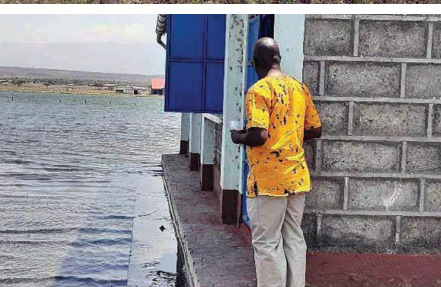


Rising Water Levels in Kenya's Rift Valley Lakes, Turkwel Gorge Dam and Lake Victoria

A SCOPING REPORT



The Short-Popular-Version





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Foreword

The rising water levels of Lake Victoria and the Rift Valley Lakes, along with the Turkwel Gorge Dam raised concerns that prompted the Cabinet through the advice of the National Security Advisory Committee (NSAC) to direct the Ministry of Environment and Forestry to set up a Multi-Agency Technical Team to embark on a scoping mission of the affected water bodies. The objective was to try and establish the causes, the socio economic impacts and to recommend interventions for cushioning the affected communities.

It is to be appreciated that the rising lake water levels and accompanying flooding had stirred panic and anxiety among the surrounding communities where the floodwaters have left trails of destruction and rendering hundreds of families' homeless. There has been consequential loss of crops, farmland and pasture. The wildlife was not spared either as the loss of grazing land drove them to higher grounds where displaced families had also sought refuge and hence leading to human-wildlife conflict.

Following the advisory by NSAC and the Cabinet directive, the Ministry of Environment and Forestry constituted the Multi-Agency Technical Team to interrogate the extent of the impacts occasioned by the rising lake water levels through a field scoping activity. The Ministry brought on board partners that included United Nations Development Programme (UNDP), United States Agency for International Development (USAID) and United Nations Educational, Science and Cultural Organization (UNESCO) who supported the formulation of roadmap for the lakes scoping mission and also provided the much-needed financial support. The comprehensive scoping mission covered all the affected lakes and areas of Lake Victoria and the Rift Valley Lakes of Turkana, Logipi, Baringo, Bogoria, Nakuru, Solai, Elmenteita, Naivasha, Ol-Bolossat, Magadi, including Turkwel Gorge Dam and the flood plains of Ewaso Ngiro South. The result has been this detailed report which, critically, also captures the voices of the affected stakeholders and providing the necessary evidence on the psycho-social impacts on the communities. It also presents a way forward on short, medium and long-term strategies that can assist in the management of the impact. The recommendations will further guide formulation of appropriate measures in order to mitigate the impacts, ultimately cushion the affected communities and plan recovery of the lost biodiversity.

It is my hope that our development partners will continue to support the government in developing a comprehensive recovery marshal plan that will help the affected communities to endure the phenomenon and cope with it in a sustainable way. The Ministry is therefore fully committed to partner with stakeholders in the formulation and implementation of practical and long-term solutions to this phenomenon. We therefore look forward to partnering with all the key stakeholders in designing an integrated programme that will respond to the rising water challenge while also strengthening the climate change adaptation measures.



**Keriako Tobiko, CBS, SC,
Cabinet Secretary, Ministry of Environment and Forestry**

Preface and Acknowledgements

The National Security Advisory Committee (NSAC) made a recommendation to the Ministry of Environment and Forestry (MoEF) to constitute a Multi-Agency Technical Committee to assess the socio-economic impacts and causes of the rising water levels within the Great Rift Valley Lakes, the Turkwel Gorge Dam and Lake Victoria. This followed the trend of the water level rise that has been witnessed since September 2010 and that significantly affected the areas in 2013 and again since 2019 to date. The Lakes level rise has led to the submergence of nearly all the riparian land and displacement of thousands of people. The entire infrastructure (roads, settlements, social amenities, grazing land, farmland, fish landing and processing facilities, electricity lines, water supply structures) and wildlife habitats have been destroyed leading to significant loss of livelihoods and biodiversity. There has been increased human wildlife conflicts occasioned by shrunk habitats and stress both on animals and humans.

The Ministry of Environment and Forestry took up the task and in collaboration with the United Nations Development Program (UNDP), constituted six (6) teams (Appendix 1) to undertake a scoping mission on the lakes and the Turkwel Gorge Dam from 21st October to 1st November 2020 as follows: (a) Lake Turkana, Turkwel Gorge Dam and Lake Logipi; (b) Lake Bogoria and Lake Baringo; (c) Lake Nakuru, Lake Elmenteita and Lake Solai; (d) Lake Naivasha and Lake Ol Bolossat; (e) Lake Magadi and Ewaso Ngiro South area and (f) Lake Victoria. The teams were tasked to assess and report on the status of the rising water levels and the allied socio-economic impacts with a view to making recommendations on required intervention measures. The report also captures the implications of the rising water levels on security, the ecological changes, previous record of changes in the lakes, the catchment area dynamics, the geological setting that control the flows into and out of the lakes, and possible litigation from the affected communities.

The abridged and more reader-friendly version of the main report from the Multi-Agency Team establishes the ground upon which policy decisions can be made on the physical planning direction and re-development of the affected areas. The results from the scoping mission reveal a complex interplay of hydro-meteorological factors, land use change dynamics as well as the geology and morphological setting of the lakes which have relatively influenced the current phenomenon. The report demonstrates the extent of destruction of human settlement and livelihoods, critical infrastructure such as buildings, roads, electricity and bridges and loss of farmlands and grazing lands. The exercise has produced a large compendium of data and information on the ten (10) lakes and their ecosystems. The Multi Agency Technical Team has also provided invaluable recommendations on short, medium and long-term interventions measures together with an implementation plan that will provide a road map on the expedite service delivery to the affected communities. Given the magnitude and the impact of rising lake water levels on livelihoods, the Government urgently requires bilateral and multilateral agencies to support the design and implementation of a comprehensive programme that would safeguard the people and nature by enhancing community and ecosystem resilience.

In compiling the reports, I wish to acknowledge the contributions and support of the following Ministries, State Departments and government institutions:

- (i) Ministry of Interior and Coordination of National Government;
- (ii) Ministry of Defence;

- (iii) Ministry of Devolution and the ASAL;
- (iv) Ministry of Tourism and Wildlife;
- (v) Ministry of Health;
- (vi) Ministry of Water Sanitation and Irrigation;
- (vii) Ministry of Energy;
- (viii) Ministry of Transport, Infrastructure, Housing and Urban Development and Public Works;
- (ix) Ministry of Education; and,
- (x) Ministry of Agriculture, Livestock, Fisheries and Cooperatives.

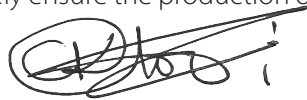
The other government institutions that were involved included the Water Resources Authority (WRA); Directorate of Resource Surveys and Remote Sensing (DRSRS); Kenya Electricity Generating Company PLC (KenGen PLC); Kenya Wildlife Services (KWS); the Climate Change Directorate (CCD); Kenya Forest Service (KFS), University of Nairobi (UoN) and Kenyatta University(KU). Others were the County Governments of the affected regions; the President’s Delivery Unit; National Environment Tribunal; Kenya Meteorological Department, National Land Commission(NLC), National Disaster Operations Centre (NDOC), Council of Governors(COG), and the Office of the Government Spokesperson. We would also like to note and appreciate the Kenya Marine and Fisheries Research Institute (KEMFRI) who supported the much-needed navigation of Lake Turkana, and other areas.

