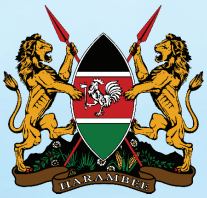
REPUBLIC OF KENYA



MINISTRY OF WATER, SANITATION AND IRRIGATION

THE NATIONAL WATER HARVESTING AND STORAGE STRATEGY (NWHSS) (2020 – 2025)

JANUARY, 2021

Water is Life

Sanitation is Dignity

Irrigation is Livelihood

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Foreword

Water harvesting and storage has been undertaken in Kenya throughout various generations, including artisanal options for harvesting stream and river water using small earth embankments and dams, by both the public and private sectors. Communities and households in Kenya have also, on a small scale, implemented various rainwater harvesting strategies, from roofs, and rainwater run-off. Water is essential for human welfare and economic development of the country. The availability of water for domestic, economic and ecosystem sustenance in addition to reduction of water related risks through infrastructure development and non-structural interventions remain critical for Kenya's development priorities.

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Water is an enabler for the achievement of the "Big Four" agenda on food security, affordable housing, manufacturing and universal health promulgated by His Excellency the President. This National Water Harvesting and Storage Strategy (NWHSS) is timely as we are implementing it at the time when the Water Sector Reforms reaches critical stage at national government and county governments. The Strategy positions this Ministry as the provider of overall leadership in water harvesting and storage as a sub-sector.

This NWHSS has been developed with the consideration of the Constitution of Kenya 2010, which outlines water as a basic human right. The plan has also been aligned to; the Sustainable Development Goals (SDG), Africa Agenda 2063, Vision 2030, National Water Master Plan, Medium Term Plan (MTP III), the Water Act 2016, the Big Four Agenda. It also boosts the Ministry of Water, Sanitation and Irrigation Vision and Mission as articulated in its Strategic Plan. The Sessional Paper on National Water Policy of 2018, Transboundary Water policy and Water Harvesting and Storage (WHS) policy of 2010 have also specifically informed the development of the NWHSS.

The water sector in Kenya faces a number of water harvesting and storage related challenges that directly affect water security and subsequent provision of quality water and sanitation services. This include integrated technical planning, how to sustainably bridge the huge financing gap and meet fast growing demands for water security for the domestic use and socio-economic development now and in the future. However, surface run-off remains high as evidenced during perennial cycles of flooding. The aquifers are being depleted due to unsustainable ground water exploitation and low rates of groundwater recharge. The options for water harvesting and storage include using domestic level roof catchment devices, small

ponds, water pans, shallow wells, boreholes, dams and groundwater infiltration or ecosystem storage. The country has not exploited the full potential of water harvesting and storage, partly due to absence of clear policy, coordinated investment, and application of inappropriate technology.

The Government has adopted a paradigm shift and embraced transformational leadership to champion and enhance sustainable water security and accessibility in the country. The Government has undertaken the development of national public water works for water resources storage and manage national public water works infrastructure for water resources storage among others. This will contribute immensely to the Ministry's target of achieving 80% water coverage by the year 2022 and alleviate the effects of floods and droughts in Kenya.

The detailed strategies are presented in this strategy which also outlines the realistic 5-year medium term mission, objectives and result areas of focus for the WHS sub-sector. The NWHSS provides the medium term roadmap to achieve improved water security through inter-governmental and inter-agency collaboration including community and private sector participation. The NWHSS is for application by water sector institutions, county governments, private sector, social institutions and domestic water users.

It is my sincere hope that the implementation of this strategy shall help the country to make great strides in improving water security to meet the national development goals.

I wish to thank all those who have contributed to the establishment of this important document.

Sicily K. Kariuki(Mrs.), EGH
Cabinet Secretary
Ministry of Water, Sanitation and Irrigation

Preface

This Strategy has been developed to provide guidance on the implementation of the provisions of Water Act 2016. The formulation of National Water Harvesting and Storage Strategy (NWHSS) is premised on the provisions of Constitution of Kenya 2010 (CoK 2010) Schedule 4, Article 14 on consumer protection, Article 19 on national public works, Article 22 (c) on protection of the environment and natural resources with a view to establishing a durable and sustainable system of development for water protection, securing sufficient residual water, Article 24 on disaster management with particular focus on water related disasters and Article 32 on capacity building and technical assistance to the Counties. It also highlights Schedule 4 part 2 Article 11 on County Governments role on county public works and services on storm water management systems in built up areas as a measure for water harvesting and surface water run-off mitigation.

The National Water Harvesting and Storage Strategy, 2020–2025 provides the strategic measures for achieving water security for Kenya towards the realisation of the national water policy priorities and vision 2030. The key strategic interventions areas which were identified in the strategy include strategies to increase domestic water security, strategies to increase water security for socio-economic development, strategies to reduce water related risks for population and economy and strategies to reduce drought related risks for population and economy.

The development of the NWHSS methodological process commenced with desk research and reviews of past related sub-sector strategies, national water harvesting and storage policies and online research in order to draw useful lessons from good global practices. Locally in the water sector, experts drawn from various public entities were consulted to provide key technical inputs and contribute their expertise and experience. This has informed the current version of the strategy.

This strategy presents another good opportunity to review and amend our past shortcomings in the day to day implementation of water sector policies by key sector institutions, county governments, private sector, civil society and the community at large. Water harvesting strategy is the responsibility of the public sector, private sector and domestic household water users with varied roles and responsibilities that ensure that Kenya becomes water secure now and for posterity.

My appreciation goes to World Bank for providing both technical and financial support under the Kenya Water Security and Climate Resilience Project (KWSCRP), Water Sector Reforms Project Implementation Unit (PIU) members, the drafting team, staff of the Ministry and water sector institutions for their participation and demonstrated commitment. It is through this joint effort that we have come up together with this Strategy.

Dr. Andrew Tuimur, CBS
Chief Administrative Secretary
Ministry of Water, Sanitation and Sanitation

Acknowledgment

The Ministry of Water, Sanitation and Irrigation wishes to acknowledge and thank all institutions and individuals who contributed in the development of this Strategy.

In particular, we acknowledge the contributions of Ministry of Water, Sanitation and Irrigation top leadership led by the Cabinet Secretary Sicily Kariuki (Mrs), EGH and the Chief Administrative Secretary Dr Andrew Tuimur, CBS. Special thanks also go to the Water Secretary Eng. SAO Alima for his immense contribution on the harmonisation of the NWHSS by bringing the key input sources such as the Big 4 Agenda.

The National Water Harvesting and Storage Strategy (2020-2025) has been developed through an intensive, inclusive, consultative and participatory approach spearheaded by the Ministry. We therefore wish to appreciate and recognise worthwhile contributions through spirited efforts and sacrifices that made it possible for this strategy to attain the standards it has. It may not be possible to thank each institution and individual for their singular sacrifices, but allow me to take singular honour to extend gratitude to some of them.

Before I do that, I wish to collectively recognise the collaboration and support extended to the Ministry of Water, Sanitation and Irrigation by Water Sector Institutions and the Council of Governors. Our most special thanks and recognition goes to the Ministry's Kenya Water Security and Climate Resilience Project (KWSCRP), financed by the International Development Association of the World Bank, for providing technical and financial support to this process under the Water Sector Reforms Sub component. This sub-component supported water sector reforms, as well as the preparation, implementation and full functioning of the new and proposed legal and institutional framework resulting from alignments with the Constitution of Kenya, 2010 and the Water Act 2016.

Special thanks also go to the task team members from the Ministry, National Water Harvesting and Storage Authority and Water Resources Authority coordinated by David K. Thiong'o (MWSI) and Eng. Fred Machine (NWHSA). My appreciation also goes to GIZ for providing initial technical and financial support under the now ended Water Sector Reform Programme. We are equally indebted to the leadership and staff of various Water Sector Institutions, for their participation and demonstrated commitment. We wish to register gratitude for the professional input and personal commitment of the members of the Water Sector Reforms Project Implementation Unit led by their Chairman, Eng. SAO Alima. We acknowledge the

technical inputs of our two experts seconded by the KWSCRP, Dr. Robert Kibugi (Legal Expert); and Ms. Carolyne Akinyi (Institutional Development Expert) who were instrumental in drafting, revising and redrafting this strategy throughout various stages of development to its conclusion.

Last but not least; it is our hope that this strategy will provide the operational planning and implementation guideline required for water harvesting and storage planning, financing, execution, monitoring and reporting by key sub-sector institutions at national and county government levels.

I am convinced that the strategy has taken a holistic approach, encompassing all water harvesting and storage policy priorities, sub-sector needs and interests including cross – cutting areas such as climate change, affirmative action and disputes & conflicts resolution, to institutional framework, investment planning and financing, and the implementation plan. As we progress towards 2030, let NO ONE be left behind as we work towards a water secure Kenya.

Mr. Joseph W. Irungu,CBS
Principal Secretary,
Ministry of Water, Sanitation and Irrigation.

Acronyms and Abbreviations

AIDS	Acquired Immunodeficiency Syndrome
ASAL	Arid and semi-arid lands
BCM	Billion Cubic Metres
BWSPs	Bulk Water Services Providers
CBS	Chief of the Order of the Burning Spear
CIDP	County Integrated Development Plans
CoG	Council of Governors
CoK	Constitution of Kenya
CS	Cabinet Secretary
CWMPs	County Water Master Plans
DRR	Disaster Risk Reduction
EAC	East African Community
EGH	Elder of the order of the Golden Heart
EIA	Environmental Impact Assessment
EMCA	Environmental Management and Coordination Management Act
ENSDA	Ewaso Ngiro South Development Authority
GHG	Greenhouse Gas
GoK	Government of Kenya
HIV	Human Immunodeficiency Virus
ICRAF	International Centre for Research in Agro-Forestry
IGAD	Inter-Governmental Authority on Development
IWRM	Integrated Water Resources Management
KMD	Kenya Meteorological Department
KNBS	Kenya National Bureau of Statistics
KPHC	Kenya Population and Housing Census
KWS	Kenya Wildlife Service
KWSCRP	Kenya Water Security and Climate Resilience Project
LVBC	Lake Victoria Basin Commission
MAR	Managed Aquifer Recharge

MCM	Million Cubic Metres
MTEF	Medium Term Expenditure Framework
MTP	Medium Term Plan
MWSI	Ministry of Water, Sanitation and Irrigation
NBI	Nile Basin Initiative
NCCAP	National Climate Change Action Plan
NDMA	National Drought Management Authority
NELSAP	Nile Equatorial Lakes Subsidiary Action Programme
NEMA	National Environment Management Authority
NIA	National Irrigation Authority
NWCPC	National Water Conservation and Pipeline Corporation
NWHSA	National Water Harvesting & Storage Authority
NWHSS	National Water Harvesting and Storage Strategy
NWMP	National Water Master Plan
NWRM	National Water Resources Management
OPD	Ongoing: Planning & Design phase
pc	Per capita
PIU	Project Implementation Unit
PPPs	Public Private Partnerships
RVWWDA	Rift Valley Water Works Development Agency
SAGAs	Semi-Autonomous Government Agencies
SDG	Sustainable Development Goals
SSSPs	Small Scale Water Service Providers
TARDA	Tana &Athi River Development Authority
TBD	To Be Determined
TBF	To Be Filled
UNFCCC	United Nations Framework Convention on Climate Change
WASPA	Water Service Providers Association
WASREB	Water Services Regulatory Board
WT	Water Tribunal
WD	Water Demand
WHO	World Health Organisation

WHS	Water Harvesting & Storage
NWHSS	National Water Harvesting and Storage Strategy
NWMP	National Water Master Plan
WR	Water Resources
WRA	Water Resources Authority
WRM	Water Resources Management
WSPs	Water Services Providers
WSS	Water Supply and Sanitation
WSTF	Water Sector Trust Fund
WWDAs	Water Works Development Agencies

Executive Summary

Water harvesting refers to all activities to collect, store and conserve available water resources, temporarily to ensure availability for use when required. Usage is particularly during periods of drought, when no perennial resources are available and for unforeseen emergency application. It therefore includes collection of natural water resources from rainwater, fog, runoff water, groundwater or even waste water. The minimum recommended available water per capita per annum needed for basic personal use is 600m^3.

Over two thirds of the country receive less than 500mm of rainfall per year and 79% has less than 700mm annually. Only 11% of the country receives more than 1000 mm per year. Water harvesting is therefore inevitable to bring water closer to the people and therefore contribute to the right to water. Rainwater harvesting has been carried out in Kenya since 1900's but only gained momentum in the last few decades with aggravation of water scarcity. Rainwater harvesting is key in building resilience occasioned by weather variability and climate change. The practice includes, impounding of surface runoff, roof harvesting, stored in tanks, Pans, on farm retention structures, sub-surface dams, underground in aquifers (Managed Aquifer Recharge (MAR)) and retention of the water in the soil as moisture.

Kenya needs to have strategic reserve of water stored for use during emergencies and unforeseen periods of drought. This can only be achieved through integrated planning, sustainable financing and WHS infrastructure development. The participation of all key stakeholders including domestic household interventions for water harvesting are therefore crucial.

