activities involving water resources and catchment protection up to 2040	Water resource and catchment protection action plan	• Water sector planning workshop on water resource catchment and protection • Capacity building training for staff on catchment protection
To strengthen the capacity of water resource management through the transfer of technology	Use of technology in water resource management	• Capacity building staff on water resource management technology • Benchmarking appropriate technology for water resource management
To increase access to sustainable, safe drinking water through the preparation of water demand projections for Isiolo County up to the year 2040 and explore any relevant demand management options	Access to potable water and future projections	• Investment in the supply and storage of water for domestic use • Implementing the water catchment protection plans
Prepare both short-term and long-term investment needs to address gaps in water supply and water resources	Water supply and water resource investment needs report	• Conducting a survey on water supply and water resource investment gaps • Validating the water strategic plan
Prepare a sequence of development for the preferred water resources and supply schemes based on the recommended development strategies	Prioritizing water resource and supply development strategy	• Conduct a workshop on water resource and supply development and prioritization plan • Multi-stakeholder engagement in water supply
Increasing access to sustainable, safe drinking water and sanitation services and promoting key hygiene behaviours	• Hygiene behaviour promotion • Promoting access to potable water	• Campaign and awareness on water use plan • Campaign and training on sanitation services through community health workers and the public health department
Protecting freshwater resources and water catchment areas	Integrated water resource management	Developing and implementing an integrated water resource management plan
Promoting cooperation on shared waters and resources	Building partnerships for shared water resource management	Implementing the water policy and water act 2016
Strengthening water governance and financing	• Developing a legal framework for water management • Promoting Accountability and Trust • Fiscal planning for water resources	Institutionalizing water policy and implementing the water supply and resource management plan

7.0 Implementing the Strategy

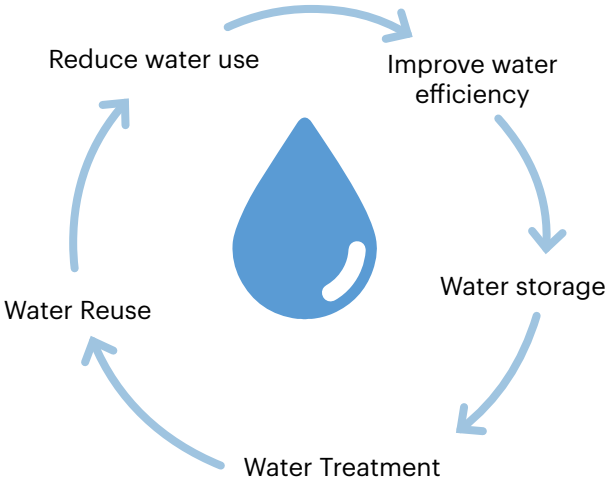
7.1 Optimising the planning cycle to ensure timing is well synchronized

Core considerations for the formulation of the implementation strategy include:

- Focus on short- to medium-term timeframes of 5, 10 and 15 years, while building a platform for future strategies in line with the policy and visions for water resource management, regulation, and development.
- Prioritizing critical concerns, starting with drought and floods, while ensuring that other issues are addressed through ongoing management or monitoring for future prioritization and action.
- Spatial scales- relevance at village, ward, sub-county, county, subcatchment, catchment, and basin scales, while ensuring horizontal alignment across sectors and institutions at each scale.
- Provide the strategic intent and framework for actions to be described in the implementation plans.
- Enable adaptive responses to changing circumstances and achievements based on effective ongoing monitoring and evaluation. Periodic assessment of achievements and setbacks, potentially yearly, for dynamic measures.

Overall, the optimizing cycle for water use should work towards improving water efficiency, increasing storage, focusing on water treatment, and promoting water re-use and recycling. As shown.

Figure 14: Optimizing cycle for water use



Source: First water smart work in Mexico: water park "La Quebradora"[30]

7.2 Implementation, monitoring, and regular updating of the County Water Strategy

The implementation of the Isiolo County Water Strategy will adopt a prioritized, phased, and progressive approach with interventions tailored for immediate, short-term, and long-term frames. To achieve this, an Isiolo Water Resource strategic roadmap has been developed. This Isiolo water resource roadmap is a management tool designed to outline the critical steps required to progressively achieve the Vision and Goals set out for managing Isiolo County water resources for the next 5-year cycle. The focus of each phase is as follows:

30 First water smart work in Mexico: water park "La Quebradora". Raquel Vargas Lara. National Water Commission. Mecico. 01.10..2018. Https://iki-alliance.mx/en/primera-obra-water-smart-en-mexico-parque-hidrico-la- quebradora/

Phase 1: Laying the Foundation

This will involve strengthening the water sector governance framework and developing a partnership approach for resource mobilization to water resource management and development. Further, the development of a coordination and facilitation framework will be done during this phase. The coordination platforms will be improved and developed over time and will see both national and Isiolo county governments, NGOs, the private sector, and faith-based organizations leading and coordinating focused interventions. A major milestone will involve awareness of water sector issues and processes, and as such, the development of knowledge products and communications materials will be developed over time.

The first phase- Laying the foundation:

- Assess and evaluate the availability, reliability, quality, and vulnerability of county water resources up to the year 2040, taking into consideration the effects of climate change.
- Prepare both short-term and long-term investment needs to address gaps in water supply and water resources. Prioritization will also be done in this phase, then, prepare a sequence of development for the preferred water resources and supply schemes based on the recommended development strategies.
- Promoting cooperation on shared waters and resources, especially with upstream riparians - both the counties and major users.
- Formulate an action plan for water resources and catchment protection activities up to 2040.
- Prepare a sequence of development for the preferred water resources and supply schemes based on the recommended development strategies.
- Coordinating capacity building, training, and knowledge management.
- Promoting hygiene behaviour changes to safeguard and enhance safe water and sanitation services.