The team was further supported by the Kenya Red Cross Society (KRCS); the United Nations Development Programme (UNDP) and the Stockholm Environment Institute (SEI). Here, I must state rather categorically, that the successful completion of the scoping mission and the production of the reports, is owed to the fruitful, collaborative partnership between UNDP and the Ministry of Environment and Forestry. We sincerely thank the UNDP Resident Representative for expeditiously providing the required technical and financial support that enabled us to undertake the task. In similar vein, we acknowledge the additional financial support that was availed by the USAID mission through its director, Mr Mark Meassick.

We particularly appreciate the cooperation and support offered by the County Governments of Baringo, Busia, Homa-Bay, Kajiado, Kisumu, Marsabit, Migori, Nakuru, Narok, Nyandarua, Siaya, Turkana, and West Pokot that were visited during the scoping mission. These County Governments warmly received the scoping mission teams, organized meetings, discussions, and the field visits, and also provided information and documentation; including reports of assessments they had undertaken in the past. The same depth of gratitude is due to the affected communities and institutions in the field most of whom came out to share their experiences and offered support.

Last, but not least, the overall leadership and coordination was provided by Mr Erick Akotsi, (Acting Environment Secretary) and Dr Pacifica Ogolla, (Director of the Climate Change Secretariat), Ministry of Environment and Forestry and Mr Geoffrey Omedo from UNDP.

Finally, we acknowledge the dedicated work of the various technical experts who worked at various stages to draft, and ultimately ensure the production of a high quality and readable report.



Dr Chris Kiptoo, CBS
Principal Secretary, Ministry of Environment and Forestry

A Word of Solidarity from UNDP

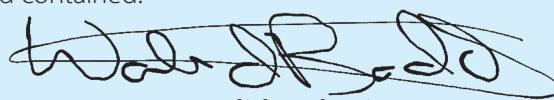
UNDP has a long and cherished history of collaboration and partnership with the people and the Government of Kenya. It is in this tradition that we are extremely delighted to have been at the forefront when the crisis of rising water levels in Kenya's Rift Valley, Turkwel Gorge dam and Lake Victoria emerged in the course of 2020/21 and to have partnered with the Ministry of Environment and Forestry who led a multi-agency task force to identify the underlying causes for this phenomenon and identify the multi-faceted impacts. To be sure, the very phenomenon of rising water levels that has led to the destruction of livelihoods and biodiversity is not new in Kenya. Since more than a decade ago, we have all been witness to heavy and unusual rainfall patterns or other extreme weather events whose impacts are serious and far reaching.

Globally, it has become almost axiomatic, that we are living in extremely unusual times, Climate Change and its associated disasters, are with us and it is no surprise that various manifestations of weather and climate extremes are being witnessed more frequently now.

As the UN agency charged with responsibility to work with governments world-wide in the developmental space, it has been our privilege and duty to have joined with the government of Kenya at a critical hour of need. It is my hope and that of the entire UNDP family, that this scoping report will go a long way in helping find long-term solutions, including adaptation and building resilience against the vulnerabilities that these changing climate and weather conditions are forcing upon us.

As the main report and this abridged version's titles readily suggests, the 'Scoping Report' is only a beginning, in perhaps, what might turn out to be a most complex and long-drawn journey of seeking solutions on a sustainable basis to this reality of our time. The impacts at the socio-economic level, legal, security and geological levels, just to mention a few of those covered in this report, are serious and likely to be with us for a long time. If the report can trigger actions and responses, including the mobilization of resources needed to address both the immediate and long-term needs, it will have served an extremely useful purpose. I would like to thank the United States Agency for International Development (USAID) for readily availing resources to UNDP to be able to provide flexible and catalytic support to undertake this initial assessment work.

Our support here has served to bring to the fore some of the core messages and recommendations outlined in our Human Development Report 2020 entitled "The Next Frontier: Human Development and the Anthropocene", which strongly advocated for striking a better balance between people and planet. As UNDP Kenya, we commit to continue walking with the Government and people of Kenya in the immediate and long term to ensure that the quest for sustainable livelihoods and mutual co-existence across ecosystems with the numerous emerging natural vulnerabilities, is in some ways managed and contained.