Policy Direction

The overarching Policy statement for WHS in the National Water Policy stipulates that *"The government will implement measures to develop an efficient water harvesting and storage capacity in order to meet the rising demand for water, and, towards realisation of water security in the country, to promote various water uses and sustainable development."*

The highest WHS priority directions the Government will undertake in this strategy include WHS compliance, WHS requirements in spatial planning, WHS information system and baseline data sourcing, national government inter-agency coordination and collaboration and technical and financial planning support to NWHSA, county criteria for county water institutions on WHS and public participation.

There is a declining trend in storage and there is need to increase it given the increasing demand for water. This requires participation of key stakeholders in planning, financing and investments in infrastructure development for water harvesting and storage. This will ensure that the storage capacity is increased from 124 MCM (Million Cubic Metres) to 4.5 BCM (Billion Cubic Metres) by 2030.

Rationale

This strategy has been prepared to provide medium term (5year period) strategic roadmap and coordinated mechanism for the progressive realisation of water resources storage development. Water by nature is a human right and it should be equitably shared among all users including the environment. However, due to declining trends and increasing demands there are tendencies of creating barriers and ownership due to vested interests. Also through devolved governance as outlined in the Constitution of Kenya (CoK) 2010, roles in water resources storage development is a concurrent function between the national government and the county governments. These need to be coordinated such that there is neither an overlap nor gaps in water resources storage development.

Water is also associated with disasters due to climate change effects and normal extreme events as per the weather patterns. These are with regard to flooding and drought incidences whose severity vary hence measures need to be put in place to mitigate them as well as improve adaptation. This also requires involvement of stakeholders and effective coordination. All these interventions require resources which need to be mobilised through innovative funding mechanisms. Therefore, to realise water needs and mitigate its impacts requires the involvement of everyone hence the motto 'all for water' which should ultimately lead to achieving 'water for all'.

The national water harvesting and storage strategy has the following intended uses:

1. It provides sub-sector vision, strategic goals, objectives and strategies to guide the medium term (5 year period) achievements in water harvesting and storage in the public sector and domestic level in line with national water policies for water harvesting and storage.
2. It outlines the operational institutional implementation arrangements and roles for the WHS sub-sector for harmonisation purposes and ease of coordination.
3. Provides the highlights baseline status of high level technical analytical data that inform the WHS sub-sector strategy performance and to aid the planning, implementation review and reporting.
4. Aids in WHS sub-sector execution planning at national sector institutions and county level namely the County Water Master Plans (CWMPs), County Integrated Development plans (CIDP) and national water sector institutional strategies.
5. Unbundles the strategic implementation approach for the national water harvesting and storage policies.

Strategic Vision for Water Harvesting and Storage

Kenya has adequate water security to support social, economic development, environmental use in periods of drought, unforeseen emergencies and absence of perennial resources.

Mission

To address national water stress and human right to water by increasing availability of water for domestic use, social economic development and to mitigate water related risks to Kenyans and the economy.

Sub-sector Goals

Goal 1: Enhanced water security for household, social and economic development.

Goal 2: Improved population coverage of structural resilience for water related disasters.

WHS Sub-sector Objectives

Water security i.e. water harvesting and storage is a multidimensional concept identifiable by three key domains namely: household water security, economic water security and resilience to water-related disasters. Water security in this strategy is rated by an index from 1 to 5 corresponding to five water security stages depicted in table 1. These inform the WHS objectives in this sub-sector strategy.

Table 1:Definition of national water harvesting & storage levels

Level/Definition	Household Water Security	Economic water security	Resilience to water related disasters
1 Hazardous	Access to safe drinking water is limited at household level nation wide	water availability for economic activity is mostly informal and constraining	Droughts and floods widely drive people into poverty.
2 Engaged	Nearly half of the urban households have access to safe drinking water though rural households are largely excluded	water availability for economic activity is both formal and informal but enables some economic activities	Basic attempts are being made to address water-related risks
3 Capable	At least half of the households in country have access to safe drinking water including in rural and urban poor areas	water availability for economic activity is mostly formal and supports most economic activities	The most serious water-related risks in the country are being addressed.
4 Effective	Most households have access to safe drinking water including in rural areas and urban poor	water availability for economic activity is mostly formal and supports all economic activities	Most of the serious water-related risks have been addressed in the country by state of infrastructure and early warning systems.
5 Model	All people have access to safe drinking water	economic activities are not constrained by water availability	water related risks are acceptable and relatively easy to deal with owing to resilience measures in place in the country

The following are the strategic objectives for the WHS sub-sector:

Objective 1.1: Efficient and sustainable increase in water harvesting and storage for domestic use from 'engaged' water security level 2 to 'capable' water security level 3.

Objective 1.2: Efficient and sustainable increase in water harvesting and storage for socio-economic development from 'engaged' economic water security level 2 to 'capable' economic water security level 3.

Objective 2.1: Acceptability level of resilience to water related disaster risks to population & economy improved from disaster 'hazardous' level 1 to 'engaged' level 2.

WHS strategies

There are three categories of strategies for this strategy namely as follows:

Strategies to increase water harvesting and storage for domestic use

1 Set up and operationalise an inter-governmental framework for collaboration that meets semi-annually,
2 Develop an inter-agency collaboration framework to guide in infrastructural development for water harvesting and storage,
3 Develop and operationalise an inter-ministerial water sector coordination framework for water harvesting and storage,
4 Develop a national WHS infrastructure investments master plan and schedule of national pipeline WHS projects,
5 Develop one institutional criteria for all counties WHS and 47 county-based WHS public infrastructure asset maps by end of 2022,
6 Implement at least one new project annually from the schedule of national pipeline WHS public infrastructure using but not limited to sustainable financing,
7 Develop and roll out domestic WHS standards or requirements by end of 2022,
8 Design and develop one national domestic WHS database and information system with inputs by all 47 counties by 2024,
9 Develop and rollout a platform on domestic water harvesting and storage information that is publicly accessible,
10 Promote incentives to encourage private sector participation in domestic water harvesting and storage,

Strategies to increase water harvesting and storage for socio-economic development

1 Identify, plan, prepare at least 3 bankable upstream public infrastructure assets targeting national economic zones.
2 Support the identification, planning and preparation of at least 5 bankable upstream public infrastructure assets for county economic zones using demand based approach.
3 Conduct and report on bi-annual water security for socio-economic development needs and progress reviews.

4 Develop, sign and operationalise water security agreements between NWHSA, Bulk Water Operators & Water Service Providers Association (WASPA).
5 Develop and roll out standards and requirements for rain water harvesting and grey water recycling for businesses, social institutions, commercial building developers and industrialists by end of 2023.
6 Ensure compliance and enforcement of Legal and regulatory measures and systems to enable good governance at business and social institutions level.
7 Develop the national business and social institutions WHS database and information system including baseline data with participation of 47 counties by end of 2024.
8 Develop and implement a framework of incentives and sanctions for rainwater harvesting and storage to enhance the participation of private sector, public benefits organisations and community.
9 Develop and rollout a platform on water harvesting and storage for social-economic development information that is publicly accessible

Strategies to reduce water related risks for population and economy

1 Develop and effect the national floods & storm water structural mitigation master plan by end of 2021.
2 Develop and roll out county storm water mitigation plans for all the 47 counties by 2024
3 Prepare bankable priority list of flood mitigation physical structures (dams) for construction or modification.
4 Counties to plan and conduct regular storm water drainage systems maintenance.
5 Conduct individual flood proofing awareness and sensitisation.
6 Partner with other agencies on land acquisition, use planning controls, building and development controls and catchment flood modelling.
7 Develop and rollout a platform that is publicly accessible on flood information and early warnings.
8 Develop, plan and embark on ground water recharge and storage structures development in at least two pilot counties.
9 Plan and initiate flood water diversion, storage systems and flood water ways projects in at least five pilot counties by 2024.
10 Integrate non-structural water availability drought response into plans and operations at national and county governments
11 Facilitate for WHS public infrastructure emergency water interconnections with other water sources and systems.
12 Conduct assessments of all planned WHS interventions for climate resilience.
13 Develop an integrated WHS data management system for both private and public water harvesting structures with safety status to aid in decision making.
14 Promote incentives to encourage private sector participation in reducing water related risks for population and economy

The following are the main result areas for the WHS in this strategy.

Result 1: More than half the households in the country to adopt water harvesting and storage techniques and technology including in the rural and urban poor areas.

Result 2: Water harvesting and storage capacity to support socio-economic development is increased and formalised.

Result 3: Improved structural resilience for water related disasters country wide

1.0 Introduction

1.1 Background

The collection and management of floodwater, rainwater runoff including waste water reuse to increase the amount of water available for domestic, economic use and ecosystem sustenance is important. It is useful in alleviating water stress for Kenya for now and future generations. Water harvesting refers to all activities to collect, store and conserve available water resources, for use when required. The use is primarily during periods of drought, when no perennial resources are available or during unforeseen emergencies. It therefore includes collection of natural water resources from rainwater, fog, runoff water, groundwater or even treated waste water. The minimum recommended available water per capita per annum needed for basic personal use is 600m^3.

Rainwater harvesting involves the diversion, collecting, storage, usage, and management of runoff through various schemes and as sustainably as possible, in order for the water to be used for domestic, livestock, irrigation and/or commercial purposes. In practice this would include for example managing water in dams, storing rainwater in tanks, or collecting rainwater from roof-tops.

Waste or grey water harvesting refers to systems that collect and recycle waste water for small-scale agriculture. More on this topic can be found in the booklet "Smart Sanitation Solutions". Water storage involves keeping of water in artificial constructions (e.g. water tanks, drums, jars, jerry cans, cisterns), in surface reservoirs (ponds, dug-outs, artificial reservoirs) and in the sub-surface as soil moisture or groundwater. The use of sub-surface storage in aquifers is relatively unknown but offers advantages with regard to storage volumes and natural filtering. Groundwater is often of good quality, but needs checking for possible contamination and for mineral contents above World Health Organization (WHO) standards (salinity, nitrate, iron, fluoride, arsenic).

Water security is a relatively recent term in water resources management. The commonly used definition is of Grey and Sadoff (2007): *water security is the availability of an acceptable quantity and quality of water for health, livelihoods, ecosystems, and production, coupled with an acceptable level of water-related risks to people, environments, and economies.*

The aim of water harvesting is to collect runoff or groundwater from areas of surplus or where it is not used, store it and make it available, where and when there is water shortage. This results in an increase in water availability by either: (a) impeding and trapping surface runoff, and (b) maximising water runoff storage or (c) trapping and harvesting sub-surface water (groundwater harvesting). Water harvesting makes more water available for domestic,

livestock and agricultural use by buffering and bridging drought spells and dry seasons through storage. The development of storage and more so with regard to reliability is affected by among others, anthropogenic activities and climate change. On anthropogenic activities and more so with regard to encroachment into water catchment areas, the consequence is increased siltation and reduction of the life the dam.

On this ground storage development will be accompanied by catchment management practices. Currently the national tree cover is about 7.2% while to reduce impact of siltation, 10% cover is required. On climate change impact, already National Water Master Plan (NWMP) 2030 reported increase in temperatures and consequently increased runoff and stream flows. This affects safety of infrastructure and therefore the designs should include reliabilities of 1 in 10 years probability for domestic and industrial water use and 1 in 5 years probability for irrigation water use. These phenomena should be taken into account in planning storage development.

On water harvesting, the intervention mainly comprises roof water harvesting and surface runoff harvesting which not only enhances water availability but also reduces incidences of flood. Marginal areas with less water resources require more water harvesting and yet rainfall is quite low. For example, over two thirds of the country receives less than 500mm of rainfall per year and 79% has less than 700mm annually. Only 11% of the country receives more than 1000 mm per year. Water harvesting is therefore inevitable to bring water closer to the people and therefore contribute to the right to water. Rainwater harvesting has been carried out in Kenya since 1900's but only gained momentum in the last few decades with aggravation of water scarcity. It is essential not only as a reliable source of water but also for biomass generation in ASALs. According to the 2019 Kenya Population Census, only 3.9 per cent of the total Kenyan households use rainwater as a source of drinking water. This implies that most of the households let water freely flow off in form of rain or storm water. Over time development partners have advocated for rainwater harvesting as a way of enhancing and diversifying water resources. One such initiative culminated into the launch of the Billion Dollar Alliance for Rainwater Harvesting on 11thApril, 2017 supported by ICRAF. This initiative targeted the entire continent with emphasis on multi-actor alliance designed to scale up farm pond technology for agribusiness and livelihood resilience for dry land farming systems. This is an indication that options are available for involvement of various stakeholders including private sector in storage development for diversification.

Rainwater harvesting is key in building resilience occasioned by weather variability and climate change. The practice includes, impounding of surface runoff, roof harvesting, stored in tanks, Pans, on farm retention structures, sub-surface dams, underground in aquifers (Managed Aquifer Recharge (MAR)) and retention of the water in the soil as moisture. The suitability of each method depends on the location and intended use. As stated in the National Water Master Plan (NWMP) 2030, water harvesting measures have mainly in the past been

planned for small and scattered water demand areas such as rural domestic, small scale irrigation, livestock, wildlife and fisheries.