Phase 2: Building capacity

Phase two will build upon the gains and misses of Phase 1 and seeks to embed the approaches developed to further develop these towards realizing the vision of water for all in Isiolo is attained. Building capacity places emphasis on institutional strengthening for the various players in the water sector in Isiolo County. It will include developing capabilities and capacities, together with institutional establishment processes, including a hydro-meteorological service centre and a water GIS and climate monitoring centre in Isiolo County. Efforts to improve the legal and policy environment translate into the development of agreed-upon approaches to water sector regulation and water use authorization.

The approaches implemented in phase one will realize the impacts of the water sector's response to climate hazards, specifically drought and flooding. The salient element in phase two will be strengthening the data and information management systems.

- Strengthening the water board and regulations.
- Strengthen water governance and financing.
- Protecting freshwater resources and water catchment areas.
- Preparation of water demand projections for Isiolo County up to the year 2040; explore service delivery management options to enhance access to sustainable, safe drinking water.
- Renew the water development plans for the year 2040, taking into consideration the effects of climate change.
- Drought and flood disaster risk mitigation plans

- Strengthening systems for monitoring water resource use.
- Strengthen the capacity of water resource management through transfer technology.
- Upgrade the information management system.

Phase 3: Driving and Sustaining Growth.

This phase will be focused on translating the gains in phases one and two to the delivery of impact and working towards sustainability. During this phase, a flagship project will be initiated, and the improvement of water services in all sectors ensured. Equally, improvement in priority catchment will be realised. The projects will be integrated to further cement partnerships in the water sector for proper coordination of water governance. A circular system will be built to ensure sustainability in the water sector. Further, there will be improvements in the delivery of water services and the monitoring of water use. The forecast will be on future water availability for all the residents of Isiolo County. Implementing the flagship project

- Improving water services.
- Circular management strategies in the water sector in place.
- Improving governance horizontally and vertically.
- Realizing improvements in key catchment areas.

Developing Sustainable Finance

There is a need to prioritize further financing of the water sector in Isiolo County, through increased fiscal allocation. The establishment of effective institutional funding arrangements and government structures is important to strengthen efforts and align Isiolo water priorities with existing and future funders. There is a need for a funding plan that identifies and outlines available funding and financing sources and matches them to priority projects. An effort to build up the systemic structures and systems to create transparency and trust and facilitate efficient decision-making will support coherent water sector planning, which will lead to efficient resource mobilization over the long term.

Ensuring ongoing Support of Development Partners, the Private sector, and other Agencies

Isiolo County has a wider network of support from Development partners, the private sector, and other agencies. The actors have provided and continue to provide technical and financial support for the realization of the water sector strategic goals in Isiolo County. Establishing a regularized and structured approach to directing this support is essential to breaking the cycle of uncoordinated support. Priority will be rolling out the first phase of the Isiolo County Water Strategy.

7.3 Implementation, monitoring, and updating of the Isiolo County Water Strategy Establishing a Monitoring and Evaluation Framework

It is important to set out a clear approach to monitoring, evaluation, learning, and reporting. The approaches not only support building capacity but, more importantly, provide the basis for adaptive management approaches. These approaches will require a monitoring system, robust tools, and embedded practice to ensure reporting. The evaluation of progress after five years will enable improvements to be incorporated into subsequent phases of implementation, enabling alignment with the county-integrated development plans and national development plans, as well as re-designing remaining activities based on prevailing circumstances. Mid-term reviews and end-of-term evaluations will be important in ensuring the successful implementation of the Water Strategy and in guiding future processes.

Table 15: Results-Based Monitoring and Evaluation Framework

Thematic Area	Indicator	Means of Verification
Improved access to regular and affordable water and sanitation services	The proportion of residents of Isiolo using safely managed drinking water services (Piped, Improved springs, Boreholes...)	Water sources and distance to water sources for residents of Isiolo.
	The proportion of the population using (a) safely managed sanitation services and (b) a hand-washing facility with soap and water	Type of sanitation facilities used by residents of Isiolo County Presence of hand washing facilities in homes, schools, and public institutions.
	The proportion of wastewater that is safely treated.	Wastewater treatment plan
	The proportion of bodies of water with good ambient water quality	Sample analysis of water quality from various sources in Isiolo.
	Change in water-use efficiency over time	The volume of wastewater treated and discharged.
	Level of water stress: freshwater withdrawal as a proportion of available freshwater resources	Value-added water withdrawn in cubic metres by a given economic activity over time. The volume of freshwater withdrawn from available sources.
	Degree of integrated water resources management implementation	Management instruments in place. Public participation in water resource management.
	Amount of water- and sanitation-related official development assistance that is part of a county government-coordinated spending plan.	Financing and fiscal policy. Development Assistance Contribution List by Isiolo County supporting the water sector.
	The proportion of local administrative units with established and operational policies and procedures for the participation of local communities in water and sanitation management, including WRUAs, Sub County Water Management Committees	Information procedure on existing county water-related policies and laws. Community participation through WRUAs.
Institutional strengthening and capacity building to enhance knowledge and support for climate resilience across all partners at the county level	Progress reports on Water committees developed.	Technical and progress reports from various committees
	Diversity in terms of expertise employed by the County in the water sector.	Audit reports on HR in the climate and water sector
	Published policy and legal framework on climate resilience.	Published laws and policies related to climate resilience. Officers working on climate resilience.
Early warning systems, and disaster risk reduction using international, regional, national, and county systems, enable and include indigenous knowledge	Preparedness and response capabilities through the development of disaster preparedness and response plans, Detection, monitoring, analysis, and forecasting, including risk and impact information.	Disaster risk management plans in place. Early warning communication materials on Disaster reports, and preparedness. Disaster Risk Management committee in place
	Consolidating indigenous knowledge on disaster risk.	Indigenous knowledge plans on Disaster Risk Management in place.