Walid Badawi
Resident Representative

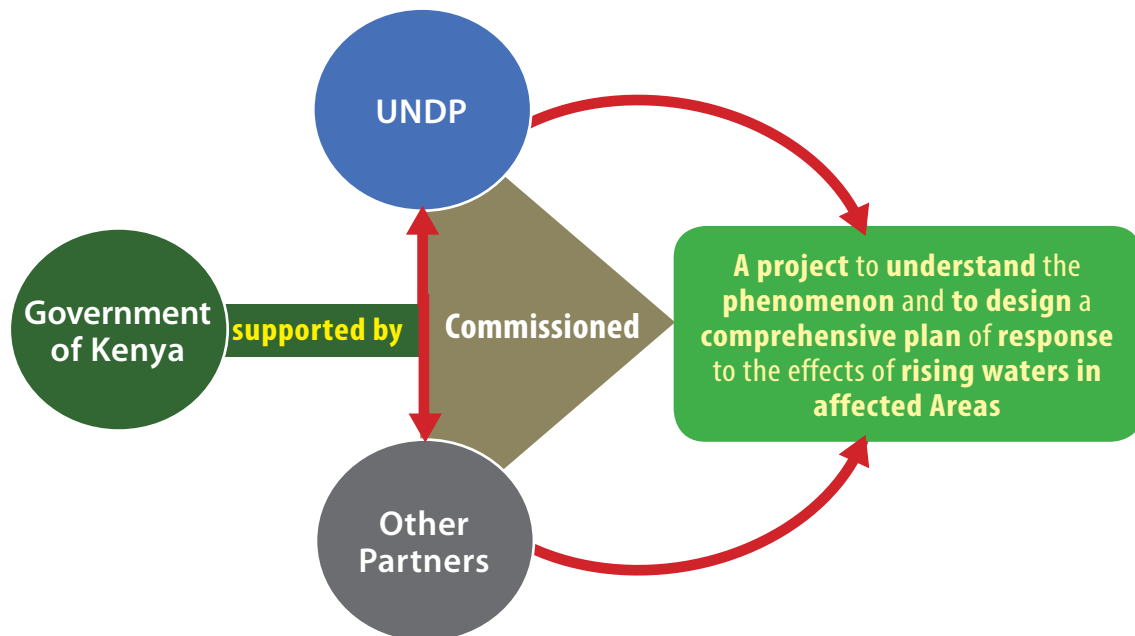
Abbreviations and Acronyms

ASAL	Arid and Semi-Arid Lands	KWS	Kenya Wildlife Services
BMUs	Beach Management Units	KRCS	Kenya Red Cross Society
CBO	Community Based Organization	KWTA	Kenya Water Towers Agency
DEM	Digital Elevation Model	LBDA	Lake Basin Development Authority
DO	Direct Observation	LULC	Land Use & Land Cover
DRSRS	Directorate of Resource Surveys and Remote Sensing	M asl	Meters above sea level
EARs	East African Rift Valleys	MEF	Ministry of Environment and Forestry
ENSO	El-Nino Southern Oscillation	MW	Megawatts
FGD	Focus Group Discussions	NASA	National Aeronautics and Space Administration
GIS	Geographical Information System	NDOC	National Disaster Operations Centre
Ha	Hectares	NEMA	National Environment Management Authority
IOD	Indian Ocean Dipole	NSAC	National Security Advisory Committee
ITCZ	Intertropical Convergence Zone	SMEs	Small-Medium Enterprises
IWUA	Irrigation Water Users Association	SRTM	Shuttle Radar Topography Mission
KALRO	Kenya Agricultural Livestock Research Organization	UNDP	United Nations Development Programme
KEFRI	Kenya Forest Research Institute	UNESCO	United Nations Educational, Science and Cultural Organization
KenGen PLC	Kenya Electricity Generating Company PLC		United States Agency for International Development
KFS	Kenya Forest Service	USAID	
KII	Key Informants Interviews	WRA	Water Resources Authority
KMD	Kenya Meteorological Department	WRUA	Water Resources User Association
KMFRI	Kenya Marine and Fisheries Research Institute		
KVDA	Kerio Valley Development Authority		

Report Background Objectives

1.1 The Background

Following rising water levels in the Rift Valley Lakes, Turkwel Gorge Dam and Lake Victoria, the Government of Kenya, with the support of UNDP and other partners, commissioned a project to understand the phenomenon and to design a comprehensive plan of responding to the effects of rising waters on communities and biodiversity in the affected areas.



A multi-agency team led the scoping mission that visited Lake Turkana, Turkwel Gorge dam, Lake Baringo, Lake Magadi, Lake Bogoria, Lake Ol' Bolossat, Lake Nakuru, Lake Elmenteita, Lake Naivasha, Lake Solai and Lake Victoria.

Different explanations have been advanced to explain these rising water levels, chief of which is hydro-meteorological variables due to climate change that have led to increased moisture availability as seen in the rainfall data and discharge of the rivers feeding the lakes. There is also increased siltation caused by increasing amounts of soil in runoff, occasioned by changes in land use.

Technical assistance for the project was provided by the Technical Committee which consisted of officers from the following government ministries, departments and institutions: the Ministry of Environment and Forestry – Climate Change Directorate, the Ministry of Water and Sanitation, the National Treasury, the Ministry of Energy (KenGen), the Ministry of Devolution and Semi-Arid Lands, the Ministry of Interior and Coordination of National Government, Department of Remote Sensing (DRSRS), National Environment Management Authority (NEMA), Kenya Water Towers Agency (KWTA), affected county governments and academics.

1.1.1 Objectives of the Scoping Mission

The objectives of the initial scoping mission as reported herein and in the main report was to:

- i) Assess the long-term climate variability and likely impacts on the areas experiencing rising water levels;
- ii) Assess the hydrology of the Rift Valley catchments including water balance in the lakes;
- iii) Map any geological incidences within the rift valley system that could be impacting on the lake basin;
- iv) Determine the changes in land and water use in the basins that may have (had) implications on water balance in the lakes and their associated risks;
- v) Produce inundation maps for each of the lakes over time, showing affected infrastructure, land use, man-made features, population and so on for risk mitigation purposes;
- vi) Analyse patterns of livelihoods and settlement for each community depending on how much they rely on the lakes; and,
- vii) Recommend actions to reduce the risk associated with extreme changes in the size of lakes.

The Scoping Mission's Methodology

2.1 The Two Method Approach

The Multi Agency Team used two approaches to collect information on the causes and socio-economic impacts of rising water levels on the Great Rift Valley lakes, Turkwel Gorge Dam and the Lake Victoria, namely, satellite image processing and GIS overlay, and field scoping by teams. The two approaches are summarised here below:

2.1.1 Satellite Image Processing and GIS Overlay

2.2 'Arc-second Digital Elevation data' was downloaded from the United States Geological Survey (USGS) data repository available at <https://earthexplorer.usgs.gov/> and used to develop Digital Elevation Models (DEM) from NASA's Shuttle Radar Topography Mission (SRTM) 30m resolution elevation global raster Grids using ArcGIS model builder. The 3-dimensional visualization technique supported the development of a shaded relief model that was used to determine the slope angle and attitude for measurement and analysis of runoff flow direction and therefore delineation of the watersheds and the drainage areas.

For the classification of land cover, mosaiced Landsat satellite image bands of various years (2000, 2010, 2014 and 2018) were composited to false colour images by combining three image bands namely the infrared, red and green. These have been used by the Directorate of Resources Surveys and Remote Sensing (DRSRS) for identification of different types of land cover. The composited images were classified using Random Forests (RF), which uses supervised classification algorithms. RF procedure begins by the operator selecting training samples from the composite imagery, which are then used by a program script in a statistical language 'R'. The RF procedure fits many separate trees, each to a randomly selected subset of the training data. Each pixel is given a class label from each tree, and the relative frequencies of a pixel's class allocations from the multiple trees are used as measures of classification

confidence. Additionally, the RF procedure produces summaries as indicators of the accuracy of classification derived from the training data. Seven classes of land cover were considered for this case: Forestland, Wooded Grassland, Open Grassland, Cropland, Vegetated Wetland, Open Water and Other Land.

Pixel based Iso Cluster Unsupervised Classification algorithm in GIS software was applied, which grouped pixels of image with the same digital values of image reflectance to the same categories of land cover. The software was instructed to classify the images into 100 different categories for high precision and accuracy during classification, with the categories being identified by numeric values of 1 to 100. The classified images were reclassified to change the numeric classes to the corresponding types of land cover. Reclassification was based on the work done by the image analyst and ground information knowledge, resulting in the identification of ten types of land cover: forest land, shrub-land, grassland, wetlands, settlements, cropland, cropland/grass, cropland/shrubs, cropland/other land and other lands.

The delineated watersheds were superimposed on the images to help determine the characteristics of the areas from which the rivers are sourced. An overlay of the watershed area also supported characterization of the catchment area and therefore the drainage basin.

2.1.2 Field Scoping by Teams

The scoping missions involved seven to ten days of simultaneous fieldwork activities on and around each of the ten lakes. The Turkana team used an additional 7 days to scope the eastern sides of lake Turkana in Marsabit County. The field trips followed consultation among the teams during a retreat in Naivasha and further engagements for groundwork activities with the County Commissioners and the County Governments of the affected counties. Travel and logistics were supported by UNDP through the Ministry of Environment and Forestry.