Kenya needs to have strategic reserve of water stored for use during emergencies and unforeseen periods of drought. This can only be achieved through integrated planning, sustainable financing and WHS infrastructure development. The participation of all key stakeholders including domestic household interventions for water harvesting are therefore crucial.

1.2 Legal Framework for Water Harvesting and Storage Services in Kenya

Nationally through water harvesting and storage, a number of infrastructures for water storage are required. It is essential that the storage infrastructure is safe and effective in usage and is developed in consideration of other storage infrastructure taking into account the principles of integrated water resources management.

1.2.1 Constitution of Kenya

The Constitution of Kenya sets the basis for WHS. This is through requirements in article 10 that says all laws and public policy decisions must integrate sustainable development as a national value and principle of governance. The Constitution sets out human rights pertinent to WHS and defines the obligation of the Kenyan State (including the national, and county governments) to respect, protect, fulfil and promote these rights. The core human rights include (i) clean and healthy environment, (ii) safe drinking water in adequate quantities, and (iii) reasonable standards of sanitation. The latter two are socio-economic rights for which the state is required to prioritise vulnerable members of population and ensure progressive realisation. The human right to clean and healthy environment implies that investments of any nature, including WHS must not affect the environmental integrity in a manner that undermines this basic entitlement. This also calls for a balanced approach to ensure that actions to fulfil the two socio-economic rights do not result in erosion of the environment, including the overuse of the available renewable freshwater resources.

The Constitution has established county governments, and in Part 2 of the Fourth Schedule, defined their functions. The national government is responsible for establishing a durable system of sustainable development including water protection, securing sufficient residual water, hydraulic engineering and the safety of dams. The county government are responsible for county public works and services, including storm water management systems in built-up areas; and water and sanitation services. This is in addition to a duty to implement national policies on soil and water conservation, Counties are also responsible for county planning.

1.2.2 Water Act 2016

The Water Act No.43 of 2016 was enacted and came into force in April 2017. It was enacted to harmonise the water sector with the constitutional provisions in accordance with the Fifth Schedule to the Constitution. The Water Act 2016 repealed the Water Act 2002. It represents

a remarkable recognition of the role played by WHS in the water sector and completes the continuum by linking water resources management, and water supply services with water harvesting. The legislation makes provision for the development of this Water Harvesting and Storage Strategy by the Cabinet Secretary. It also establishes the National Water Harvesting and Storage Authority (NWHSA) with various mandates including to:–

a. Undertake on behalf of the national government the development of national public water works for water resources storage and flood control;
b. Maintain and manage national public water works infrastructure for water resources storage;
c. Collect and provide information for formulation by the Cabinet Secretary of the national water resources storage and flood control strategies;
d. Develop a water harvesting policy and enforce water harvesting strategies:
e. Undertake on behalf of the national government strategic water emergency interventions during drought; and
f. Advise the Cabinet Secretary on any matter concerning national public water works for water storage and flood control.

The NWHSA is the successor to the former NWCPC which, although a water sector institution, had been established through a legal notice under the State Corporations Act. Inclusion of both this Strategy and the NWHSA in the Water Act provides a valuable institutional and mandate linkage with the two other critical water subsectors. These provisions must be seen in context of other provisions of the Water Act, including the mandate of the Water Resources Authority to regulate the development and operations of dams for water harvesting and storage. WWDAs are responsible for development of water storage capacity through investments in infrastructure for the WSS sub-sector, and investments by NWHSA could fill the gap as well. Counties have a primary role in this respect and there is no barrier in the Water Act subject to obtaining permits and approvals required from WRA and WASREB for this purpose. Where WHS actions require abstraction, the approval from WRA through a permit is mandatory.This is also the case of private actors, but they also fall under regulation of county governments where development permitting maybe required for certain investments. The functions of the Cabinet Secretary (and by extension the ministry) are at the apex of the institutional structure with a role for policy making, planning and mobilising financing as well as ensuring coordination on the needs and plans of the three water sub-sectors.

1.2.3 Environmental Management and Coordination Act (EMCA)

EMCA is the overall law in Kenya regulating environmental management and it establishes the National Environment Management Authority (NEMA) as the principal agency of government for that purpose. The provisions of EMCA require certain activities specified in the Second Schedule to undergo an Environmental Impact Assessment (EIA). It also requires certain plans, programmes and policies to under the macro-level Strategic Environmental Assessment (SEA). EMCA confers on NEMA the power to supervise lead agencies, which are

any ministries, departments, agencies or counties in which any law vests functions of control or management or any element of the environment or natural resources. This includes actions in the WHS subsector. EMCA provides for development of a National Environment Action Plan, and a County Environment Action Plan and their provisions should be taken into account when planning and implementing WHS activities. Environmental audits, for WHS activities operating under an EIA license are mandatory and permit NEMA to monitor compliance with the issued EIA license. Where consideration for WHS includes water recycling and grey water,compliance with the water quality standards issued under EMCA for various purposes including drinking, agriculture, recreational, or other use, are important.

1.2.4 County Governments Act

The County Governments Act provides the power of counties to develop County Integrated Development Plans (CIDP), the accompanying sectorial plans, and the spatial map of the county. These will play an important role in WHS because CIDP prioritises sectorial actions and forms a basis for financing of counties by the national government. The Spatial plans provide an indicator of geographical availability of space for WHS investments.

1.2.5 Climate Change Act

This law, enacted in 2016, provides that actions by government of Kenya must aim to realisation of low carbon climate resilient development. The law further provides for development of a five-year National Climate Change Action Plan (NCCAP), which identifies priority sectorial actions economy-wide and sets out the necessary inputs to mainstream both mitigation and adaptation actions. This is important for WHS both in terms of how the interventions support Kenya's goal to reduce Greenhouse Gas (GHG) emissions by 30% in the period to 2030 as committed under the Nationally Determined Contributions Kenya submitted in 2015 to the United Nations Framework Convention on Climate Change(UNFCCC) and Paris Agreement. The Climate Change Act requires all entities at the national and county levels of government to mainstream provisions of the NCCAP into the plans and budgets. Thus WHS interventions must interrogate the NCCAP, which is also integrated into the Third Medium Term Plan for Vision 2030. At county level, it is mandatory for counties to mainstream the NCCAP into their CIDPs. Importantly, under section 15 of the Climate Change Act, agencies undertaking WHS at the national level should establish a Climate Change Unit to coordinate and ensure that implementation of statutory mandates mainstream the Climate Change Act, Policy and NCCAP as required by law.

1.2.6 Forest Conservation and Management Act

The Forest Conservation and Management Act was enacted in 2016, and provides for management of public, private and community forests. This law requires that the management of each category of forests should be accompanied by a management plan, which is a land use plan for permitted activities in the forest area. Where WHS interventions are planned, it

will be important to consult with the Kenya Forest Service, relevant county, and private or community forest owner in order to ensure WHS infrastructure does not interfere with forest conservation and management objectives stipulated in the management plan.

1.2.7 Wildlife Conservation and Management Act

The Wildlife Conservation and Management Act provides for the conservation and management of wildlife and the protected areas serving as habitat for wildlife. Wildlife is protected under this law whether it is inside a protected area, or outside a protected area such as on private or community land. Protected areas for wildlife, such as national parks are managed under a management plan, and the Kenya Wildlife Service approves and monitors implementation. Where WHS interventions are planned, analysis will be required to determine if they will impact wildlife outside protected areas; and where this is planned upstream, inside or downstream protected area, the approval of the KWS should be sought to avoid adversely impacting wildlife and the habitat.

1.2.8 Physical and Land Use Planning Act

This law, enacted in 2019, implements the power of the Kenyan State to regulate land use planning under article 66(1) of the Constitution. It provides for the development of various categories of physical and land use development plans, as follows –

(i) National Physical and Land Use Development Plan
(ii) Inter-County Physical and Land Use Development Plan.
(iii) County Physical and Land Use Development Plan.
(iv) Local Physical and Land Use Development Plan
(v) Special Area Plan.

The development and implementation of WHS interventions should ensure the provisions of the relevant physical and land use development plan are analysed and taken into account. Additionally, the relevant development permission under this law should be sought from the county government.

1.3 Policies on National Water Harvesting and Storage

1.3.1 The National Water Policy 2020

The National Water Policy 2020 has been developed in line with the mandate, vision and mission of the ministry responsible for water affairs in Kenya. In particular, the Policy is based on the achievements of the water sector reforms commenced with the enactment of the Water Act, 2002, that was based on the sector principles outlined in the Sessional Paper No. 1 of 1999 on National Policy on Water Resources Management. The spirit of the Constitution of Kenya 2010, sector aspirations in Kenya's Vision 2030 and lessons that have been learnt since 1999 necessitated the urgent need for realignment of the Water Policy to enhance delivery of our mandate. Therefore, the National Water Policy aims at moving the sector to the next level of development in order to contribute to the national goals and global Sustainable Development Goals.

The Government of Kenya is committed to ensuring the realisation of constitutional requirement on the human right to water, and the right to reasonable standards of sanitation as stipulated in Article 43 of the Constitution as well as promoting the human right to a clean and healthy environment espoused in Article 42 of the Constitution. This is a new path that is uncharted and is likely to encounter a myriad of challenges. Nevertheless, through the National Water Policy and the collective commitment of sector stakeholders, the Government is determined to meet its mandate and obligations. The policy also takes into account obligations of the country with regard to regional and international arrangements related to water resources management and environment, such as trans-boundary protocols, arrangements, and treaties; and the Nile Basin Commission Framework. The policy proposes a broad range of measures and actions responding to key water issues and challenges. It seeks to provide the framework for an integrated approach to planning and sustainable development & management of water resources in the country and progressive realisation of the human rights on water, sanitation and environment.

The goal of the policy is to guide the achievement of sustainable management, development and use of water resources in Kenya. It provides a framework for sustainable management and financing of water resources; water harvesting and storage; and for equitable, efficient, and universal access to water supply and reasonable standards of sanitation, for domestic, economic use and ecosystem sustenance. It provides guidance for aligning the water sector to the Constitution of Kenya especially with respect to the establishment of mechanisms to guide intergovernmental and, institutional coordination for better delivery of respective functions.

The specific objectives of the policy pertinent to WHS are as follows: -

i) To strengthen sustainable water resource management in the country.
ii) To promote development of water harvesting and storage infrastructure.
iii) To accelerate delivery of water supply services through progressive realisation of the human right to water towards universal access.
iv) To accelerate delivery of sewerage and non-sewerage sanitation services through progressive realisation of the human right to reasonable standards of sanitation towards universal access.
v) To strengthen water education, training, research and innovation to be responsive to the water sector needs.
vi) To implement mainstreaming of climate change considerations, and disaster risk reduction throughout the water sector.
vii) To enhance the mainstreaming of gender considerations in water sector towards progressive attainment of gender equality.
viii) To put in place mechanisms to manage conflicts in the water sector, enhance the use of alternative dispute resolution and operationalise the Water Tribunal.
ix) To implement mainstreaming of affirmative actions to enhance equity and equality and integrate the interests of the youth in the water sector.

x) To strengthen coordination in investment planning in the water sector at national, county, and intergovernmental level.

xi) To strengthen integrated and sustainable resource mobilisation, effective, efficient financing throughout the water sector at national and county levels.

xii) To implement a harmonised, coherent and constitutionally compliant regulatory framework for devolution of water sector functions, and, for the management of intergovernmental relations in order to ensure performance of respective mandates, and management of interdependent mutual relation between the national government, and county governments.

xiii) To guide establishment of harmonised and cost efficient institutional arrangements and operations for the national, and, county level water sector institutions.

xiv) To set up a strengthened implementation framework for effective and efficient delivery, monitoring, evaluation, and reporting on progress on the implementation of this policy

The overarching policy statement for WHS stipulates that *"The government will implement measures to develop an efficient water harvesting and storage capacity in order to meet the rising demand for water, and, towards realisation of water security in the country, to promote various water uses and sustainable development."*

The following are the prioritised policy directions that the Government commits to undertake in relation to WHS sub-sector.

On the highest WHS priority directions the Government will undertake the following in this strategy: -

S/No	***Policy Direction***
1	WHS compliance
2	WHS requirements in spatial planning
3	WHS information system
4	National government inter-agency coordination & collaboration
5	Technical and financing support to national WHS entity
6	County criteria for county water institutions for WHS
7	Private sector, civic and community participation
8	Climate change mainstreaming for WHS decisions and investments

The second highest priorities on WHS set for next NWHSS include the following:

S/No	***Policy Direction***
1	WHS mainstreaming into Disaster Risk Reduction (DRR) programmes
2	All inclusive financing mechanism for WHS
3	Storm and grey water recycling mechanism
4	Sustainable framework for ground water recharge

1.3.2 Trans-boundary Water Policy

More than 54% of water resources are transboundary which are contained in the following systems:

i. Lake Victoria in Catchment 1 shared with Tanzania and Uganda; Lake Victoria is the world's second largest fresh water lake and strides the borders of Kenya, Tanzania and Uganda and with a catchment area which extends to the five East African countries. Lake Victoria with its greatest natural resource potential also forms part of the Nile River System.
ii. The Rivers Sio-Malaba-Malakisi, Lwakhakha, and Suam shared with Uganda;
iii. Lake Turkana, which is the world's second largest desert lake and whose catchment extends to Ethiopian highlands and which Kenya shares with Ethiopia.
iv. The River Omo shared with Ethiopia;
v. The River Daua shared with Ethiopia and Somalia in the EwasoNgiro North Catchment; and
vi. The Rivers Mara (Lake Victoria Basin), Umba, Lumi and Pangani; and Lakes Natron, Jipe and Chala (Athi River Basin) shared with Tanzania.