Thematic Area	Indicator	Means of Verification
Sectoral interventions purely related to climate adaptation and mitigation, must be harmonized/ integrated	Promotion of technologies, including water harvesting technologies.	Homes and public institutions installed that are using water harvesting technologies. Investment in air-to-water (Watergen) harvesting techniques.
	Protection and conservation of water catchment areas.	Water catchment fenced or protected
	Renewable Energy-based Mini-grid developments and clean cooking solutions projects.	Adoption of clean cooking technologies. Adoption of solar mini grids.
	Enactment of a Rangeland management policy	Rangelands Management Policy published.
	Expand the wastewater treatment capacity	Wastewater treatment facility constructed.
	Adoption of integrated approaches includes kitchen gardens in schools, conservation agriculture, and climate-smart agriculture.	Schools and homes utilise strategies such as kitchen gardens, conservation agriculture, and climate-smart agriculture.
Cross-county interventions e.g., catchment restoration, rangeland reseeding, adaptive water, and pasture management	Improved accountability and transparency through timely reporting and participatory discussion of results/issues in the water sector.	Annual audited accounts in all the sectors working to improve water access.
	Improved coordination and collaboration of sector activities, particularly among forest/catchment restoration, pasture management, the ministry of agriculture, and the department of public health on promotional hygiene.	Reports on strategic collaboration and networking amongst the key sectors to improve water access.
	Increased financing sources and investments in the water and sanitation sector	Fiscal policy demonstrating increased commitment by the county government to provide water

Annexes

Annex 1: References

1. A Framework for Developing Community Water Strategies. Brace Centre for Water Resources Management. McGill University, Montreal, Canada. Marie-Claire St-Jacques. April 2009

2. A Method to Develop Sustainable Water Management Strategies for an Uncertain Future. M. Haasnoot, H. Middelkoop, E. van Beek and W. P. A. van Deursen. Sustainable Development. Published online in Wiley InterScience. August 2009

3. Alio, M. A. (2018). Land use changes and human-wildlife conflict in Garba Tula Sub-County, Isiolo County, Kenya

4. Assessing Water Availability under Pastoral Livestock Systems in Drought-prone Isiolo District, Kenya. Working Paper 106. International Water Management Institute. Bancy M. Mati, John M. Muchiri, Kennedy Njenga, Frits Penning de Vries and Douglas J. Merrey. February 2005

5. Aurecon AMEI Limited. 2020. Ewaso Ng'iro North Integrated Water Resources Management and Development Plan (IWRMDP). Final Report. Technical Report prepared for the Ministry of Water, Sanitation and Irrigation. Republic of Kenya by Aurecon AMEI Limited. Ebéne, Mauritius. 263 pp.

6. Aurecon AMEi Limited. 2020. National Integrated Water Resources Management and Development Plan, Final Report. Technical Report prepared for the Ministry of Water, Sanitation and Irrigation, Republic of Kenya, by Aurecon AMEi Limited, Ebene, Mauritius, 212 pp

7. District Water Management Strategies. Guidelines for preparing a district water management strategy to support a region scheme amendment or district structure plan Department of . Australia. 2013

8. Ewaso Ng'iro North Integrated Water Resources Management and Development Plan (IWRMDP). 2020.

9. Ewaso Ng'iro North Integrated Water Resources Management and Development Plan. Kenya water security and climate resilience project. Implementation Support Consultancy (ISC) to Support Strengthening of Water Resources Management and Planning. World Bank. August 2020.

10. Ewaso Ng'iro North Integrated Water Resources Management and Development Plan. Kenya water security and climate resilience project. Implementation Support Consultancy (ISC) to Support Strengthening of Water Resources Management and Planning. World Bank. August 2020

11. First Water Smart Work in Mexico: Water Park "La Quebradora". Raquel Vargas Lara. National Water Commission. Mecico. 01.10.2018. Https://iki-alliance.mx/en/primera-obra-water-smart-en-mexico-parque-hidrico-la-quebradora/

12. Guidelines For The Development Of Urban Water Strategies. Environment, Land Water and Planning. Victoria State Government. Australia. March 2021

13. Guyo, S. S. (2019). Assessment Of The Dynamics Of Resource-Based Conflict On Human Security In Kenya: A Case Study Of Isiolo County.

14. Isiolo CIDP 2013-2017

15. Isiolo CIDP, 2013-2017

16. Isiolo CIDP, 2018-2022

17. Isiolo District Water Development Study. Water Resources Assessment And Planning Project (WRAP). Ministry of Water Development. June 1991.

18. Isiolo Draft CIDP 2023- 2027

19. Isiolo NDMA brief of September 2022

20. Isiolo Water Bill, 2019

21. Ministry of Water, Sanitation and Irrigation. Climate Action in the Water Sector in Kenya - Sector Roadmap. February 2022

22. MoALF. 2017. Climate Risk Profile for Isiolo County. Kenya County Climate Risk Profile Series. The Ministry of Agriculture, Livestock and Fisheries (MoALF), Nairobi, Kenya.

23. National Water Master Plan 2030. Water Resources Management Authority. Ministry of Environment, Water and Natural Resources. Japan International Cooperation Agency. October 2013.

24. National Water Resource Strategy 2021 - 2025. Ministry of Energy and Water Resources. Federal Government of Somalia. August 2021.

25. Okullo, J. O., Moturi, W. N., & Ogendi, G. M. (2017). Open defecation and its effects on the bacteriological quality of drinking water sources in Isiolo County, Kenya.