The visits to the lakes allowed the scoping teams to:

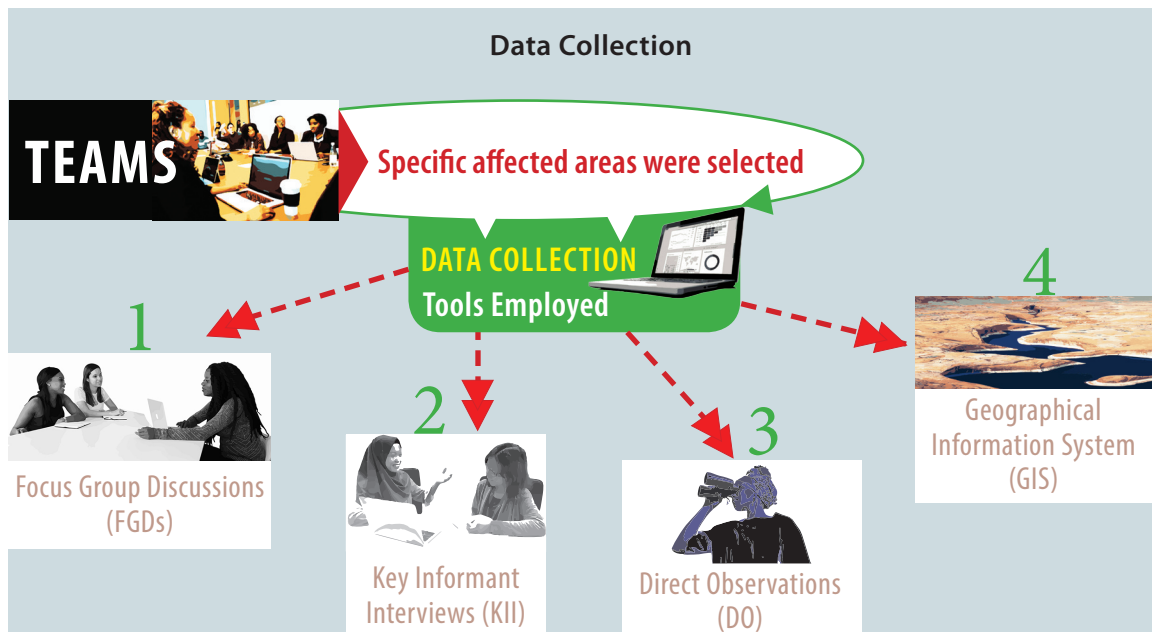
- i) Make observations and gather data on the impacts and the actual extent of the flooding by measuring the location of the water on the ground using Geographic Positioning Systems (GPS) for geolocation;
- ii) Engage in a participatory assessment of the expanse of the lakes through consultations and interviews with the affected communities;
- iii) Hold consultative meetings with the County Commissioners and the respective Heads of Government Departments in the counties;
- iv) Hold consultative meetings with the departments responsible for Public Service, Environment, Water and Disaster Risk Management in the County Governments in question;

- v) Establish the possible causes of the rise of lake water levels and to find out from the community elders and the local administration whether this phenomenon had been experienced in the past. In some cases, focused group discussions were used to achieve this; and,
- vi) Visit various affected development infrastructure, make observations, and document the extent of the impacts using photographs.

The morphology, resources and conditions of land use were recorded and related to locations on the ground so that notes and photographs could be studied in relation to the physical impacts on the lakes.

2.2 Data Collection Tools

The teams employed both qualitative and quantitative research methods during the scoping mission that was carried out between 21 October and 1 November 2020. The main goal of the scoping mission was to investigate probable causes of rising water levels in various lakes and dams, and to highlight the resulting social, economic, legal and security implications on the neighbouring communities and the effects this phenomenon has had on biodiversity in these regions. The teams selected specific affected areas in which they collected data. The tools employed for data collection included: Focus Group Discussions (FGDs), Key Informant Interviews (KII), Direct Observations (DO) and Geographical Information System (GIS).



The following methods were used in collecting the data:

- a) Extensive tour of selected sites around the ten lakes and one dam
- b) Interviews with the leadership of affected areas, mainly National Government and County Government officials
- c) Literature review particularly of recent reports and data from key government institutions and other stakeholders
- d) Extensive interactive discussions with heads of government departments and institutions in the affected Counties. These departments included those of Environment, Water, Agriculture, Livestock and Fisheries, Education, Wildlife, and Social Services
- e) Administration of questionnaires to key respondents
- f) Interaction and discussions with local leaders such as Chiefs and selected members of the Beach Management Units within the Counties
- g) Assessment of major rivers and National Irrigation Schemes including rapid tours of some sections of the wetlands such as Yala and Kanyaboli
- h) Taking GPS positions and photographic evidence at all the sites
- i) Using 30m Landsat satellite imageries of 2000, 2010, 2014 and 2018 to analyse patterns of land use and land cover and to conduct an analysis of time series area coverage
- j) Receiving petitions from the affected groups around the ten lake ecosystems
- k) Observation of the hotspots impacted by the flood waters
- l) Statistical analysis of data on hydro-meteorology and water quality.

Key Findings From the Scoping Mission

3.1 Key Findings Summarised

The key findings of the scoping mission fall into six categories that span socio-economic aspects; the emerging legal issues; impacts on biodiversity and the catchment hydrology. Others are geological controls and emerging security issues. The six are briefly elaborated below:

3.1.1 Socio-economic Impacts

Lake Victoria, Turkwel Gorge Dam and all the Rift Valley lakes have registered significant biodiversity and socio-economic impacts on the vegetation, wildlife and communities living in these areas. There has been destruction of livelihoods and amenities including basic infrastructure like roads, schools, health centres, hospitality facilities, and fish handling facilities at fish landing sites. The destruction of many hospitality facilities and tourist attraction areas has crippled tourism economy. The rising waters have generally affected an estimated 75,987 households, with a total of 379,935 people at risk. On the positive side, the rising water levels have boosted the fishing industry; there is a projected increase in fisheries potential of the lakes. On the negative side, however, the rising water levels have aided the spread of invasive aquatic weeds like water hyacinth into previously unaffected wetlands.