Initiatives in these basins in the form of water harvesting and storage development will in one way or another have cross border effects therefore policies governing transboundary water use become handy in effecting national storage development and flood. Platforms to be used to reach out to cross border stakeholder to create enabling environment for water harvesting and flood include NBI/NELSAP, EAC/LVBC and IGAD. Good practices such as the annual Mara Day will be up-scaled to include other cross border transboundary basins. These interventions will be executed within the transboundary policy objectives which encourage involvement of riparian communities and states at ground level and policy level respectively to facilitate storage development and coexistence.

1.4 Inter-Governmental Collaboration Framework for WHS Strategy

The framework is developed in line with Inter-Governmental Relations Act No. 2 of 2012 section 13(2) to define water sector forum as a platform for consultation and to synergise initiatives from national and county perspectives on water resources management and service provision. In this context the platform will serve to promote synergy in water harvesting and storage development from national and county government perspectives. With regard to flood control, and water related emergencies the platform can be used to reach out to stakeholders for immediate response and restoration of normalcy using the county mechanisms.

1.5 WHS Key Stakeholders and their Institutional Roles

The following are the key and primary stakeholders for water harvesting and storage services sub-sector as espoused in this strategy. Each of the stakeholder category has needs, interest and power that eventually impact on the performance of the sub-sector in one way or another. At the apex is the Ministry of Water, Sanitation and Irrigation (MWSI) which is vested with the overall mandate of fulfilling the national government constitutional obligation of fulfilling

the human right to water and reasonable standards of sanitation. The ministry also leads in creating an enabling environment through the development of conducive and enabling policies. It also supports in ensuring availability of resources for water harvesting and storage sub-sector performance. The ministry is therefore a key stakeholder in terms of critical decisions that impact on the WHS sub-sector performance.

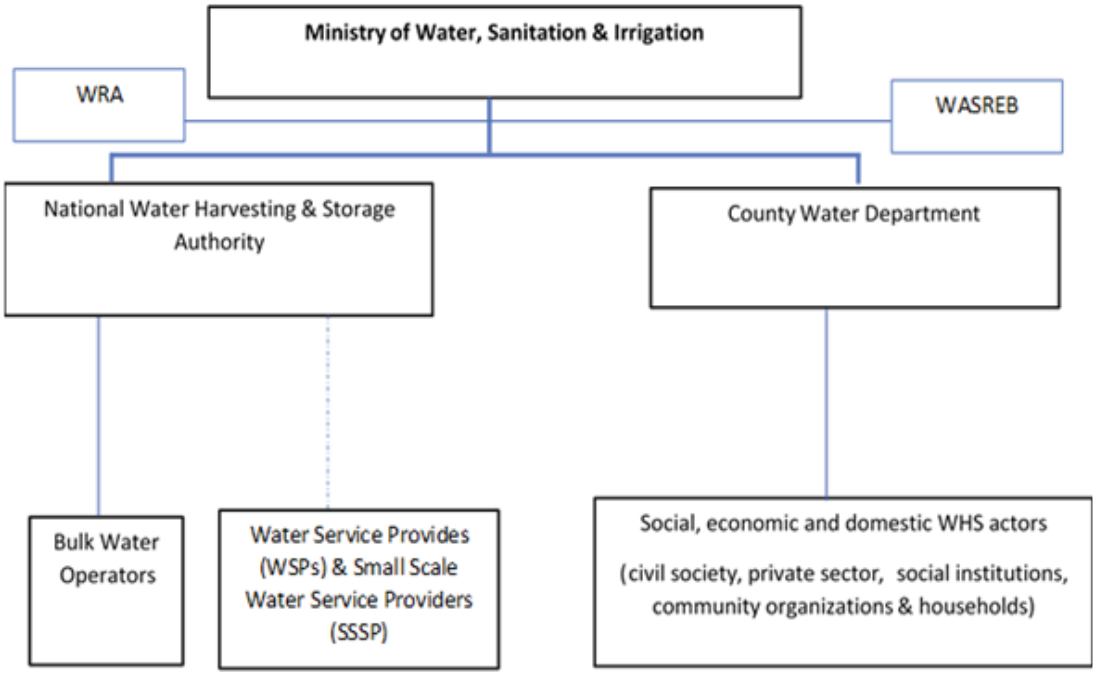


Figure 1: *WHS sub-sector stakeholders and institutional roles*

The next level of key stakeholders arethe two key regulatory institutions in the water sector, which are national government institutions namelyWater Service Regulatory Board (WASREB) and Water Resources Authority (WRA).

The third level of key stakeholder institutions are namely the National Water Harvesting and Storage Authority and the County Water Departments.

The needs and interests of county water department are also expressed through the Council of Governors Committee on water and natural resources. County water departments are therefore important as they undertake county level sectorial planning that affect progress of water harvesting and storage in their areas of jurisdictions. Further, counties are constitutionally assigned many mandates such as agriculture, water supply and sanitation services which require availability of water resources.

The fourth tier comprises of varied organisations or entities. These also include the bulk water operators, small scale water and sanitation service providers and varied civic organisations. The social, economic and domestic WHS actors include the non-state actors, private sector, community organisations and respective households. These entities are responsible for

uptake and adoption of WHS technologies in private capacity for their social and economic development.

The specific roles and responsibilities in the provision of water harvesting and storage services are summarised below.

1.5.1 Ministry of Water, Sanitation and Irrigation

The Ministry of Water, Sanitation and Irrigation (MWSI) through its Directorate for Water Storage is responsible for tracking and consolidation of national outlook of water storage developments. It is in charge of ensuring coordinated water storage and flood control developments country wide. MWSI is also incharge of the following:development of national policy, sub-sector strategies, sector coordination, national sector data and information including data quality, integrated sector development planning, technical quality assurance, sector financing, resource mobilisation & partnerships, sector level institutional development, good governance and strategic sector communication.

1.5.2 Water Services Regulatory Board

Water Services Regulatory Board (WASREB) is responsible for the regulation of water and sanitation services not limited to:licensing of Water Service Providers, determining standards for water services, monitoring compliance with set standards, reporting water services for consumer protection. This would infer to the regulation applicable to release for consumption water harvested and stored through developed public and private water infrastructure.

1.5.3 Water Resources Authority

Water Resources Authority(WRA) is to formulate and enforce standards, procedures and regulations for the management and use of water resources and flood mitigation - WR Regulator role across all the standard WRM sub-sectors, regulate the management and use of water resources – set regulations, enforce Regulations made under the Act – compliance of WRM set Regulations, receive water permit applications for water abstraction, water use and recharge and determine, issue, vary water permits; and enforce the conditions of those permits. Water allocation is a core function involving demand management and availability. It collects water permit fees and water use charges – e.g. assessment, user, polluter, inspection etc. advises and provide information for formulation of NWRM policy, water storage and flood control strategies; coordinate with other regional, national and international bodies for the better regulation of the management and use of water resources, determine and set permit and water use fees – with respect to classes of water use and to set up the National Monitoring and Information System for water resources.

1.5.4 National Water Harvesting and Storage Authority

National Water Harvesting and Storage Authority(NWHSA) is in charge of the development of national public water works for water resources storage and flood control, maintaining and managing national public water works infrastructure for water resources storage,collecting

and providing information for the formulation of the national water resources storage and flood control strategies,developing a water harvesting policy and enforce water harvesting strategies, undertake strategic water emergency interventions during drought and advising the CS on any mater concerning national public water works for water storage and flood control. NWHSA may also appoint agents for the operation, management, maintenance and safety of any storage infrastructure that it has developed.

1.5.5 Water Tribunal

Water Tribunal (WT): Arbitration of water-related disputes and conflicts between individuals, institutions and organisations.

1.5.6 County Water Department

County Water Department is in charge of the development of country public water works for water resources' storage and storm water control, development of county institutional operating policy and strategy formulation in line with national water policies, county water sector coordination, guidance, monitoring and evaluation. County water sector investment planning and sustainable financing including in liaison with national government, registration of county level water and sanitation service providers and ownership of public WSPs.

1.5.7 Bulk Water Service Providers

Bulk Water Service Providers (BWSPs) provide bulk water supply, sewer and non-sewer sanitation services, operation, maintenance and management for downstream use by water services providers. They are responsible for bulk water apportionment to various WSPs. BWSPs are often involved in water harvesting and storage, such as through dams.

Further institutional collaboration with the following national government entities are required for the achievement of the WHS strategy vision, goals and objectives.

1.5.8 Ministry of Industrialisation

The Ministry of Industrialisation drives the development of special economic zones in the country. To ensure required water security for these economic zones, collaboration from planning to development phase is needed between Ministry of Industrialisation, MWSI, NWHSA and WASREB. NEMA and WRA need to further collaborate on the setting and testing of quality standards (waste-water, effluent, sludge, etc.) including water treatment and laboratory chemicals to ensure access to good water quality in the economic zones.

1.5.9 Ministry of Agriculture and County Agriculture departments

The Ministry of Agriculture and County Agriculture Departments work closely with farmers on day to day basis for on-farm water harvesting and storage. There is need for collaboration between NWHSA and the Ministry of Agriculture and County Agriculture departments on the implementation and enforcement of water storage policy and strategies.

1.5.10 National Drought Management Authority (NDMA)

Drought emergencies are coordinated by NDMA but the NWHSA ensures adequacy of public infrastructure to provide emergency water supply to the victims. NDMA has an important role to advise on investments needed to increase water harvesting and storage capacity that is adequate for use during emergencies and droughts.

Table 2: Summary analysis of institutional roles in water storage, floods and drought emergencies

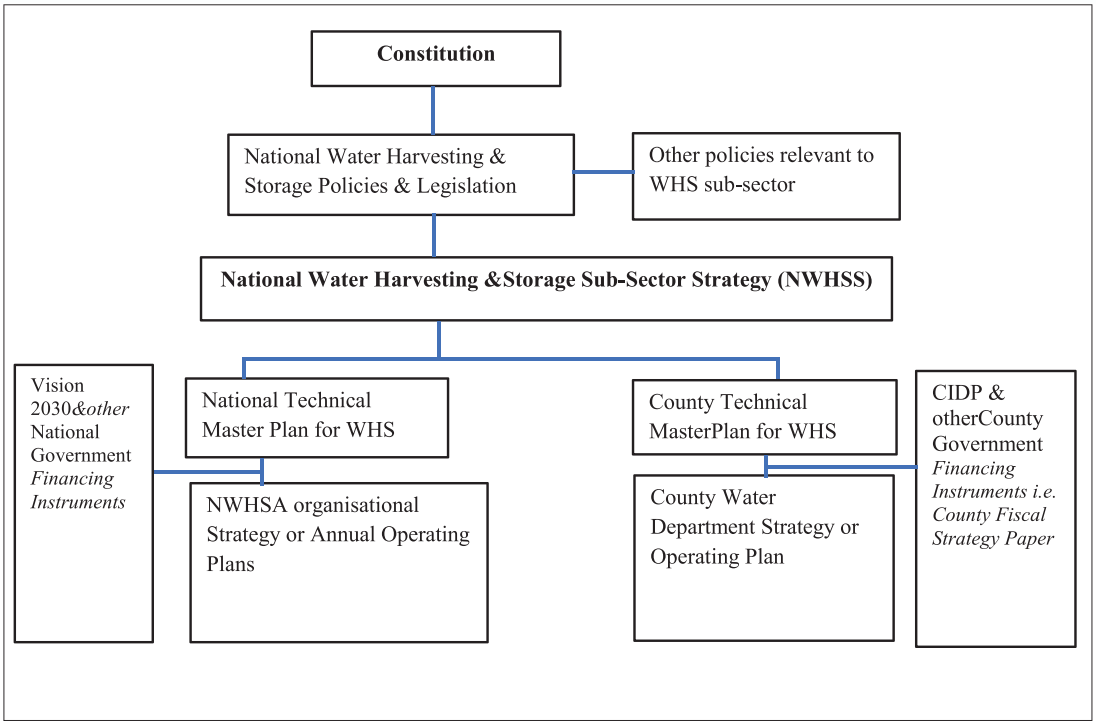
Role	Institution
National planning of storage & flood infrastructure	MWSI- Directorate for water storage
Institutional and project planning of storage & flood infrastructure	NWHSA, National Irrigation Authority (NIA), private sector, regional development authorities, county water departments
Data and information	WRA, KMD, NDMA, NWHSA and Ministry of Water, Sanitation and Irrigation.
Water storage and flood control infrastructure development	NWHSA, NIA, private sector, regional development authorities, county water departments
Maintenance of infrastructure	
Safety of infrastructure	WRA, NWHSA, MWSI and NEMA.
Standards and guidelines for design of water storage and flood, storm water control infrastructure	WRA & WASREB.
Non-structural flood and drought mitigation	Civil society, NWHSA, county government, NDMA

As outlined above, the identified roles involve a number of key stakeholders and strategy level coordination is required for effective execution of the strategy.