26. Rapid Integrated Water Assessment in 10 Arid and Semi-Arid Land (ASAL) Counties, Kenya.UNEP-DHI. 2021. https://www.unepdhi.org/wp-content/uploads/sites/2/2022/05/ASAL-Rapid-Integrated-Assessment-Final-Report.pdf

27. The Factors Driving Land Cover Transitions And Land Degradation And The Potential Impacts Of The Proposed Developments In The Isiolo Dam Watershed, LAPSSET corridor, Kenya. Catherine C. Sang, Daniel O. Olago, Zedekia J. Ongeri. Discover Sustainability. 13 February 2023

28. Understanding the Kenya 2016 Water Act, Water Resources Group 2030.

29. Water Resources And Sustainable Development In Northern Kenya: A Case Of Isiolo District Dedan.O. Onganya, Jackline M. Omuya, Kennedy M.B. Ombaba and Phyllis A. Arogo. Department of Development Studies, Moi University. 5 November 2012.

Annex 2: Isiolo County Water Strategy: Financial Review Summary

Introduction

Isiolo County is classified as arid and semi-arid, with the arid zone in the central part covering 30% of the total land area and rainfall ranging between 300 and 350 mm annually, supporting grassland. About 65% of the total area of the county is considered very arid, mainly in northern Isiolo, and receives rainfall of between 150 and 250 mm annually. The. A relatively small part (5%) in southern Isiolo, near Mt. Kenya receives 400–650 mm on average. The wettest months are November and April, with an average rainfall of 80 and 66 mm respectively. The mean annual temperature is 29°C and dry in most months of the year with two rainy seasons, displaying both temporal and spatial variation[31].

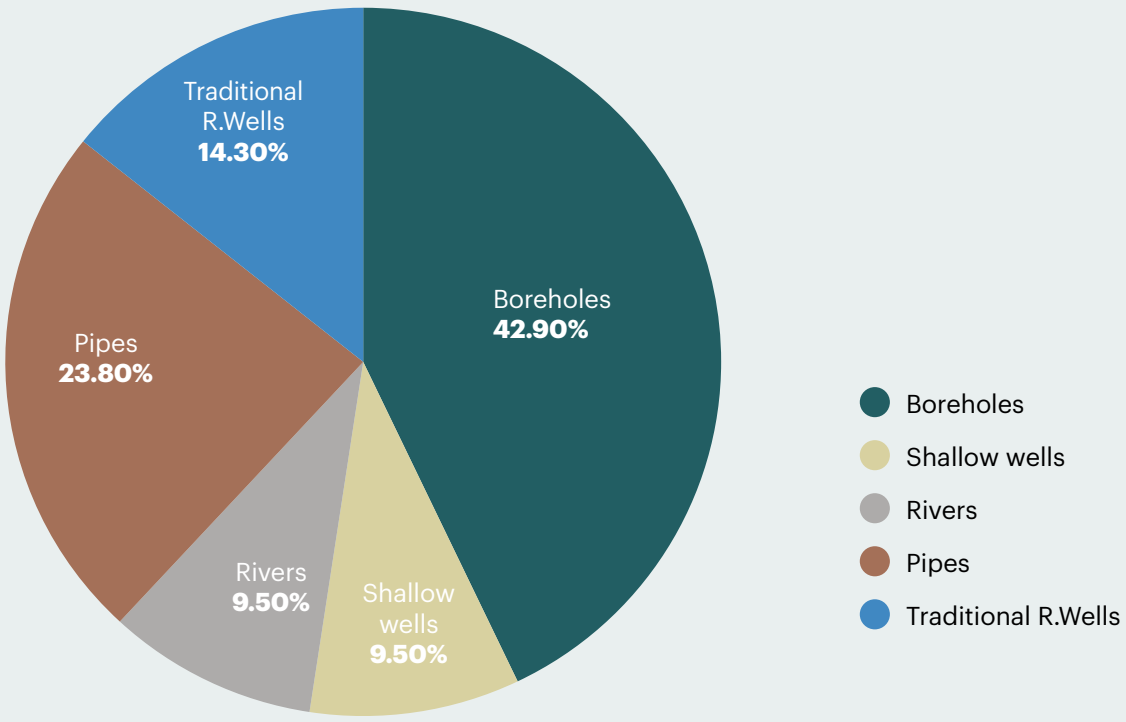
Water scarcity is a major issue, and Isiolo Town's water supply is drawn from three surface sources and a cluster of 14 boreholes, only 8 of which are functional. The drainage system is inadequate for the peak flows experienced, and heavy rains can flood the central commercial district[32]. The main water sources in Isiolo County as of January 2023 are highlighted in Figure 1 below.

Financial planning for the Water Sector in Isiolo

To guide the budgeting for Water Sector activities in Isiolo, extracts from the County Government and development partners are provided as follows:

1. Isiolo County Water Supply and Storage Services
2. Isiolo County WASH budget,
3. Isiolo County Flagship Projects, and
4. On-going interventions in the water sector in Isiolo

Figure 15: Main Water Sources in Isiolo County



Source: Isiolo County Drought Early Warning Bulletin for January 2023

31 Https://kenyarapid.acaciadata.com/media/cluster2/Isiolo_County_WR_Factsheet.pdf

32 Https://issuu.com/tetratechintdev-europe/docs/isiolo_urban_economic_plan/s/11688994

1. Isiolo County Water Supply and Storage Services

Table 16: Isiolo water supply and storage services Budget

Programme 1 Name: Water supply and storage services.
Objective: To increase coverage and access to potable water services for both rural and urban households.
Outcome: Increased coverage and access to potable water services for both rural and urban households.