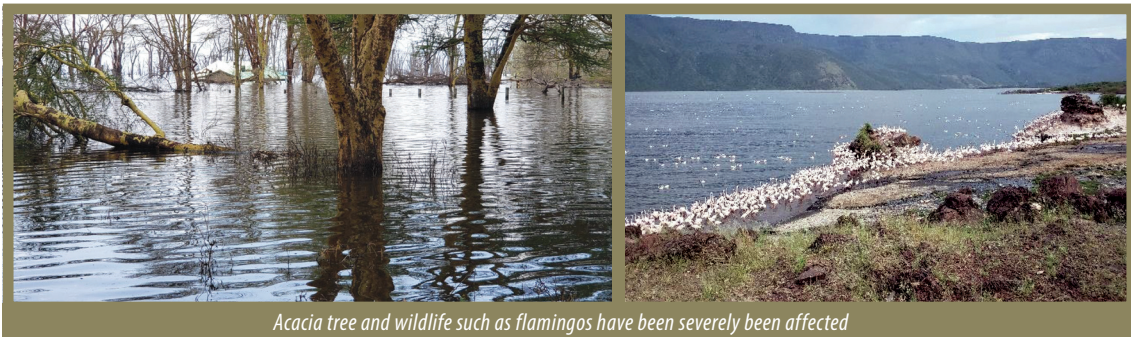
Submerged Grazing lands around Turkwel Gorge Dam area

3.1.2 The Emerging Legal Issues

There are simmering legal challenges due to loss of about 1106 Km² (110600 Ha) of land around the lakes. Part of the land that has been submerged has legal title deeds to it, implying that the holders have genuine grievances that will need to be addressed. Some of the owners of lands that have been submerged had however encroached on riparian lands and will need to be moved to safer areas. The government needs to determine the new high-water marks and ensure that new guidelines on the riparian lands are communicated and effectively enforced as impending short rainy seasons may intensify the current problems, creating even more legal challenges.

3.1.3 Impacts on Biodiversity

The rich biodiversity areas including wildlife sanctuaries and key Ramsar sites in some of these counties have been greatly impacted. The areas around the lakes which have been associated with such a robust interplay of rich biodiversity of trees, shrubs and important habitat for animal species including numerous species of Kenya's wildlife have all been negatively impacted by the rising water levels. There is a total annihilation of some of the trees and biodiversity. The worst impacted are the acacia trees, which have dried up and fallen. Increased human-wildlife conflicts have also been witnessed in most of the lakes as animals such as hippopotamus now walk freely within areas that were previously safely occupied by humans.



Acacia tree and wildlife such as flamingos have been severely been affected

3.1.4 Siltation and Sedimentation of the Lakes

Unsustainable farming practices and deforestation have significantly degraded the lake catchments. The encroachment on forest land for agriculture and other development purposes has led to stripping off of important forest cover, exposing the land to increased runoffs and hence soil erosion, eventually leading to increased siltation and sedimentation in the lake basins. Unsustainable land use practices within the headwaters and/or catchments require focused and in some cases site specific interventions to reduce land degradation. The government should rededicate efforts towards sustainable production practices to stop soil erosion, for instance through planting trees and constructing gabions and trenches to avert continued loss of fertile soil and increasing sedimentation in the lakes. Although silt removal is quite expensive, this should be considered because most of these lake ecosystems are choking with silt and soil sediments.

3.1.5 Geological Controls

A number of geological controls are linked to current surge of lake water levels. First, the East African Rift Valleys (EARs), being an active tectonic belt, is characterized by extensional stress-regime where myriad of tectonic forces continues to shape the present rift geometry including the segmentation of the rift lake basins. Such forces include magmatic stresses that have led to formation of major volcanic edifices and increased seismic activity.

Second, groundwater saturation within the rift valley lake basins poses eminent threats to the discharge of lake water. There is likelihood of potential subsurface groundwater exchange due to saturation resulting in an unbalanced negative moisture budget. The impacts of groundwater saturation within the fault-pathway networks are thought to limit underground out-flow from the water bodies. The varied hydrodynamics within the rift lake basins due to increased precipitation are thought to be responsible for the current phenomenon. As such, the increased lake water levels within EARs suggests that the lake basins could be experiencing periodic isostatic adjustments compounded by neotectonics deformation. This has the potential of creating asymmetry of water bodies within the rift systems creating escape routes for the waters and subsequent reduction of lake water levels.

Lastly, the location of these lakes within an active tectonic belt, where open faults and fractures continue to dissipate a significant number of magmatic gases like Carbon Dioxide (CO₂), increases the likelihood of high CO₂ concentration within these water bodies, raising major concerns on safety implications. This is likely possible considering that some of the submerged famous geysers and hot springs at Lake Bogoria could potentially lead to gas saturation. Such phenomenon is also likely to be replicated across all the other lakes due to the faulting nature of the basins.

3.1.6 Critical Security Issues

There have been increased cases of human-wildlife and inter-community conflicts in the areas in question. For instance, in Lake Baringo/Bogoria, Rukos Island wildlife sanctuary was submerged, forcing wildlife to relocate. Also submerged in the area were a GSU-RDU camp, KEMFRI labs, the Fisheries department, and other government and private facilities including hotels. The residents of Partalo, Ilgurme and Nosidan villages increasingly feel insecure after the rising water levels pushed them out of their ancestral land onto other people's territories where they are now competing for pasture. As for human-wildlife conflict, most lake basins reported increased incidences of human-wildlife conflicts, particularly those involving animals like buffalo, *Hippopotamus amphibious*, crocodiles and snakes which moved closer to the villages hence posing a threat to the community and their livestock.



Submerged Lake Baringo Club Lodge facilities.

In Lake Magadi basin, security issues revolve around of loss of lives and livestock due to flash floods; exposed fault lines and sinkholes in Nairage Enkare; unease within the Purko pastoral community at the construction of the silt diversion dykes; and vandalism of galvanized steel wires that support the gabions at the diversion point for own use. In the Turkwel Dam area, there has been increased tension between Pokot and Turkana communities due to loss of grazing lands and lack of awareness of the dam operation mechanisms, especially the concern over the potential of dam spillage downstream.

Scoping Mission's Recommendations and Conclusions

4.1 Need for Adequate and Sustainable Solutions

The scoping mission's recommendations for addressing the issue of rising waters in Kenya's Rift Valley, Turkwel Gorge Dam and Lake Victoria adequately and in a sustainable manner are elaborated below. Most prominent is the interests of local communities and the biodiversity within these areas which should drive any further interventions and plans by government, both at county and national levels.

4.1.1 Immediate Intervention Measures

The scoping mission recommends the following intervention measures to be undertaken immediately:

- i) **Humanitarian Assistance:** Immediate humanitarian assistance should be provided to the affected communities in the form of food and non-food items as well as in terms of incentives, subsidies and cash transfers to enable them cope with the crisis. Non-food items and services refer to shelter and shelter kits, emergency health services, health and nutrition, portable water, hygiene and sanitation facilities as well as psycho-social support which is urgently required in the immediate phase;
- ii) **Intensify Public Engagements:** Public engagements between the government and affected persons should be intensified in order to assure the people of the government's commitment to supporting them. This is a crucial a first step towards getting the affected persons back on their feet;

- iii) **Climate Change Awareness campaign:** This should be established using simple illustrations that would also lead to co-creation of solutions while also addressing the issue of increasing human-wildlife conflicts;
- iv) **Rising Lake Levels:** This should be closely monitored as it helps avert hazards before their occurrence in the future;
- v) **Meteorological Patterns:** This too, should be closely monitored, and simulation of future scenarios be advanced as part of immediate intervention approaches; and,
- vi) **Rapid Assessment:** A rapid assessment of the impacts of rising lake levels on biodiversity and food security needs to be conducted in the affected areas.