1.6 Technical Planning Structure

The WHS Strategy recognises the different levels of technical and operational planning for the sub-sector. To create common understanding and working synergy, this strategy presents the following technical sub-sector planning framework in line with the legal provisions:

Technical WHS Sub-Sector Planning Framework



There are 5 tiers of planning that span the long term, medium term, strategic organisational planning levels for the water harvesting and storage sub-sector in Kenya.They are aligned to ensure that there are integrated planning processes that work towards WHS service delivery for Kenyans in accordance with the Constitution.

In the **first and apex** tier is the **Constitution** which is the overarching sub-sector planning pillar for the WSS. It provides the **national planning vision** for the sub-sector.

At the **second level** is the National Water Policy. The Water Act is also a critical anchor in the second level of planning in addition to the WHS regulations.

The National Water Policy provides the national planning directions towards the fulfilment of prioritised WHS policy directions. The national legislation i.e. the Water Act anchor key aspects of the national water policy and also provide the legal institutional arrangements required. The regulations are key sub-sector operational instruments required by law and are also in line with the Constitution. The delivery of the goals at this level is realised, in practice, through a National Water Masterplan which correlates the needs and priorities across water resources management, water harvesting and storage, and water supply and sanitation.

The third national planning level for the sub-sector is this NWHSS. It provides the high level technical prioritised national approaches and strategies to be applied by sub-sector stakeholders. It anchors the policy and legislative sub-sector priorities as key instrument in the

medium term technical planning framework. It also provides the sub-sector level performance measurement benchmarks and result areas for joint implementation by key stakeholders.

The fourth level is the technical tacticaltier that anchors national cross-county and county public WHS technical master plans. These specific national and country plans are known as the national WHS master plan and the county WHS master plans respectively. These plans are the technical blue prints for WHS project plans and programmes. They also advance the implementation of priorities defined in this NWHSS.

The fifth level is the organisational or county departmental planning level for the sub-sector. This planning level is articulated in respective organisational strategy document and subsequent annual operating plans. The targets from planning level documents in this level namely the NWHSA organisational strategy and the county water department strategy also inform the performance contracts at respective national or county government working levels.

2.0 Baseline Water Harvesting and Storage Services Technical Analytics

2.1 Water Harvesting & Storage in the Public sector

2.1.1 Current structural capacity for water harvesting and storage

The current status shows that nationally, there are 26 large dams with about 3,906 MCM of stored water for hydropower. The total capacity of the major water supply storage dams is about 95 MCM. Another 47 relatively large non-hydroelectric dams and 3000 small dams together with pans have a total storage of 124 MCM. This is below the threshold value of 4.5 BCM implying that there is need to increase storage about 30 times. Estimates by Ministry of Water, Sanitation and Irrigation shows that increasing storage volume by 3.2 BCM will require about US$ 1.5 Billion (Kshs 112 Billion) which will give a total of 3.224 BCM by 2030 against the target of 4.5 BCM.

The coverage of water supply systems by various sources indicates the level of access from the various sources. The sources and the level of coverage for urban and rural population are given in Table 3 with projections to 2030 as documented.

Table 3: Water demand project per source, population in millions

Year	Area	Piped by WSPs	Spring/Well/Borehole	Water Vendor	Stream Lake and others	Total
2010	Urban	7.1 (54%)	3.1(24%)	1.7(13%)	1.2(9%)	13.1(100%)
	Rural	4.1(16%)	10.9(43%)	0.5(2%)	9.9(39%)	25.4 (100%)
	Total	11.2(28%)	14.0(37%)	2.2(6%)	11.1(29%)	38.5 (100%)
2030	Urban	46.0(100%)	0.0 (0%)	0.0 (0%)	0.0 (0%)	46.0(100%)
	Rural	4.7 (22%)	17.1 (78%)	0.0 (0%)	0.0 (0%)	21.8(100%)
	Total	50.7(75%)	17.1 (25%)	0.0 (0%)	0.0 (0%)	67.8 (100%)

The reliability of the coverage by WSPs is only realistic if the source is stable which is only possible if there is storage. Further statistics shows that 450 MCM serves 55% of the population including rationing. 25% additional water supply is required without rationing. To realise this one needs 4% storage development per year to meet the remaining demand. In total 675 MCM storage is required to cater for urban population by WSPs.

Achievements in construction of large dams by national water include rehabilitation of Maruba dam in June 2010 which resulted in increase of storage from 0.60 MCM to 2.45 MCM. This has resulted in increase of water supply to Machakos from 2,050m^3/day to 8,700 m^3/day. Umaa dam project, which is 68% complete, is estimated to store 870,000 m^3 and will increase water supply to Kitui town by 2,500 m^3/day and serve 75 000 people. Planned dams by Athi Water Works Development Agency include Karimenu II, Bathi and Maragua Dams.

Table 4: Status of water storage infrastructure development (2015-2019)

Dam / Transfer	Entity	Costs(Kshs Million)	Use	Storagecapacity (MCM)	Funding source	Status
1. Maruba Dam rehab	NWHSA	305.98	WS	2.45		O&M
2. Kiserian Dam	NWHSA	989.00	WS	1.20		O&M
3. Chemususu Dam	NWHSA	4,861.14	WS	12.00	GoK	O&M
4. Ndarugu Dam			WS/IR	225.00		TBD
5. Theta Dam	Athi		WS	2.00		O&M
6. Ruiru 2 Dam	Athi		WS	18.00		Tender Awarded
7. Thiririka 3 + Rwabura 4	NIA		WS/IR	7.00		TBD
8. Ruaka Dam			WS	4.00		Feasibility Studies & procurement Stage
9. Kamiti 1 Dam	Athi		WS	16.00		Feasibility Studies & procurement Stage
10. Stony Athi Dam			WS	23.00		Feasibility Studies complete
11. Upper Athi Dam			WS	24.00		TBD
12. Kikuyu Dam			WS	31.00		TBD
13. Munyu MP dam	TARDA		HY/IR/WS	600.00		TBD
14. Mbuuni Dam			WS	10.00		TBD
15. Kiteta Dam			WS	16.00		TBD
16. Kajiado dam	ENSDA		WS	12.00		TBD
17. Thwake Dam	NIA		HY/IR/WS	600.00		On going
18. Little Kiboko Dam						TDB
19. Itare Dam	RVWWDA	30,278.00	WS & Industrial	28	Loan/GoK	Stalled -
20. Murunyi (Siyoi)	NWHSA	9,640		8.9	GoK	On going
21. Badasa Dam	NWHSA	178.29	WS	5	GoK	Stalled – under design review
22. Umaa Dam	NWHSA	202.56		0.87	GoK	Stalled – under design review
23. Londiani Dam	NWHSA	96.94		55	GoK	Final Design Stage
24. Upper Narok Dam	NWHSA	112.36		23	GoK	Design Stage
25. Rumuruti Dam	NWHSA	167.05		30	GoK	Design Stage
26. Soin-Koru	NWHSA	26,480		93.7	GoK	Tender Awarded
27. Isiolo Dam	NWHSA	56.24	WS/HY	214.00	GoK	Final Design Stage
28. Rare Dam	NWHSA	84.98		30	GoK	Final Design Stage
29. Pesi (Nyahururu) Dam	MWSI				GoK	Design Stage
30. Kinja Dam	NWHSA	30,300			GoK	Design Stage

Dam / Transfer	Entity	Costs(Kshs Million)	Use	Storagecapacity (MCM)	Funding source	Status
31. Kinale Dam	NWHSA	35,250			GoK	Design Stage
32. Bosto	NWHSA	22,105,253	WS	18.3	Lonas	Tender Awarded
33. Mwache Dam	MWSI	13,000.00	WS & IR		WB/GoK	Tender Awarded
34. Makamini Dam	CWWDA	1,283.01	WS	4.25	GoK	Tender Awarded
35. Thiba Dam						
36. Malewa Dam						
37. Itare Dam						
38. Ololoitikosh Dam		4,000.00	WS	6.0		Feasibility Studies Stage
39. Maragua Dam						
40. Gatamaiyu Dam	AWWDA	5,500.00	WS	4	TBD	Feasibility
41. Riara dam	AWWDA	450.00	WS	0.3	WB/GOK	O&M
42. Maragua 4	AWWDA	30,000.00	WS		TBD	Tendering Stage
43. Thika 3A	AWWDA	220.00	Ws/hydro	1	Danida	Feasibility
44. Tuthu dam	AWWDA	55.00		0.2	TBD	Construction Stage
45. Karimenu II dam	AWWDA	24,000.00	WS	18	Exim/GOK	Construction Stage

TBD – To be determined; WS – Water services; WR – Water resources; IR – Irrigation; HY – Hydropower

Notes:

1. Costs indicated for Badassa and Umaa are for Consultancy Services for the review of the constructed works.
2. Costs indicated for Londiani, Upper Narok&Rumuruti are for feasibility studies and designs and not for the proposed Construction Costs.
3. Pesi (Nyahururu) Dam, Kinja Dam &Kinale Dam are no longer with NWHSA. Ministry to guide on this.

The national status of water storage public infrastructure comprises of **26** dams according to data contained in NWMP 2030. **Four** are under construction in 2020 as at the time of the development of this Strategy.

The national status of storage development is shown in Table 5 below.

Table 5: Summary WHS projects (2009-2016)

Institution	Capacity (m^3)	Cost (Kshs)	Duration	Remarks
NWHSA	22,070,000	6,601,435,700	2009-2013	Umaa (61%), Badasa (57%), Chemususu and Kiserian. Duration 4 years
Coast	168,797	63,405,880	2013/2014-2015/2016	2small dams and 7 pans, duration 3 years
Lake Victoria North	69,700	26,144,660	2013/2014-2015/2016	3 small dams
Lake Victoria South	70,000	26,458,175	2013/2014-2015/2016	2 small dams and 2 pans
Northern	602,960	308,215,218	2013/2014-2015/2016	1 small dam and 21 pans
Rift Valley	217,142	132,795,677	2013/2014-2015/2016	2 small dams and 8 pans
Tana	94,600	37,573,030	2013/2014-2015/2016	2 small dams and 1 pan
Tanathi		147,517,302	2013/2014-2015/2016	13 small dams and 8 pans
Athi	490,295	742,109,942		25 small dams and 47 small pans

Current status of water harvesting entails 1,000 small dams and pans since 2005 with a total capacity of 27 MCM. By 2003 the total number of dams / water pans was 4,037 and together gives an existing capacity of 74 MCM. On rock catchment, available information indicates that in 1993, 12 rock catchments facilities with a total of 1,015 m^3 were constructed in Ewaso Ngiro North catchment area while records from NWCPC shows that 2 rock catchments with a total of 25,000 m^3 have been constructed.

Varied water storage interventions exists countrywide but there is need to conduct a comprehensive information review on the same to inform realistic planning of storage development.

Small dams and pans have been constructed over time with arid and semi-arid areas being the main targets. Since 2005/2006, NWCPC has constructed / rehabilitated 1,019 small dams/ pans across the country in ASAL areas. This has increased the national water storage by about 18.5 MCM serving about 1 million people and over 2 million livestock.

2.1.2 Water availability and demand

The freshwater endowment which is renewable annually and which is available for development is 22.576 BCM. This constitutes renewable surface water of 20.637 BCM/year and sustainable yield of ground water resources is 1.939 BCM/year as stated in National Water Master Plan 2030. Due to impacts of climate change, the available water resources are expected to increase to 26,664 MCM and 28,459 MCM per year by 2030 and 2050 respectively. These translate to per capita water availability of 586 in 2010, 393 in 2030 and 294 m^3 in 2050. The main driver of this is population which is estimated to be 38.53 million, 67.84 million and 96.89 million respectively hence the decreasing trend of per capita water even though mean annual rainfall is estimated to increase in the order of 679 mm, 750 mm and 801 mm in 2010, 2030 and 2050 occasioned by increase in vapour transpiration resulting from increase in surface air temperatures by 10 in 2030 and 20 in 2050. The decreasing reduction in per capita water is therefore inevitable hence the need for options to improve availability at the point of need. In terms of spatial variability, Tana catchment area has the highest portion with about 29% of the water resources, Lake Victoria South has 22% while and Lake Victoria North 21% with Athi catchment area being the least with 7%. EwasoNgiro North and Rift Valley catchment areas have about 10% and 11% respectively. These two areas are the most expansive and experience effect of water scarcity most in addition to lower Tana and Lower Athi catchment areas. They comprise ASAL areas with sparse population and low rainfall ranging from 600 to 800 mm annually hence the need to relatively intensify water conservation and storage to enhance water availability especially during dry seasons.