Sub-Programme	Key Output	Key Performance Indicators	Linkages to SDG Targets*	Planned Targets and Indicative Budget (KSH. M)										
				Year 1		Year 2		Year 3		Year 4		Year 5		Total Budget (KSH. M)
				Target	Cost	Target	Cost	Target	Cost	Target	Cost	Target	Cost	
SP 1.1 Rural water supply and storage services	New water system developed	Number of boreholes drilled and equipped	SDG 6.1, SDG 6.2, SDG 6.4	7	35	7	35	7	35	7	35	7	35	140
		Number of new water pans constructed / de-silting of existing pans	SDG 6.1, SDG 6.2, SDG 6.4	3	16	3	16	3	16	3	16	3	16	80
		Number of sand dams constructed	SDG 6.2 , SDG 6.4	2	10	2	10	2	10	2	10	2	10	50
		Number of rock catchments constructed	SDG 6.4, SDG 6.2, SDG 6.4	2	10	2	10	2	10	2	10	2	10	50
		Number of shallow wells constructed/ rehabilitated	SDG 6.1 , SDG 6.2, SDG 6.4	3	12	3	12	3	12	3	12	3	12	60
		Number of springs protected	SDG 6.1, SDG 6.4, SDG 6 B	1	3	1	3	1	3	1	3	1	3	15
	Piped water extended to critical institutions	Number of critical institutions connected to public water supply	SDG 6.1	5	5	5	5	5	5	5	5	5	5	25
	Pipeline extensions to households	Number of kilometers of pipeline extensions	SDG 6.1	50	50	50	50	50	50	50	50	50	50	250
	Solarized boreholes	Number of boreholes installed with Solar energy	SDG 7	11	22	11	22	11	22	11	22	11	22	110
	Saline water boreholes treated	Number of highly saline boreholes installed with reverse osmosis plants	SDG 6.1	1	2	1	2	1	2	1	2	1	2	10

Sub-Programme	Key Output	Key Performance Indicators	Linkages to SDG Targets*	Planned Targets and Indicative Budget (KSH. M)										
				Year 1		Year 2		Year 3		Year 4		Year 5		Total Budget (KSH. M)
				Target	Cost	Target	Cost	Target	Cost	Target	Cost	Target	Cost	
	Water systems rehabilitated	Number of boreholes rehabilitated	SDG 6.1	21	42	21	42	21	42	21	42	21	42	210
		Number of shallow wells rehabilitated	SDG 6.1	12	24	12	24	12	24	12	24	12	24	120
		Number of sand dams rehabilitated	SDG 6.1	4	8	4	8	4	8	4	8	4	8	40
		Number of water pans rehabilitated/expanded	SDG 6.1	9	27	9	27	9	27	9	27	9	27	135
		Number of kilometers of pipelines rehabilitated	SDG 6.1	21	45	21	45	21	45	21	45	21	45	225
		Number of water kiosks rehabilitated	SDG 6.1	20	5	20	5	20	5	20	5	20	5	25
		Number of water tanks rehabilitated	SDG 6.1	12	24	12	24	12	24	12	24	12	24	120
		Number of water systems power sources rehabilitated	SDG 6.1	21	1	21	1	21	1	21	1	21	1	5
	Mega Dams constructed	Number of mega dams constructed	SDG 6.1, SDG 6.2, SDG 6.4			1	2000			1	25000			27000
		Number of consumer water meters installed in rural water supply schemes	SDG 6.1, SDG 6.4, SDG 6 B	500	2.5	500	2.5	500	2.5	500	2.5	500	2.5	7.5
	Water storages constructed/installed	Number of masonry tanks constructed	SDG 6.1, SDG 6.4, SDG 6 B	9	27	9	27	9	27	9	27	9	27	135
		Number of steel tanks constructed	SDG 6.1, SDG 6.4, SDG 6 B	2	10	2	10	2	10	2	10	2	10	50
		Number of plastic tanks supplied	SDG 6.1, SDG 6.4, SDG 6 B	20	3	20	3	20	3	20	3	20	3	15

Sub-Programme	Key Output	Key Performance Indicators	Linkages to SDG Targets*	Planned Targets and Indicative Budget (KSH. M)										
				Year 1		Year 2		Year 3		Year 4		Year 5		Total Budget (KSH. M)
				Target	Cost	Target	Cost	Target	Cost	Target	Cost	Target	Cost	
	Consultancy conducted for comprehensive surface and underground water potential	Underground ater investigation conducted	SDG 6.1, SDG 6.4, SDG 6 B	1	40	1	40							
	Water options Feasibility studies done	Number of re-feasibility & feasibility studies conducted	SDG 6.1, SDG 6.2 , SDG 6.4	5	10	5	5	5	10	5	10	5	10	50
		Number of hydrogeological studies	SDG 6.2	30	15	30	15	30	15	30	15	30	15	75
		Number of water systems designs	SDG 6.2	30	15	30	15	30	15	30	15	30	15	75
		Number of Environmental Impact and social studies	SDG 6.2	30	15	30	15	30	15	30	15	30	15	17.5
SP 1. 2: Rural Water services Governance	County water and sewerage services master plan developed	A County Water & Sewerage Master plan	SDG 6.2	1	10									10
	Ratified rules and regulations for rural water services	Operational rules and regulations	SDG 6.4, SDG 6.5	1	0.2									0.2
	Community sensitized on rules and regulation for rural water & sanitation services	Number of persons sensitized	SDG 6.4	1000	1	1000	1	1000	1	1000	1	1000	1	5
	Rural water and sanitation services corporation established, registered and operationalized	Number of rural water corporations established	SDG 6.4 , SDG 6B	1	15		15		15		15		15	75
	Rural water schemes applying sustainable service delivery models and professional management	Number of rural water schemes applying sustainable service delivery models and professional management	SDG 6.1, SDG 6.2, SDG 6.4, SDG 6B	1	5	1	5	1	5	1	5	1	5	25