4.1.2 Short-term Intervention Measures

The following are some of the intervention measures that need to be executed in the short-term, between, defined as the period between the immediate and three(0–3) months:

- i) **Rehabilitation Programme:** Rehabilitate, relocate, and restore damaged infrastructure such as water supplies, sewerage plants, fish handling facilities, health centres, electricity supplies, roads, schools, police stations and police posts as per the specified requirements;
- ii) **Flood Control:** Carry out flood control and conservation practices in catchment areas in order to reduce the impact of flood water on livelihoods and properties in general. Green Recovery approaches such as enhancing green infrastructure should be adopted. This will help enhance the percolation of rainwater and improve recharge of shallow unconfined underground aquifers which are integral to minimizing risks and impacts of rising water levels; and,
- iii) **Study the Hydrochemistry of the Lakes:** Carry out a focused study on the hydrochemistry of the lakes; particularly on isotope studies and on monitoring the saturation of carbon dioxide to understand the dynamics of each lake and the associated hazards due to swelling. This can be expanded through engaging WRA sub-regional offices and County Governments for speedy execution.

4.1.3 Medium-term Intervention Measures

- i) **Broader LULC Studies:** A broader range of land use, land cover (LULC) studies should be conducted, and water balance on all the lakes and their respective basins to inform establishment of the highest water mark under the worst-case scenarios in the history of the lakes. This will help in clearly defining and demarcating boundaries around the lakes;

- ii) **Buying off Affected Area:** The government should consider buying off the affected areas in order to create a buffer zone; and,
- iii) **Ground Water Monitoring Boreholes Drilling and Tectonic Movements Research:** These would help determine the likelihood of episodic recharge within the aquifers during heavy rains against the saturation potential of groundwater. The aim in such drilling would be geared towards monitoring potential isotactic adjustments that may be catastrophic. The tectonic movements research on magmatic stresses, including seismic monitoring would help detect active zones potentially in distress due to swelling lakes. This should be conducted together with bathymetric studies to determine the depth of lakes and sedimentation.

4.1.4 Long-term Intervention Measures

- i) **Lake Basin Management Strategy:** The government must prioritize, finalize and implement the *National Lake Basin Management Strategy* currently domiciled at the Ministry of Water and Irrigation. The purpose of the strategy is to provide an integrated framework for the sustainable management and use of Lake Basin resources through informing policies, strategies, plans, projects and programmes, as well as to guide coordinated actions. It embraces all institutions mandated to manage and conserve land, water and other resources within each lake basin; recognizes the role of the public and other stakeholders in the conservation and governance of lake basins; embraces appropriate and practical state-of-the-art technologies and innovations which advance conservation and sustainability of water resources; advocates for a strong data, knowledge and information system for evidence-based decision making at all levels; and explores opportunities for broad-based financial mobilization; and,
- ii) **Support Preparation of Climate Resilient County Spatial Plans:** The Government should re-dedicate efforts to support all the 47 Counties to prepare *Climate Resilient County Spatial Plans* that will anticipate such challenges in a more predictive manner. The CRSPs should clearly delineate the new proposed high-water marks and provide clear land use and physical planning guidelines that will avert the continued developments in areas considered as riparian areas, under the relevant laws.

4.2 Budgets for Financing the Identified Interventions

It is proposed that the Government should set aside a budget for resolving some of the challenges identified in the scoping report. Other partners should also be mobilised to contribute towards the sustainable management of this unprecedented challenge. Partners like UNDP and USAID,

along with other friends of Kenya, should continue to support efforts to coordinate measures aimed at responding to the issue of rising water levels.

4.3 Summary Costs of Proposed Interventions

The above-outlined intervention measures are likely to attract a cost to the tune of KSh 17,622,832,936, summarised in the table below:

Intervention Category	Estimated Cost KSh	Estimated Cost US\$
(i) Immediate Intervention Measures	3,133,547,436	29,022,916
(ii) Short term Intervention Measures	233,085,500	2,158,799
(iii) Medium Term Intervention Measures	8,273,200,000	76,624,988
(iv) Long Term Intervention Measures	6,321,968,250	58,536,743
Grand Total	17,961,180,119	166,353,433

4.4 Conclusion and Way Forward

The scoping report concludes by imploring the Government of Kenya to undertake follow-ups of the recommendations made in the report which have been categorized in terms of the immediate; short-term, medium-term and long-term actions. The report recognises that the interests of the local communities and the biodiversity within the affected areas is quite prominent and will drive further interventions and plans by the government, at the county and national levels. It is only through the proposed actions and follow-ups that the continued rise and the resultant impacts of the devastating situation of rising water lakes will be averted.

Given the magnitude of the challenge, the Government will continue to partner with UNDP and other multilateral and bilateral partners in order to mobilize the much-needed resources through a multi-donor programme that will seek to resolve the short-term; medium-term and long-term issues identified in the report. The Government and UNDP, together with other partners will also move to secure a broad-based ownership and support of a comprehensive programme that will seek to manage any such future occurrences in a sustainable manner.

ANNEX 1: A Summary of the Changes in the Size of the Affected Lakes

Taking 2010, 2014 and 2020 as cases in point, Landsat imagery was used to digitize and compute the changes in the surface area of these lakes. The table below summarizes the results:

S/N	Lake/Dam	Toposheet (Km ²)	2010 Extent (Km ²)	2014 Extent (Km ²)	2020 Extent (Km ²)	Change (2020-2010)	% Change	Change (2020 Normal)	% Change from Normal
1	Turkana	7485.48	7947.85	8064.09	8265.07	317.22	3.99	779.59	10.41
2	Logipi	129.88	183.46	178.43	190.93	7.47	4.07	61.05	47.00
3	Baringo	128.08	159.49	221.77	268.06	108.57	68.07	139.98	109.29
4	Bogoria	34.35	34.79	40.5	43.25	8.46	24.32	8.9	25.91
5	Solai	5.74	9.54	13	13.61	4.07	42.66	7.87	137.11
6	Nakuru	40.04	45.01	56.82	68.18	23.17	51.48	28.14	70.28
7	Ol' Bolossat	18.2	39.81	50.39	52.16	12.35	31.02	33.96	186.59
8	Elmenteita	21.24	21.54	22.78	22.97	1.43	6.64	1.73	8.15
9	Naivasha	135.32	154.16	164.86	193.48	39.32	25.51	58.16	42.98
10	Magadi	141.09	148.09	150.9	153.3	5.21	3.52	12.21	8.65
11	Victoria	3971.37	4030.22	4421.32	4572.7	542.48	13.46	601.33	15.14
12	Turkwel Dam	18.97	22.97	31.68	59.27	36.3	158.03	40.3	212.44
	Total	12129.76	12796.93	13416.54	13902.98	1106.05	8.64	1773.22	14.62

The data is based on GIS Landsat8 Satellite imagery of 28m spatial resolution.