On water demand, there are six major areas namely domestic, industrial, irrigation, livestock, wildlife and fisheries. Total water demand increased steadily from 2,073MCM in 1990 and was projected to reach 5,817MCM in 2010 according to National Water Master Plan 1992 but it declined to 3,218 MCM mainly due to reduction in irrigation water use which dropped

to 1,602 MCM against the estimated value of 4254MCM. With the strategy to revitalise agriculture, irrigation is set to increase steadily until the potential of 1.3 Million ha is realised by 2030 which will result in ultimate water demand of 18,048 MCM a year constituting 84% of total water demand. Thereafter it will remain constant while domestic, industrial, livestock and fisheries will continue to increase.

By 2030 it is estimated that domestic water demand will be 2,561 MCM /year from 1,186 MCM in 2010. Respective figures for industrial, livestock and fisheries are 125 MCM and 280 MCM, 255 MCM and 497 MCM, and 32 MCM and 74 MCM respectively. In total the demand will increase to 21,486 MCM in 2030 and 23,141 MCM in 2050.

A comparison of demand against availability of water resources is shown in the Table 6 below, which shows that Athi and Tana catchment areas will have their demand higher than availability by the year 2030 while Ewaso Ngiro North will surpass the availability by the year 2050. Rift Valley, Lake Victoria South and Lake Victoria North will still have their demands less than availability by the year 2030 being 81% and this will remain constant up to 2050. The increasing demand put a lot stress on natural water resources and therefore the need to increase water availability through storage development.

Table 6: NWMP water availability vs demand

Catchment Area	2010			2030			2050		
	WR	WD	WD/WR	WR	WD	WD/WR	WR	WD	WD/WR
Lake Victoria North	4742	228	5%	5077	1337	26%	5595	1573	28%
Lake Victoria South	4976	385	8%	5937	2953	50%	7195	3251	45%
Rift Valley	2559	357	14%	3147	1494	47%	3903	1689	43%
Athi	1503	1145	76%	1634	4586	281%	2043	5202	255%
Tana	6545	891	14%	7828	8241	105%	7891	8476	107%
EwasoNg'iro North	2251	212	9%	3011	2857	95%	1810	2950	163%
Total	**22564**	**3218**	**14%**	**26634**	**21468**	**81%**	**28437**	**23141**	**81%**

WR=Water Resources; WD = Water Demand

The boundaries of the catchment areas, which contain the water resources, do not coincide with those of the counties as given in the map overleaf. The development of water storage infrastructure or national and county level water security requires concerted efforts. At the same time the semi-autonomy of the counties should enhance development and equitable sharing of water resources towards a water secure Kenya. Sharing water resources currently and in the future across basins is also inevitable and plans for storage development should take this into account. The WD/WR ratio provides a general guide for such a plan with worst hit areas such as Athi with high ratios given higher priority. Over time, other avenues such as recycling and desalination of the ocean water need to be explored to enhance availability.

Table 7 shows the catchment areas and respective counties which provides fundamental framework for building IWRM

Table 7: Catchment areas in Kenya and the counties within the watershed

Catchment Areas	Counties
Athi Catchment Area	Nairobi, Makueni, TaitaTaveta, Kwale, Mombasa Counties, major part Kajiado, Kilifi, Machakos, Kiambu, small part Tana River, Kitui, Muranga, Nyandarua
Lake Victoria South Catchment Area	Kisumu, Homa-Bay, Kisii, Nyamira, Migori, Kericho, and Bomet Counties and minor part Siaya, Narok, Vihiga, Nandi, Nakuru, Uasin-Gishu, and Baringo
Lake Victoria North Catchment Area	Busia, Kakamega, Bungoma, Major part Trans Nzoia ,Uasin-Gishu, Nandi, Vihiga, Siaya, part of ElgeyoMarakwet, part of West Pokot
EwasoNg'iro North Catchment Area	Mandera, Wajir, major part Marsabit , Isiolo, Samburu Laikipia smaller part Garissa, part of Meru, Nyeri, Nyandarua
Tana Catchment Area	Lamu, Tana River, Garissa, Kitui, TharakaNithi, Embu,Kirinyaga, Muranga, Nyeri& part of Meru
Rift Valley Catchment Area	Turkana, Baringo, Narok, Kajiado, Nakuru, Nyandarua , ElgeyoMarakwet, small part of Laikipia, Samburu, Marsabit, West Pokot

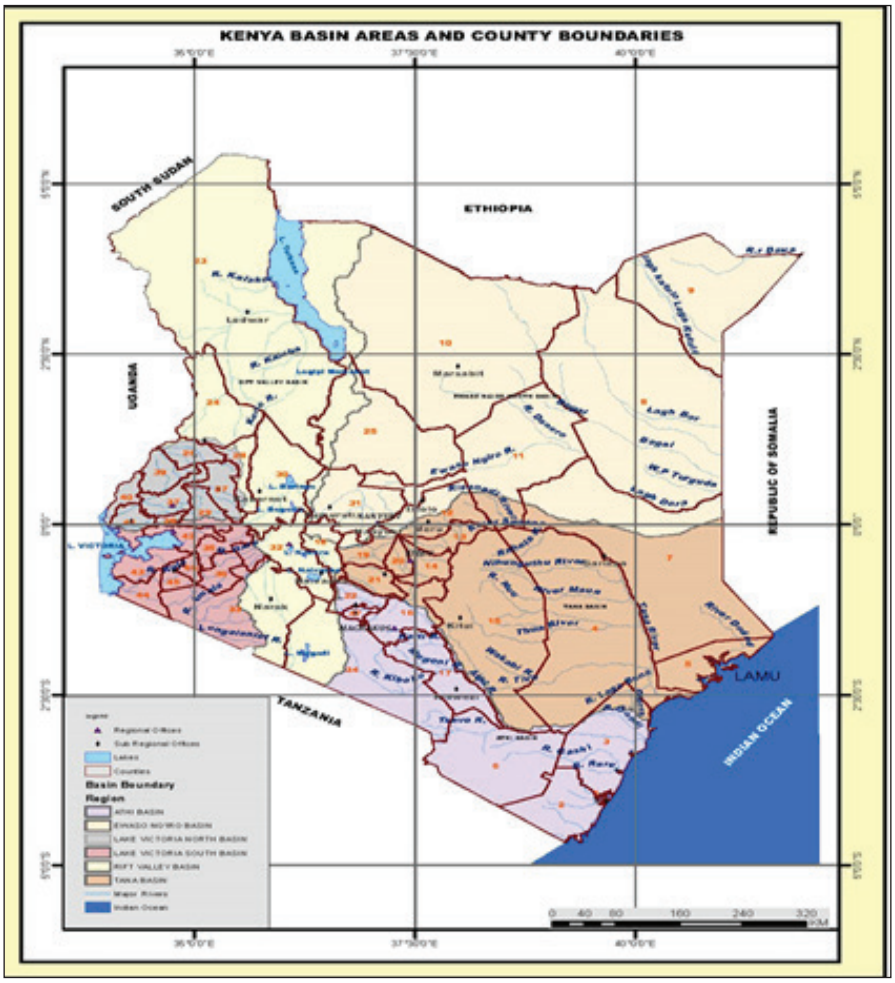


Figure 3: Catchment areas and associated counties as a basis for building IWRM framework

2.1.3 Current status of economic water security

The National Water Policy outlines major directions which can be built on to improve storage taking into account the decline of the same from 11 m3pc in 1969 to 4 m^3 Per Capita in 2010 with the current figure being 3.1 m^3 Per Capita.

This storage is for consumptive use while for non-consumptive use the current storage is 100m^3 pc mainly for hydropower stored in six large dams. In order to enhance water availability, the storage capacity is planned to be increased from 124 MCM to 4.5 BCM which increases per capita storage from 5.3 to 16 CM by 2030.

Storage developments through large dams are intended for domestic water supplies, industrial water use and irrigation water demand. In the NWMP 2030 it is recommended that as much as possible, large dams should have multi-purpose functions including flood control, water supplies, hydropower, irrigation and any other function that demand bulk water. In this context it makes economic sense with faster realisation of returns to investments and diversified benefits.

2.1.4 Current status of structural resilience to water related risks for population and economy

Flood control measures including emergencies include the following interventions which have been carried out in some of the major flood prone areas

Structural measures for flood control and adaptation

i. Civil works comprising culverts, footbridges, weirs and revetments, evacuation centres, toilets and storage located in 17 villages in lower Nyando basin
ii. Architectural works comprising evacuations centres, toilets and storage located in 10 villages located in lower Nyando basin
iii. 11 Boreholes for clean water supply for victims of flood incident
iv. Evacuation hall, raised toilets and drainage culverts in Eldoro primary school in Lumi river basin

Pilot projects at lower Gucha in Migori sub-catchment comprising

i. Enhancement of safety ability
ii. Refuge training to enhance disaster prevention consciousness
iii. Life improvement through skill acquisition for flood management including improvement of technique for forecast and countermeasure
iv. Knowledge improvement by information share on flooding experience to improve disaster prevention consciousness and effective learning
v. Provision of sign board showing inundation depth and evacuation route in the inundated area
vi. Maintenance of structures such as culverts and gabions provided for flooding countermeasure to ensure effective functioning during flooding period

Pilot project at Isiolo sub-catchment

i. 3 rain gauges for rainfall measurements and one staff gauge for water level measurement
ii. River bank protection through participatory gabion construction to protect the banks of river Isiolo

Flood control projects carried out by NWHSA for the period of 5 years from 2013 to 2018, amounted to KShs 691 Million. The specific project sites and counties are in Table 8 below.

Table 8: Flood control projects (2013-2018)

Year	No	Cost (Kshs Million)	Project sites	County
2013/14	9	141	River Nyando, Budalangi, River Kuja, River Awach, RiverKalawase, Narok, NjoroKubwa, Bura, Garissa	Kisumu, Tana River, Nakuru, Narok, Turkana, Homa Bay, Migori, Busia
2014/15	8	286	River Nyando, Budalangi, River Kuja, River Awase, Mogotio, Narok, NjoroKubwa, River Kalawase	Turkana, Nakuru, Narok, Baringo, Homa Bay, Migori, Busia, Kisumu
2015/16	7	127	River Nyando, Budalangi, River Kuja, River Awase, Mogotio, Narok, NjoroKubwa	Kisumu, Busia, Migori, Homa Bay, Baringo, Narok, TaitaTaveta
2016/17	6	57	River Kalawase, Godha plains, River Awase, River Kuja, River Nyando, River Nzoia	Turkana, Isiolo, HomaBay, Migori, Kisumu, Busia
2017/18	5	80	River Kapkawa, Godha plains, River Sabwani, Logiri dam	ElgeyoMarakwet, Isiolo, Trans Nzoia, Baringo

2.2 Domestic Water Harvesting and Storage

This refers to household and individual entity investments and initiatives to harvest and store water for use that contributes to meeting the amount of water per capita basic requirements per person in the household. The minimum recommended annual water per capita required for basic living per person is $600m^3$.

The domestic level water harvesting and storage can also be impacted on by the type of source of drinking water used by a household. Access to water contributes to the ease of water harvesting and storage for use hence a household that can easily access water is more likely to be water secure. More than a third (34.2 per cent) of households in Kenya rely on piped water as a source of drinking water as per the KNBS, 2019 census.Further, the housing conditions and amenities is an indicator of the likelihood of adoption of water harvesting and storage interventions. Those who own their main dwelling unit and the type of dwelling unit determines whether a household is likely to have water harvested and stored.

The proportion of households owning the main dwelling unit they occupied in Kenya is 61.3 per cent while those occupying rented/provided dwelling units were 38.7 per cent. Most of the owned dwelling units are in rural areas while the majority in urban centres live in rented dwellings.The 2019 KPHC data also shows that 80.3 per cent of the households occupied dwelling units had iron sheet as the main roofing material followed by concrete/cement at 8.2 per cent. Those living in owned dwellings with iron sheets or other safe water harvesting roofs are more likely to undertake rain water harvesting and storage.

2.2.1 Current status of urban household water security

The KNBS population census (2019) indicates the number of conventional households in all urban areas in Kenya to be 4,663,734 in number. Of this number 18.1 % of the households have piped water directly to their dwellings while 23.9 % have shared piped water to their yard or plot. 15.6% use public tap or stand pipe for source of drinking water. Only 2% of the households in the urban centres depend on rain water harvesting for drinking in the urban areas.

Table 9: Baseline status of urbanand rural domestic water security

Source of drinking water (%) as per KNBS 2019 Census report			
	KENYA	**Urban**	**Rural**
Conventional Households (No.)	12,043,016	4,663,734	7,379,282
Pond	1.6	0.2	2.4
Dam/Lake	3.3	0.8	4.9
Stream/River	16.8	2.6	25.8
Protected Spring	7.1	1.8	10.5
Unprotected Spring	2.4	0.3	3.7
Protected well	7.0	4.0	9.0
Unprotected well	2.6	0.5	4.0
Borehole/Tube well	9.9	6.8	11.8
Piped into dwelling	10.1	18.1	5.1
Piped to yard/plot	14.1	23.9	7.8
Bottled Water	2.8	6.7	0.3
Rain/Harvested water	3.9	2.0	5.0
Water Vendor	8.5	16.7	3.3
Public tape/Standpipe	9.9	15.6	6.4
Not Stated	0.0	0.0	0.0

2.2.2 Current status of rural household water security

The KNBS population census (2019) indicates the number of conventional household in all rural areas in Kenya to be 7,379,282 in number. Of this number 5.1 % of the households have piped water directly to their dwellings while 7.8 % have shared piped water to their yard or plot. 6.4 % use public tap or stand pipe for source of drinking water. Only 5% of the households in the rural areas depend on rain water harvesting for drinking yet most households in the rural areas own their houses.