Sub-Programme	Key Output	Key Performance Indicators	Linkages to SDG Targets*	Planned Targets and Indicative Budget (KSH. M)										
				Year 1		Year 2		Year 3		Year 4		Year 5		Total Budget (KSH. M)
				Target	Cost	Target	Cost	Target	Cost	Target	Cost	Target	Cost	
	Community managed water supplies capacity built on Operation, and Maintenance and Management operations	Number of community managed water supplies capacity built	SDG 6.1, SDG 6B	25	12.5	25	12.5	25	12.5	25	12.5	25	12.5	125
	Mapped water point attributes	An up to date database established on water points	SDG 6B	1	10	1	10	1	10	1	10	1	10	50
	Staff recruited	Number of water staff recruited	SDG 6B	10	10	10	10	10	10	10	10	10	10	50
	Vehicles purchased	Number of 4WD Vehicles purchased	SDG 8.2	1	9	1	9	1	9					27
	Water bowsers purchased	Number of water bowsers	SDG 8.2	2	30	2	30	1	15	1	15	1	15	75
	Rural water and sanitation services corporation established, registered and operationalized	Number of rural water corporations established	SDG 8.2	15		4	1.5	4	1.5	4	1.5	4	15	7.5
	Rural water schemes applying sustainable service delivery models and professional management	Number of rural water schemes applying sustainable service delivery models and professional management	SDG 6.1, SDG 6.2, SDG 6.4 , SDG 6B	1	5	5	2.5	5	2.5	5	2.5	5	25	12.5
	Community managed water supplies capacity built on Operation and Maintenance and Management operations	Number of community managed water supplies capacity built	SDG 6.1, SDG 6B	25	12.5	10	3	10	3	10	3	10	3	15
	Mapped waterpoint attributes	Up to date database established on water points	SDG 6B	1	10	10	3	10	3	10	3	10	3	15
	Staff recruited	Number of water staff recruited	SDG 6B	10	10	30	1	30	1	30	1	30	1	5
	Vehicles purchased	Number of 4WD Vehicles purchased	SDG 8.2	1	9	30	1	30	1	30	1	30	1	5

Sub-Programme	Key Output	Key Performance Indicators	Linkages to SDG Targets*	Planned Targets and Indicative Budget (KSH. M)										
				Year 1		Year 2		Year 3		Year 4		Year 5		Total Budget (KSH. M)
				Target	Cost	Target	Cost	Target	Cost	Target	Cost	Target	Cost	
	Water management committees	Number of youth in rural water management	SDG 8.2	30	1	30	1	30	1	30	1	30	1	5
SP 1.3: Rural water quality	Rural water quality monitored	Number of rural water quality testing laboratories established	SDG 6B			1	3.5	1	3.5	1	3.5	1	3.5	14
		Number of water quality test reports	SDG 6.1	20	0.5	20	0.5	20	0.5	20	0.5	20	0.5	2.5
		Number of HHs receiving WASH NFIs	SDG 6.1	3480	87	3480	87	3480	87	3480	87	3480	87	261
		Number of HHs receiving hygiene promotion		29000	21	29000	21	29000	21	29000	21	29000	21	105
SP 1.4: Adaptive capacity to natural disasters	Drought risk management planned and budgeted	Number of early warning information received		4	0.5	4	0.5	4	0.5	4	0.5	4	0.5	2.5
		Mapped drought-stressed hotspots	SDG 13.3	15	1	15	1	15	1	15	1	15	1	15
		Number of water response activities implemented	SDG 6.1	5	40	5	40	5	40	5	40	5	40	200
		Number of highly water-insecure communities served with potable water	SDG 13.2	10	20	10	20	10	20	10	20	10	20	100
		Number of water infrastructure rehabilitated	SDG 6.1	15	30	15	30	15	30	15	30	15	30	150
		Number of borehole breakdowns fixed	SDG 13.2	25	15	25	15	25	15	25	15	25	15	75
	Flood control	Number of flood control structures constructed	SDG 6.1	1	100	1	100	1	100	1	100	1	100	500

Sub-Programme	Key Output	Key Performance Indicators	Linkages to SDG Targets*	Planned Targets and Indicative Budget (KSH. M)										
				Year 1		Year 2		Year 3		Year 4		Year 5		Total Budget (KSH. M)
				Target	Cost	Target	Cost	Target	Cost	Target	Cost	Target	Cost	
SP 1.5 Urban water supply and storage services	Boreholes drilled and equipped in Isiolo town	Number of boreholes drilled and equipped in Isiolo town	SDG 13	2	10	3	15	3	15	3	15	3	15	70
	Reservoirs constructed	Number of reservoirs constructed	SDG 6.2, SDG 6.4			1	20	2	10	2	10			40
	Pipeline extension in town	Kilometers of pipeline laid	SDG 6.2, SDG 6.4	10	10	15	15	20	20	20	20	20	20	85
	Non-functional meters replaced	Number of water meters replaced	SDG 6.2, SDG 6.4	1000	4	1000	4	1000	4	1000	4	1000	4	20
	Water supply facilities secured	Number of water supply facilities fenced	SDG 6.2, SDG 6.4	2	20									20

Source: Draft Isiolo CIDP 2023-2027

2. Isiolo County WASH budget

The Isiolo County Integrated Development Plan for the period 2023 – 2027 provides a blueprint of the county's development framework, including financial plans that will accelerate realization of identified priorities within the water sector. These not only provide guidelines for government allocation of funds to WASH development projects but also inform support mechanisms from non-state actors through grants, loans, and other arrangements such as Public Private Partnerships (PPPs). A reflection of key budget points for the period 2023 -2027 is summarized in Table 1 below.