ANNEX 2: Implementation Matrix of Intervention Measures for the Rising Water Levels in the Rift Valley Lakes, Turkwel Gorge Dam and Lake Victoria

IMMEDIATE INTERVENTIONS (Time Frame 0 to 3 Months)

No.	Activity	Unit of measure	Qty	Time Frame (Months)			Actor	Activity Cost (KSh)	
				1	2	3			
1	Intervention Measure: Provision of Relief and Cash Assistance								
1.1	Disbursement cash using appropriate cash transfer delivery mechanism (for 3 Months) – Baringo	HH / Month	3087				Ministry of Devolution/ Ministry of Interior	41,674,500	
1.2	Disbursement cash using appropriate cash transfer delivery mechanism (for 3 Months) – Nakuru	HH / Month	1700				Ministry of Devolution/ Ministry of Interior	22,950,000	
1.3	Disbursement cash using appropriate cash transfer delivery mechanism (for 3 Months) – Nyandarua	HH / Month	200				Ministry of Devolution/ Ministry of Interior	2,700,000	
1.4	Disbursement cash using appropriate cash transfer delivery mechanism (for 3 Months) – West Pokot	HH / Month	1500				Ministry of Devolution/ Ministry of Interior	20,250,000	
1.5	Disbursement cash using appropriate cash transfer delivery mechanism (for 3 Months) – Turkana	HH / Month	4053				Ministry of Devolution/ Ministry of Interior	54,715,500	
1.6	Disbursement cash using appropriate cash transfer delivery mechanism (for 3 Months) – Marsabit	HH / Month	3710				Ministry of Devolution/ Ministry of Interior	50,085,000	
1.7	Disbursement cash using appropriate cash transfer delivery mechanism (for 3 Months) – Kajiado	HH / Month	500				Ministry of Devolution/ Ministry of Interior	6,750,000	
1.8	Disbursement cash using appropriate cash transfer delivery mechanism (for 3 Months) – Busia	HH / Month	8922				Ministry of Devolution/ Ministry of Interior	120,447,000	
1.9	Disbursement cash using appropriate cash transfer delivery mechanism (for 3 Months) – Kisumu	HH / Month	13800				Ministry of Devolution/ Ministry of Interior	186,300,000	
1.1	Disbursement cash using appropriate cash transfer delivery mechanism (for 3 Months) – Siaya	HH / Month	32507				Ministry of Devolution/ Ministry of Interior	438,844,500	
1.11	Disbursement cash using appropriate cash transfer delivery mechanism (for 3 Months) – Homabay	HH / Month	7752				Ministry of Devolution/ Ministry of Interior	104,652,000	
1.12	Disbursement cash using appropriate cash transfer delivery mechanism (for 3 Months) – Migori	HH / Month	3416				Ministry of Devolution/ Ministry of Interior	46,116,000	
Total for Cash Disbursement								1,095,484,500	1,095,484,500

No.	Activity	Unit of measure	Qty	Time Frame (Months)			Actor	Activity Cost (KSh)	
				1	2	3			
Intervention: Other Cash Disbursements									
1.13	Transaction cost, Transfer and withdrawal charges – MPESA (Baringo, Nakuru, West Pokot, Turkana, Marsabit, Samburu, Kajiado, Busia, Siaya, Kisumu, Homabay, Migori)	Transfer					Ministry of Devolution/ Ministry of Interior	29,179,008	
1.14	Target and register beneficiaries – Community meetings at county level	Pax / County	300				Ministry of Devolution/ Ministry of Interior	180,000	
1.15	Cash working group meetings	Pax / County	150				Ministry of Devolution/ Ministry of Interior	600,000	
1.16	Local Volunteers (10 volunteers per county), community mobilization, beneficiaries registration, validation, complaints, PDM	Pax / County	500				Ministry of Devolution/ Ministry of Interior	900,000	
1.17	Encashment monitoring – supervision from GoK/ implementing actors for 3 days	Lumpsum/ County	10				Ministry of Devolution/ Ministry of Interior	4,000,000	
Total for Other Cash Disbursements								34,859,008	34,859,008
Relief and Cash Assistance Total								1,130,343,508	

2 Intervention Measure: Provision of Emergency Health and Hygiene Services									
2.1	Replenishment of Inter-agency Emergency Health Kit, Basic Modules – (Baringo, Nakuru, West Pokot, Turkana, Marsabit, Samburu, Kajiado, Busia, Siaya, Kisumu, Homabay, Migori)	Kits	12				Ministry of Health/ Ministry of Interior/ County Govts	4,800,000	
2.2	Procurement of Rapid Diagnostic Kits, Malaria – (Baringo, Nakuru, West Pokot, Turkana, Marsabit, Samburu, Kajiado, Busia, Siaya, Kisumu, Homabay, Migori)	Kits	12				Ministry of Health/ Ministry of Interior/ County Govts	4,800,000	
2.3	Nutrition commodities (iron folic acid supplements) – (Baringo, West Pokot and Turkana, Marsabit)	Tins / county	3200				Ministry of Health/ Ministry of Interior/ County Govts	1,600,000	
2.4	Nutrition commodities (de-wormers) – (Baringo, Nakuru, Kajiado, West Pokot, Turkana, Busia, Kisumu, Siaya, Homabay, Migori)	Tins / County	8300				Ministry of Health/ Ministry of Interior/ County Govts	10,375,000	
2.5	Procurement NCD screening and monitoring equipment and Supplies	County	12				Ministry of Health/ Ministry of Interior/ County Govts	3,000,000	
2.6	Procurement of assistive and mobility devices for PWDs – (Baringo, West Pokot, Turkana and Marsabit are considered to have higher numbers of PWDs whose concerns are not well addressed)	County	4				Ministry of Health/ Ministry of Interior/ County Govts	2,400,000	
2.7	Sensitization of displaced population on disease prevention and control strategies	Sessions / County	54				Ministry of Health/ Ministry of Interior/ County Govts	1,749,600	