2.2.3 Current status of private & social sector involvement in water harvesting and storage

Baseline data on private and social sector involvement in water harvesting and storage to be undertaken as a strategic intervention in this Strategy.

3.0 Water Harvesting and Storage Strategic Medium Term Vision, Goals, Objectives & Strategies

3.1 Strategic Vision for Water Harvesting and Storage

Kenya has adequate water security to support social, economic development, environmental use in periods of drought, unforeseen emergencies and absence of perennial resources.

3.2 Mission

To address national water stress and human right to water by increasing availability of water for domestic use, social economic development and to mitigate water related risks to Kenyans and the economy.

3.3 WHS Sub-Sector Goals

Goal 1: Enhanced water security for household, social and economic development.

The water harvesting and storage sub-sector seeks to focus on ensuring water security for present usage and posterity to meet household, social and economic development. The focus is on meeting priorities outlined in the national water harvesting and storage policies, Vision 2030 national development blue print and Presidential Executive Big Four Agenda.The goal is to ensure that the storage per capita is increased from 5.3 m^3 in 2010 to 25 m^3 by the year 2030.

Goal 2: Improved population coverage of structural resilience for water related disasters.

The strategy aims at reducing the population of Kenyans likely to be driven to poverty by droughts and floods by prioritising well planned, coordinated and consultative public infrastructure asset investment development, operation and maintenance to address structural resilience to water related disasters.

3.4 WHS Sub-Sector Objectives

Water security i.e. water harvesting and storage is a multidimensional concept identifiable by three key domains namely: household water security, economic water security and resilience to water-related disasters. Water security in this strategy is rated by an index from 1 to 5 corresponding to five water security stages depicted in Table 10. These inform the WHS objectives in this sub-sector strategy.

Table 10: Definition of national water harvesting & storage levels

Level/Definition	Household water security	Economic water security	Resilience to water related disasters
1 **Hazardous**	Access to safe drinking water is limited at household level nationwide	water availability for economic activity is mostly informal and constraining	Droughts and floods widely drive people into poverty.
2 **Engaged**	Nearly half of the urban households have access to safe drinking water though rural households are largely excluded	water availability for economic activity is both formal and informal but enables some economic activities	Basic attempts are being made to address water-related risks
3 **Capable**	At least half of the households in country have access to safe drinking water including in rural and urban poor areas	water availability for economic activity is mostly formal and supports most economic activities	The most serious water-related risks in the country are being addressed.
4 **Effective**	Most households have access to safe drinking water including in rural areas and urban poor	water availability for economic activity is mostly formal and supports all economic activities	Most of the serious water-related risks have been addressed in the country by state of infrastructure and early warning systems.
5 **Model**	All people have access to safe drinking water	economic activities are not constrained by water availability	water related risks are acceptable and relatively easy to deal with owing to resilience measures in place in the country

The following are the strategic objectives for the WHS sub-sector.

Objective 1.1: Efficient and sustainable increase in water harvesting and storage for domestic use from 'engaged' water security level 2 to 'capable' water security level 3.

Objective 1.2: Efficient and sustainable increase in water harvesting and storage for socio-economic development from 'engaged' economic water security level 2 to 'capable' economic water security level 3.

Objective 2.1: Acceptable level of resilience to water related disaster risks by population & economy improved from resilience to water related disaster 'hazardous' level 1 to 'engaged' level 2 of resilience to water disasters.

3.5 Water Harvesting and Storage Strategies

The following are the prioritised strategies i.e. key interventions to be effected by key WHS sub-sector stakeholders for the realisation of the vision, mission, goals and objectives in this strategy.

3.5.1 Strategies to increase water harvesting and storage for domestic use

1 Set up and operationalise an inter-governmental and inter-agency for collaboration that meets semi-annually.

The collaborative arrangement is not limited to MWSI, NWHSA, bulk water operators and county governments on needs mapping, planning, stakeholder engagement and communication. Integration of key stakeholders including private sector, society groups and communities in water harvesting and storage development has been inadequate. There is need to promote participation of private sector, public benefits organisations and communities in water harvesting and storage and to build synergy for WHS public interventions. Further strengthening national government inter-agency coordination and collaboration in the development of water harvesting and storage infrastructure is required. This strategy directly aligns to the prioritised national water policy directions on national government inter-agency coordination and collaboration and private sector, civic and community participation.

2 Develop and operationalise an inter-ministerial water sector coordination framework for water harvesting and storage

3 Develop a national WHS infrastructure investments master plan and schedule of national pipeline WHS projects.

The development of water harvesting storage mechanisms at the national, county level, domestic level, and, by commercial stakeholders is not well planned, coordinated, regulated or guided hence there is need for an integrated national plan or approach. There is need to determine the magnitude of storage deficit and its variability both spatially and temporally and then develop an integrated plan for water storage development taking into account the roles and interests of players at national and county levels. This strategy directly aligns to the prioritised national water policy direction on technical and financial support to the national WHS entity.

4 Develop oneinstitutional criteria for all counties and 47 county based WHS public infrastructure asset maps by end of 2022.

This strategy directly aligns to the prioritised national water policy direction on county criteria for county water institutions for WHS.

5 Implement at least one new project annually from the schedule of national pipeline WHS public infrastructure using but not limited to sustainable financing. This strategy directly aligns to the prioritised national water policy direction on technical and financial support to the national WHS entity.

6 Develop and roll out domestic WHS standards or requirements by end of 2022.

This would include inter-agency and stakeholder collaboration to integrate stand-alone WHS requirement in building plans and approvals. There is need to advocate for rainwater harvesting and storage requirements into relevant national and county spatial plans, the national building code. This strategy directly aligns to the prioritised national water policy direction on WHS requirements in spatial planning. Public awareness and sensitisation campaign on WHS domestic level standards and requirements for urban and rural areas.This strategy directly aligns to the prioritised national water policy direction on WHS compliance.

7 Design and develop one national domestic WHS database and information system with inputs by all 47 counties by 2024.

There is need to address availability and access to data on existing investments and potential in water harvesting and storage. An established and populated data and information system will aid the planning and implementation of national, cross-county and county-level water harvesting and storage infrastructure investments. This strategy directly aligns to the prioritised national water policy direction on WHS information system. It will inform planning and implementation of investments in related infrastructure at national cross-county and county level in addition to public accountability.

8 Develop and rollout a platform on domestic water harvesting and storage information that is publicly accessible

9 Promote incentives to encourage private sector participation in domestic water harvesting and storage

3.5.2 Strategies to increase water harvesting and storage for socio-economic development

1. Identify, plan, prepare at least 3 bankable upstream public infrastructure assets targeting national economic zones.

There is need to develop bankable project proposals to attract funding including to promote private sector participation in water harvesting and storage development. Use of innovative financing models to support water harvesting and storage development ensures sustainability of the projects.This strategy directly links to the specific WHS national policy objective of promoting the development of water harvesting and storage infrastructure.

2 Support the identification, planning and preparation of at least 5 bankable upstream public infrastructure assets for county economic zones using demand based approach. This strategy directly links to the specific WHS national policy objective of promoting the development of water harvesting and storage infrastructure.

3 Conduct and report on bi-annual water security for socio-economic development needs and progress reviews. This strategy directly links to the priority national water policy direction on WHS compliance.

4 Develop, sign and operationalise water security agreements between NWHSA, bulk water operators &Water Service Providers Association (WASPA).

This is to increase WHS for socio-economic downstream use. This strategy directly links to the priority national water policy direction on national government, inter-agency coordination and collaboration.

5 Develop and roll out standards and requirements for rain water harvesting and grey water recycling for businesses, social institutions, commercial building developers and industrialists by end of 2023.This strategy directly links to the priority national water policy direction on WHS compliance.

6 Legal and regulatory compliance and enforcement involving measures and systems to enable compliance at business and social institutions level. There is need to develop

regulations, guidelines, standards and certifications on water harvesting and storage and ensure compliance.This strategy directly links to the priority national water policy direction on WHS compliance.

7 Develop the national business and social institutions WHS database and information system including baseline data with participation of 47 counties by end of 2024.
This strategy directly links to the priority national water policy direction on WHS information system.

8 Develop and implement a framework of incentives and sanctions for rainwater harvesting and storage to enhance the participation of private sector, public benefits organisations and community.

9 Develop and rollout a platform on water harvesting and storage for social-economic development information that is publicly accessible

3.5.3 Strategies to reduce water related risks for population and economy

1. Develop and effect the national floods & storm-water structural mitigation master plan by end of 2021.
   There is need for a plan that factors all prioritised flood defences that are needed for identified flood prone areas in the country. This strategy directly links to the priority national water policy direction on technical and financial support to the national WHS entity.
   These flood defences for articulation in the plan could include the following:
   i. dams,
   ii. diversion canals,
   iii. floodplains and groundwater replenishment,
   iv. river defences, e.g. levees, bunds, flood walls and gates dykes etc.
   v. Coastal defences, e.g. sea walls, revetments, gabions, and so on,
   vi. Retention water pans
2. Develop and rollout counties' storm water mitigation plans for all the 47 counties by 2024
3. Prepare bankable priority list of flood mitigation physical structures dams for construction or modification of that will reduce impact of flooding on individual properties or whole catchments.This strategy directly links to the specific WHS national policy objective of promoting the development of water harvesting and storage infrastructure.Limited resources have been allocated to development and implementation of water harvesting and storage capacity over the years. The level of overall investments required to attain water security is inadequate against increased water security needs. There is need for new innovative and sustainable financing approaches for WHS development.
4. Counties to plan and conduct regular stormwater drainage systems maintenance. The framework on the development and maintenance of water harvesting and storage infrastructure including stormwater management is weak lacks proper coordination between the national and county governments. There is need for integrated clear

approach to regular stormwater drainage maintenance systems that provide value for money.

5. Conduct individual flood proofing awareness and sensitisation.This strategy directly links to the prioritised national WHS policy direction on WHS compliance.
6. Partner with other agencies on land acquisition, use planning controls, building and development controls and catchment flood modelling.

   The limited access to land for development of the infrastructure for water harvesting has led to escalated projects costs due to acquisitions and delays in implementation. Strategic land use planning needs to identify the extent of flood impacted land to limit the construction of urban and rural residential, commercial and industrial land. Building controls can require new homes or substantial renovations to be constructed at habitable floor levels above known flood levels for the location to protection from flooding.Elevated structures, permanent relocation, zoning, subdivision, and building codes.
7. Develop and rollout a platform on water harvesting and storage related risks that is publicly accessible. This strategy directly links to the prioritised policy direction on WHS information system.
8. Develop plan and embark on ground water recharge and storage structures development in at least two pilot counties. This strategy directly links to the specific WHS national policy objective of promoting the development of water harvesting and storage infrastructure.
9. Plan and initiate flood water diversion, storage systems and flood water ways projects in at least five pilot counties by 2024. This strategy directly links to the specific WHS national policy objective of promoting the development of water harvesting and storage infrastructure.
10. Integrate non-structural water availability drought response planning and operations

    The impacts of climate change induced disasters are widely experienced in Kenya. The current responses to drought by the water harvesting and storage sub-sector has been reactionary with limited planning and implementation. A clear operational blue print for WHS preparation and response in relation to droughts is required.
11. Facilitate for WHS infrastructure emergency water access interconnections with other water resources and systems.
12. Conduct assessments of all planned WHS interventions to ensure they mainstream climate change actions to enhance resilience of the infrastructure and take into account interference by climate change with WHS goals.
13. Develop an integrated WHS data management system for both private and public water harvesting structures with safety status to aid in decision making.
14. Promote incentives to encourage private sector participation in reducing water related risks for population and economy

4.0 Water Harvesting and Storage Result Areas And Performance Indicators

Result 1: More than half of the households in the country to adopt water harvesting and storage techniques and technology including in the rural and urban poor areas.

Indicators

1. Number of households per county applying water harvesting and storage techniques and technologies
2. Number of population served by WHS public infrastructure
3. Number of WSPs reporting increase in minimum service level on number of hours for access to safe water at household level
4. Percentage increase in volume of bulk water available to large and medium WSPs
5. Percentage increase in number of new small scale service provider (SSSP) water points per county
6. Increase in number of new national WHS public works sustainably financed
7. Volume of total available renewable ground and surface water resources conserved by drawing water from WHS storage
8. Inter-agency collaboration framework in place and operational
9. Inter-ministerial collaboration framework in place and operational
10. A functional National domestic WHS database and information system
    A platform on domestic water harvesting and storage information developed and accessible
11. Number of PPP projects in pipeline

Result 2: Water harvesting and storage capacity to support socio-economic development is increased and formalised.