Table 17: Isiolo County WASH Budget

Programme 2 Name: Urban and rural sanitation services
Objective: Increase coverage and access to sanitation services for both rural and urban households
Outcome: Increased coverage and access to sanitation services for both rural and urban households

Sub -Programme	Key Output	Key Performance Indicators	Linkages to SDG Targets*	Planned Targets and Indicative Budget (Ksh. M)										Total Budget (KSH. M
				Year 1		Year 2		Year 3		Year 4		Year 5		
				Target	Cost	Target	Cost	Target	Cost	Target	Cost	Target	Cost	
SP 2.1: Urban Sanitation services	Sewer line extensions	Kilometers extended	SDG 6.3 SDG 6 A	5	25	5	25	5	5	5	25	5	25	125
	Dilapidated sewer pipes replaced	Kilometers of sewer pipes replaced	SDG 6.3 SDG 6 A			5	25	5	25	5	25	5	25	100
	Manhole chambers rehabilitated	Number of manhole chambers rehabilitated	SDG 6.3 SDG 6 A	200	6	200	6	200	6	200	6	200	6	30
	Relocated sewerage treatment plant to a suitable site downstream of the town	Number of new treatment ponds constructed	SDG 6.3 SDG 6 A	8	100	8	100	8	100	8	100	8	100	500
SP 2.2: Rural Sanitation services	Shared sanitation facilities constructed at rural water supplies	Number of households using shared sanitation facilities at rural water supplies	SDG6.3	30	12	30	12	30	12	30	12	30	12	60

3. Isiolo County Flagship Projects

Aligned with the Kenya Vision 2030, the County Government of Isiolo has identified key flagship projects that are vital towards ensuring increased access to Water, Hygiene and Sanitation (WASH) services. These are identified in the Isiolo CIDP 2023 – 2027 and are summarized below:

Table 18: Isiolo County Flagship Projects

Project Name	Location	Objective	Description of Key Activities	Key Output(s)	Time Frame	Estimated cost (KSH.)	Source of Funds	Lead Agency
Isiolo Mega dam	Oldonyiro	To harvest flood water upstream from Ewaso- Nyiro river	Construction of the multipurpose dam	Dam constructed	2023-2027	22B	National Govt	Ministry of Water (HQs) & County Department Ent of Isiolo PPP arrangements
Kubi Qallo dam	Biliku Marara	To harvest flood water downstream from the Ewaso Nyiro rRver	Construction of a multipurpose dam	Dam constructed	2023-2027	2 B	County & National Govt	Ministry of Water (HQs) & County Department of Isiolo PPP arrangements
Modogashe water project	Modogashe	To provide water to Modogashe town centre	• Drill and equip boreholes • Lay a pipeline to Modogashe town • Booster pumping Construct storage tanks • Set up a water governance structure for Modogashe • water supply	Water supplied to Modogashe	2023-2027	0.5B	County & National Govt	Ministry of Water (HQs) & County Department of Isiolo PPP arrangements
Relocation of Isiolo town sewerage treatment plant to a suitable site downstream of the town	Isiolo town	To increase connectivity to sewerage services in Isiolo town	• Securing land • Construction of new sewerage treatment ponds • Construction of offices and laboratory • Lay new sewer lines to cover the underserved area • Increase connectivity	• Sewerage system for Isiolo town relocated • Connectivity to sewerage services increased	2023-2027	0.2B	County & National Govt	Ministry of Water (HQs) & County Department of Isiolo PPP arrangements
Kenya Off-Grid solar access project (KOSAP)	Countywide	Provision of clean, modern and renewable energy.	• Equipping public facilities with solar systems. • Provision of affordable power. • Provision of clean cooking solutions to residents. • Provision of alternative sources of energy for boreholes	• Access to power. • Development of solar-mini-grids. • Solarization of boreholes.	By 2024. By 2026.	600 million	World Bank.	MOE, Rerec and KPLC.

Source: Draft Isiolo CIDP 2023 – 2027

4. On-going interventions in the Water Sector in Isiolo

National Drought Management Agency (NDMA)

With the shift from pastoralism to agropastoralism, the settlement of pastoralists is increasingly occurring thus heightening domestic water demand in villages and towns. Capital investments under Kenya Vision 2030 and the LAPSSET Corridor are expected to accelerate population growth, further increasing the demand for water. This implies that while there has been growing financial investment in the water sector in the county, much more needs to be done to address the current deficit and future demand for quality water supply.

The NDMA Drought Early Warning Bulletin for January 2023 summarizes key current intervention measures towards enhancing access to water services. These are presented in Table 4a below:

Table 19a: On-going and Proposed Interventions in the Water Sector

Current Interventions					
Intervention	**Ward/Areas**	**Sub-County**	**Action**	**Beneficiaries**	**Cost (KSH)**
1. Provision of water storage tanks (2 tanks - 5000 litres)	Burat and Oldonyiro	Isiolo	AAIK	400 HHs	80,000 -
2. Provision of 10 -10,000 litre plastic water storage tanks with gutters and base for Public Schools	Cherab, Ngaremara, Kinna,	Isiolo Merti Garbatulla	NDMA with support from the EU	2,000 learners	2,000,000
3. Water trucking to Malkagalla, Lakole and, Dadachabasa and Modogashe	Cherab	Merti	CGI	2100 HHs	3,000,000
Planned Interventions					
Intervention	**Coverage**			**Cost (Kshs)**	**Funding Gap (KSH)**
4. Upscale water trucking in water scarce locations in Cherab and Oldonyiro as well as Sericho (Modogashe).	Cherab, Sericho and Oldonyiro			25,000,000	25,000,000
5. Promotion of hygiene and sanitation practices, especially the treatment of water for household consumption, among pastoral and agro-pastoral communities	All wards			5,000,000	5,000,000

6. Initiation of range rehabilitation efforts during the rainfall season to support recovery	Cherab, Garbatulla, Charri, Sericho, Kinna, and Oldonyiro	60,000,000	60,000,000
7. Strengthen the rangeland and peace management structures in Garbatulla, Kinna, and Burat to enable manage the current influx and its likely consequences	Kinna, Garbatulla, and Burat	1,500,000	1,500,000
8. Sensitization and support for voluntary livestock commercial destocking among the pastoralists	Cherab, Charri Sericho, Burat, Ngaremara, Kinna and Garbatulla, Oldonyiro	24,000,000	2,000,000

Other WASH projects

To complement government efforts, Development Partners and Civil Society Organizations (CSOs) continue to play a very significant role in enhancing access to WASH services in ASAL counties in Kenya, including Isiolo County. A list of on-going and planned projects within target ASAL counties where Isiolo County is included is provided below.