Indicators

1. Number of social institutions and business per county applying water harvesting and storage techniques and technologies.
2. Increase in number of new social institutions and businesses benefitting from WHS public infrastructure.
3. Number of WSPs reporting increase in minimum service level on number of hours for access to safe water for social institutions and businesses.
4. Increase in number of new national WHS public works sustainably financed largely for socio-economic development.
5. Adoption by counties of mandatory requirement for water harvesting and storage provision before approving any development permit application.

6. Inter-agency collaboration framework in place and operational
7. Inter-ministerial collaboration framework in place and operational
8. A functional national socio-economic WHS database and information system
9. A platform on socio-economic water harvesting and storage information developed and accessible
10. Number of PPP projects in pipeline

Result 3: Improved structural resilience for water related disasters country wide

Indicators

1. At least 50 % of the population in flood and drought prone areas are shielded from abject poverty caused by water disasters.
2. Number of national and county level operational instruments and frameworks to reduce water related risks for population and economy developed and rolled out.
3. Increase in proportion of public officers trained in water related disaster resilience at national level and country.
4. Proportion of country flood prone areas mapped and mitigation plans developed. There is need to develop an inventory on the spatial and temporal distribution of occurrence of flooding and its causes and build knowledge on occurrence of droughts both spatially and temporally.
5. Adoption of minimum standards at all levels of government to ensure mainstreaming of climate change risks considerations in the capacity and structural integrity of WHS infrastructure.
6. Inter-agency collaboration framework in place and operational
7. Inter-ministerial collaboration framework in place and operational
8. A functional national water related disaster risk WHS database and information system
9. A platform on water harvesting and storage information developed and accessible
10. Number of PPP projects in pipeline

5.0 Financing Water Harvesting and Storage

Given the importance of water as a commodity in poverty reduction and socio-economic development, there is need to attract sustainable financing, grants from development partners and financial grants from the Government of Kenya. Resource mobilisation is critical to the implementation of this NHWSS. The resources required for the NWHSS to implement the 2020- 2025 Strategic Plan include financial, human and physical resources.

Additionally, transparency and accountability in the implementation of this NWHSS will be critical. Proper utilisation of resources will be done in a professional and responsible manner. Internal controls, monitoring and evaluation systems will be put in place to ensure efficiency and effective use of resources.

5.1 Financial Resources

To realise the NWHSS there is need to source for funds through Government grants, development partners and internally generated funds.

a. Government Grants: The MWSI will lead in advocating for more resources from the Government for WHS investments guided by the strategies, results and indicators in this strategy.

b. Development Partners: The NWHSA and county governments will profile, prepare and present proposals for the purposes of sourcing for funds for WHS public assets development.

c. Joint Venture Agreements: Joint ventures for sustainable financing of public WHS infrastructure will be pursued to augment financing from central government. Possibilities of Public Private Partnerships (PPPs), and outright private investments will also be explored.

The NWMP highlights that the entire water sector's government grant remains below 3% of the government's total budget. This is equivalent to less than 1% of the country's GDP. In the water sector, irrigation has been receiving the majority of the sector's government grant, comprising around 39% of the country's development expenditure (KSh 8.0 billionin 2012-2013), followed by water supply, water resource development (storage), and sewerage.

NWHSA is one of the semi-autonomous government agencies (SAGAs) in the water sector and with exclusive focus on WHS. As it implements WHS projects it therefore has a higher resources requirement yet a deficiency of investment funds also exists. NWHSA has largely received most of its resources from the central government. Table below shows the projected resources requirements for WHS investments planned by NWHSA during this strategy period.

Table 11: 2012 – 2016 revenue and project expenditure

Current and future projected revenue and expenditure in water sector (MWSI), 2012-2016 (billion Kshs)					
Item		**Actual**	**Projected**		
		2012-2013	2013-2014	2014-2015	2015-2016
Total Revenue	(a*)* =b+c+d	50.3	54.1	57.3	58.9
Internally Generated	(b)	1.8	2.1	2.1	2.1
Government Grants	(c)	24.8	25.9	27.8	29.4
% of Government Budget		3.0%	2.9%	2.9%	2.8%
Recurrent Grants	(d)	4.4	4.4	4.7	4.7
Development Grants	(e)	20.4	22.0	23.7	25.4
External Resources	(f)	23.7	26.1	27.4	27.4
Total Expenditure for Development (including External Resources)	*(h)* = f+i	44.1	47.6	50.5	52.1
Estimated Development Expenditure by Government Grant	*(i)* = j+k+l+m+n	20.4	22.0	23.7	25.4
Water Supply	(j)	6.1	6.8	7.3	8.0
Sewerage & Sanitation	(k)	0.7	0.7	0.8	0.8
Irrigation	(l)	8.0	8.0	9.0	9.9
Water Resource Development (Storage)	(m)	5.2	5.2	5.9	6.0
Water Resource Management	(n)	0.4	0.4	0.6	0.7

Source: Ministry of Water & Irrigation, National Irrigation Board, estimated by the JICA Study Team

Table 12: Project WHS financial requirements by NWHSA

	FINANCIAL YEARS AND AMOUNTS (MILLIONS KES)			
	2020/21	2021/22	2022/25	TOTAL
1 works infrastructure	2,249.50	24,521.50	31,176.50	57,947.50
2 Protect/save lives and property from the effects of floods and drought	441.00	369.00	501.00	1,311.00

6.0 Technical Implementation Plan and Reporting of What Strategy

To effect this sub-sector strategy, the respective implementers in the implementation plan are to budget, implement and report on the implementation plan on an annual basis.

The organisational operational plans are expected to include the NWHSS implementation plan (See annex) obligations by respective key stakeholders. The Ministry (national level), counties, sector institutions, utilities, civil society organisations, private sector, community-based organisations and other stakeholders in the water sector are the respective implementers.

With regard to implementation of the strategy, National Water Harvesting and Storage Authority (NWHSA) has the role of collecting and providing information for the formulation of the national water resources storage and flood control strategies. It is also responsible for developing a water harvesting policy & enforce water harvesting strategies.

6.1 Strategic Approach to Implement Prioritised Cross-cutting Policy Directions in the Sector

Cross-cutting issues are important in the sub-sector because they influence the other areas and overall development of the country. They include information systems, sector coordination, planning and communication, mainstreaming climate change and disaster management, gender and disability mainstreaming, governance, poverty alleviation and equity, research and capacity development, youth empowerment and HIV/AIDS.

The objectives of the National Water Policy that are pertinent to the Water Harvesting and Storage Strategy but are left out for direct MWSI coordination and sub sequent implementation by key sector institutions and county governments are as follows:

i) To strengthen water education, training, research and innovation to be responsive to the water sector needs.
ii) To implement mainstreaming of climate change considerations, and disaster risk reduction throughout the water sector.
iii) To enhance the mainstreaming of gender considerations in water sector towards progressive attainment of gender equality.
iv) To put in place mechanisms to manage conflicts in the water sector, enhance the use of alternative dispute resolution and operationalise the Water Tribunal.
v) To implement mainstreaming of affirmative actions to enhance equity and equality and integrate the interests of the youth in the water sector.

The Ministry, counties (water department), sector institutions (WASREB, WSTF, WRA, WWDA, NWHSA) and water utilities will develop 5 years' strategic plans within the medium-term plan framework (linked to Vision 2030) to implement this strategy. The private sector, civil society and community organisations including social institutions are to ensure that their operating plans link to this strategy and promote the goals, objectives and result areas for WHS.

The ministerial strategy for implementation (5 years) will form the basis for annual planning for the Ministry while this sub-sector strategy informs on the strategies for application by various water sector entities including at county level.

The NWHSS will be reviewed every 3 years and its status will be reported in the water sector conference. This ministerial strategy for implementation by water sector will be formulated or reviewed every 5 years following Medium Term Expenditure Framework (MTEF) public participation process.

6.2 Sub-Sector Performance Monitoring, Evaluation & Reporting

The MWSI will lead function for monitoring the progress in the implementation of NWHSS working closely with the NWHSA. The NWHSA is in charge of making appropriate recommendations on the sub-sector to the Cabinet Secretary in line with the Water Act.

Sector institutions and the counties (department of water) will participate in annual sector review and reporting for the strategy. The annual sector review report will be published and made available to the public.

The NWHSA will report to the Ministry on the progress in the implementation of the NWHSS around its mandates.

The proposed sub-sector information systems to be developed will be used to monitor and evaluate the key indicators for progress in the NWHSS.

Civil society organisations working in the sub-sector will anchor their activities within the existing regulatory framework and report through NWHSA where designated or county governments onward to Ministry.

The monitoring and evaluation will be done annually. The report will be made public.

ANNEX – NWHSS Implementation Plan

Strategy category	Key strategies	Lead Entity	Implementation Year				
			20/21	21/22	22/23	23/24	24/25
1. Strategies to increase water harvesting and storage for domestic use							
1	Set up and operationalise an inter-governmental and inter-agency for collaboration that meets semi-annually.	MWSI	X	X	X	X	X
2	Develop an inter-agency collaboration framework to guide in infrastructural development for water harvesting and storage	NWHSA	X	X			
3	Develop and operationalise an inter-ministerial water sector coordination framework for water harvesting and storage	MWSI &CoG	X	X			
4	Develop a national WHS infrastructure investments master plan and schedule of national pipeline WHS projects	NWHSA	X	X	X	X	X
5	Develop one institutional criteria for all counties WHS and 47 county based WHS public infrastructure asset maps by end of 2022	WASREB	X	X			
6	Implement at least one new project annually from the schedule of national pipeline WHS public infrastructure using but not limited to sustainable financing.	MWSI &CoG	X	X	X	X	X
7	Develop and roll out domestic WHS standards or requirements by end of 2022	MWSI	X	X	X	X	X
8	Design and develop one national domestic WHS database and information system with inputs by all 47 counties by 2024.	MWSI	X	X	X	X	X
9	Develop and rollout a platform on domestic water harvesting and storage information that is publicly accessible	NWHSA	X	X	X	X	X
10	Promote incentives to encourage private sector participation in domestic water harvesting and storage	MWSA	X	X	X	X	X
2. Strategies to increase water harvesting and storage for socio-economic development							
1	Identify, plan, prepare at least 3 bankable upstream public infrastructure assets targeting national economic zones.	NWHSA	X	X	X	X	X
2	Support the identification, planning and preparation of at least 5 bankable upstream public infrastructure assets for county economic zones using demand based approach.	NWHSA, CoG	X	X	X	X	X
3	Conduct and report on bi-annual water security for socio-economic development needs and progress reviews.	NWHSA	X		X		X
4	Develop, sign and operationalisewater security agreements between NWHSA, Bulk Water Operators & Water Service Providers Association (WASPA).	NWHSA	X	X			
5	Develop and roll out standards and requirements for rain water harvesting and grey water recycling for businesses, social institutions, commercial building developers and industrialists by end of 2023.	WASREB	X	X	X		

6	Legal and regulatory compliance and enforcement involving measures and systems to enable compliance at business and social institutions level.	WASREB		X	X	X	X
7	Develop the national business and social institutions WHS database and information system including baseline data with participation of 47 counties by end of 2024.	MWSI		X	X	X	
8	Develop and implement a framework of incentives and sanctions for rainwater harvesting and storage to enhance the participation of private sector, public benefits organisationsand community.	MWSI	X	X	X		
9	Develop and rollout a platform on water harvesting and storage for social-economic development information that is publicly accessible						
3. Strategies to reduce water related risks for population and economy							
1	Develop and effect the national floods & storm water structural mitigation master plan by end of 2021.	NWHSA, CoG	X	X			
2	Develop and roll out county storm water mitigation plans for all the 47 counties by 2024	NWHSA, CoG	X	X	X	X	X
3	Prepare bankable priority list of flood mitigation physical structures dams for construction or modification.	NWHSA	X	X			
4	Counties to plan and conduct regular storm water drainage systems maintenance	NWHSA	X	X	X	X	X
5	Conduct individual flood proofing awareness and sensitisation.	CoG& counties		X	X		
6	Partner with other agencies on land acquisition, use planning controls, building and development controls and catchment flood modelling.	MWSI	X	X	X	X	X
7	Develop, rollout a platform that is publicly accessible on flood information and early warnings.	Counties		X	X		
8	Develop plan and embark on ground water recharge and storage structures development in at least two pilot counties.	NWHSA		X	X	X	
9	Plan and initiate flood water diversion, storage systems and flood water ways projects in at least five pilot counties by 2024.	NWHSA		X	X	X	
10	Integrate non-structural water availability drought response into national and county NWHSA plans and operations	NWHSA, CoG		X	X	X	X
11	Facilitate for WHS public infrastructure emergency water interconnections with other water sources and systems.	NWHSA		X	X	X	X
12	Conduct assessments of all planned WHS interventions for climate resilience	BWSP	X	X	X	X	X
13	Develop an integrated WHS data management system for both private and public water harvesting structures with safety status to aid in decision making.	MWSI	X	X	X	X	X
14	Promote incentives to encourage private sector participation in reducing water related risks for population and economy	MWSI	X	X	X	X	X

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