Table 19b: On-going and Planned Initiatives by Development Partners

Financing Source	Beneficiary	Implementation Period	Implementation Status (Completed / Ongoing)	Name of Project / Imitative	ASAL County targeted	List all relevant partners	Budget
DANIDA	Water Sector Trust Fund	07.2021-06.2026	Ongoing	Sustainable Management and Access to Water and Sanitation in the ASALs	Turkana, Garissa, Marsabit, Lamu, Isiolo, Tana River	Ministry of Water, Sanitation & Irrigation	DKK 70 million
DGIS Netherlands	SNV, FCDC, AGRA	2020-2023	On-going		Isiolo and Samburu	County Governments, WRA	EUR 3.6 million
DANIDA	Northern Rangeland Trust Fund	2022-2025	Pending approval from Danish Government	Improved access to water and energy for resilient communities and natural resources	Isiolo, Marsabit, Samburu, Turkana, West Pokot, Baringo, Laikipia, Meru, Lamu, Tana River, Garissa	N/A	DKK 35 million

Financing Source	Beneficiary	Implementation Period	Implementation Status (Completed / Ongoing)	Name of Project / Imitative	ASAL County targeted	List all relevant partners	Budget
World Bank	Ministry of Water, Sanitation and Irrigation (MoWSI), Water Sector Trust Fund (WSTF), and Water Resources Authority (WRA)	Planning Phase	Planning Phase	Horn of Africa Groundwater for Resilience Program	Turkana, Marsabit, Mandera, Wajir, Garissa, West Pokot, Samburu, Isiolo, Tana River, Lamu	Regional Center on Groundwater (RCGW), the National Drought Management Agency (NDMA), Water Services Regulatory Board (WASREB), Water Works Development Agencies (WWDAs), Water Resource User Associations, Water Works Development Agencies, Basin Management Committees, and County Governments.	USD 80 million
USAID	N/A	N/A	On-going	STAWI	Isiolo, Samburu, Turkana, Wajir, Marsabit, Garissa, Kitui, Makueni, Taita Taveta	N/A	USD 39.5 million

33 Rapid Integrated Water Assessment in 10 Arid and Semi-Arid Land (ASAL) Counties, Kenya.UNEP-DHI. 2021. https://www.unepdhi.org/wp-content/uploads/sites/2/2022/05/ASAL-Rapid-Integrated-Assessment-Final-Report.pdf

Financing Source	Beneficiary	Implementation Period	Implementation Status (Completed / Ongoing)	Name of Project / Imitative	ASAL County targeted	List all relevant partners	Budget
KFW	N/A	Phase IV: July 2020 to July 2025	On-going	Water Supply and Sanitation for the Urban Poor (WSSUP) Program:	All Counties	N/A	Ksh. 1.27 billion with CounterPart Funding from GoK at Ksh. 253 million

Source: Rapid Integrated Water Assessment in 10 Arid and Semi-Arid Land (ASAL) Counties, Kenya[33].

Annex 3: Isiolo county special projects

Table 20: Isiolo county special projects

Isiolo County

Water, Sanitation, Energy, Environment, Natural Resource and Climate Change sub-sector

Project Name	Location	Objective	Description of Key Activities	Key Output(s)	Time Frame	Estimated cost (KSh)	Source of Funds	Lead Agency
Isiolo Mega dam	Oldonyiro	To harvest flood water upstream from Ewaso Nyiro River	Construction of a multipurpose dam	Dam constructed	2023-2027	22B	National Govt	Ministry of Water (HQs) & County Department PPP arrangements
Kubi Qallo dam	Biliku Marara	To harvest flood water downstream from the Ewaso Nyiro River	Construction of a multipurpose dam	Dam constructed	2023-2027	2 B	County & National Govt	Ministry of Water (HQs) & County Department PPP arrangements

Modogashe water project	Modogashe	To provide water to Modogashe town centre	• Drill and equip boreholes • Lay a pipeline to Modogashe town • Booster pumping Construct storage tanks • Set up a water governance structure for Modogashe • water supply	Water supplied to Modogashe	2023-2027	0.5B	County & National Govt	Ministry of Water (HQs) & County Department PPP arrangements
Relocation of the Isiolo town sewerage treatment plant to a suitable site downstream of the town	Isiolo town	To increase connectivity to sewerage services in Isiolo town	• Securing of land • Construction of new sewerage treatment ponds • Construction of offices and laboratory • Lay new sewer lines to cover underserved areas • Increase connectivity	• Sewerage system for Isiolo town relocated • Connectivity to sewerage services increased	2023-2027	0.2B	County & National Govt	Ministry of Water (HQs) & County Department PPP arrangements
Kenya Off-Grid Solar Access Project (KOSAP)	County-wide	Provision of clean modern and renewable energy.	• Equipping public facilities with solar systems. • Provision of affordable power. • Provision of clean cooking solutions to residents.	• Access to Power • Development of Solar mini-grids	By 2024	600 million	World Bank.	MOE, REREC, and KPLC.
			• Provision of alternative source of energy • for boreholes	Solarization of boreholes.	By 2026			

Source: Draft Isiolo CIDP 2023-2027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