No.	Activity	Unit of measure	Qty	Time Frame (Months)			Actor	Activity Cost (KSh)	
				1	2	3			
2.8	Conduct Individual and Group therapy sessions (Session costs which include 19 counsellors' costs)	Sessions / County	54				Ministry of Health/ Ministry of Interior/ County Govts	4,860,000	
2.9	Safe spaces for children and other groups for 19 counsellors (child therapy sessions)	County	9				Ministry of Health/ Ministry of Interior/ County Govts	810,000	
2.1	Identification of referral linkages for advanced care – (Baringo, West Pokot, Turkana, Busia, Marsabit)	County	5				Ministry of Health/ Ministry of Interior/ County Govts	3,000,000	
2.11	Facilitate the incorporation of 20 counsellors in all the outreaches (mainstreaming PSS at primary Health care level) – (Baringo, Nakuru, West Pokot, Turkana, Marsabit, Samburu, Kajiado, Busia, Siaya, Kisumu, Homabay, Migori)	Pax / County	45				Ministry of Health/ Ministry of Interior/ County Govts	5,791,500	
2.12	Conduct Rapid assessments in the affected counties for early identification and referral for appropriate management at health facilities – (Baringo, West Pokot, Turkana, Marsabit, Busia)	County	5				Ministry of Health/ Ministry of Interior/ County Govts	2,000,000	
2.13	Support coordination at County and Sub County level for review of available data and the situation and response gaps	County	13				Ministry of Health/ Ministry of Interior/ County Govts	975,000	
2.14	Facilitate referrals for Emergency Obstetric care – (Baringo, West Pokot, Turkana, Marsabit, Busia)	County	5				Ministry of Health/ Ministry of Interior/ County Govts	420,000	
2.15	Procurement of Reproductive Dignity kits (500 male and 500 female)	Kits / County	10000				Ministry of Health/ Ministry of Interior/ County Govts	15,000,000	
2.16	Community awareness on GBV prevention, response and reporting mechanisms	County	12				Ministry of Health/ Ministry of Interior/ County Govts	2,400,000	
2.17	Mapping, establishment and support of GBV referral pathway – (Baringo, West Pokot, Turkana and Marsabit)	County	4				Ministry of Health/ Ministry of Interior/ County Govts	400,000	
2.18	Support Health Emergencies county level coordination.	Meetings	13				Ministry of Health/ Ministry of Interior/ County Govts	1,950,000	
2.19	Continuously monitor emergency health, Nutrition, MHPSS, RH and GBV intervention in the operation	County	13				Ministry of Health/ Ministry of Interior/ County Govts	7,800,000	
2.2	Include messages on preventing and responding to Sexual and Gender-Based Violence (SGBV) in all community outreach activities – (Baringo, West Pokot, Turkana and Marsabit have high cases reported)	County	4				Ministry of Health/ Ministry of Interior/ County Govts	960,000	

No.	Activity	Unit of measure	Qty	Time Frame (Months)			Actor	Activity Cost (KSh)	
				1	2	3			
2.21	Map and make accessible information on local referral systems for any child protection concerns – (Baringo, West Pokot, Turkana and Marsabit)	County	4				Ministry of Health/ Ministry of Interior/ County Govts	960,000	
2.22	Provide essential services (including reception facilities, RFL, and access to education, health, shelter, and legal services) to unaccompanied and separated children and other children on their own – (Baringo, West Pokot, Turkana and Marsabit)	County	4				Ministry of Health/ Ministry of Interior/ County Govts	1,200,000	
2.23	Establish child-friendly spaces and community-based child protection activities, including educational ones – (Baringo, West Pokot, Turkana and Marsabit)	County	4				Ministry of Health/ Ministry of Interior/ County Govts	600,000	
2.24	Continuously monitor Inclusion and protection interventions in the operation – (Baringo, West Pokot, Turkana and Marsabit)	County	4				Ministry of Health/ Ministry of Interior / County Govts	600,000	
Sub-Total								78,451,100	78,451,100

3 Intervention Measure: Emergency Response									
	Emergency referrals, social mobilization, risk communication and health promotion in view of the current surge of COVID-19	County					Ministry of Health/ Ministry of Interior/ County Govts	10,000,000	
	Integrated outreach services, expertise movement training and national technical support to counties (HEDRM, DSRU, EH)	County					Ministry of Health/ Ministry of Interior/ County Govts	50,000,000	
	Laboratory and diagnostic support	County					Ministry of Health/ Ministry of Interior/ County Govts	50,000,000	
	Pharmaceutical for emergency relief	County					Ministry of Health/ Ministry of Interior/ County Govts	100,000,000	
	Emergency Medical Commodities for field hospitals, trauma and mass casualty kits	County					Ministry of Health/ Ministry of Interior/ County Govts	20,000,000	
	Non-food items (Tents for field and mobile hospitals, forensic and blood service materials, GIS equipment)	County						50,000,000	
Sub-Total								280,000,000	280,000,000

No.	Activity	Unit of measure	Qty	Time Frame (Months)			Actor	Activity Cost (KSh)	
				1	2	3			
3	Intervention: Hygiene Promotion								
3.1	Procurement and distribution of WASH NFIs	Pieces	48678				Ministry of Health/ Ministry of Interior/ County Govts	3,650,850	
3.2	Water treatment chemicals (PUR) – 2 sachets/ HH	Pieces	48678				Ministry of Health/ Ministry of Interior/ County Govts	1,168,272	
3.3	Water treatment chemicals (aqua tabs) – 2 tablets/HH	Pieces	48678				Ministry of Health/ Ministry of Interior/ County Govts	730,170	
3.4	Hygiene refresher training for community hygiene promoters (60 CHVs/Volunteers per county in 13 counties)	County	13				Ministry of Health/ Ministry of Interior/ County Govts	3,900,000	
3.5	Community clean up campaigns	County	13				Ministry of Health/ Ministry of Interior/ County Govts	3,900,000	
3.6	Community hygiene promoters' allowances	County / Pax	600				Ministry of Health/ Ministry of Interior/ County Govts	2,160,000	
Sub-Total								15,509,292	15,509,292
4	Intervention: Provision of Wash NFIs								
4.1	Procurement and distribution of emergency latrine slabs for schools	Slabs	1168				Ministry of Health/ Ministry of Interior/ County Govts	7,009,632	
4.2	Jerricans (2 per family), to be distributed to vulnerable persons	Pieces	24339				Ministry of Health/ Ministry of Interior/ County Govts	6,084,750	
4.3	Bar Soap (2 per family, plus 1,000 bars to be distributed for hand washing)	Pieces	25339				Ministry of Health/ Ministry of Interior/ County Govts	2,027,120	
4.4	Sanitary towels (1 pack per deserving beneficiary/females with menstrual cycles)	Packs	14603				Ministry of Health/ Ministry of Interior/ County Govts	4,381,020	
Sub-Total								19,502,522	19,502,522
5	Intervention: Promotion of Appropriate Sanitation								
	Education and awareness sessions on latrine construction	County / Pax	12				Ministry of Health/ Ministry of Interior/ County Govts	1,800,000	

No.	Activity	Unit of measure	Qty	Time Frame (Months)			Actor	Activity Cost (KSh)	
				1	2	3			
	Demonstration of latrine and hand washing facility construction	County	12				Ministry of Health/ Ministry of Interior/ County Govts	2,520,000	
	Rehabilitation of latrines in schools	County	12				Ministry of Health/ Ministry of Interior/ County Govts	60,000,000	
Sub-Total								64,320,000	64,320,000
Emergency Health and Hygiene Services Total								177,782,914	457,782,914

6 Intervention: Supply of clean and safe Water									
6.1	Rehabilitation and/or improvement of water points/systems (30 water points in 12 counties)	County / per system	12				Ministry of Water/ County Governments	79,200,000	
6.2	Disinfection of water points/wells	Well	12				Ministry of Water/ County Governments	720,000	
6.3	Deployment and operation of emergency water treatment plant including water trucking in counties with high displacement population density – (Baringo, West Pokot, Turkana, Busia, Kisumu, Homabay & Migori)	County / days	7				Ministry of Water/ County Governments	2,646,000	
6.4	Procurement of chemicals for the emergency treatment plant	County / Month	7				Ministry of Water/ County Governments	491,400	
6.5	Water quality testing	Unit	7				Ministry of Water/ County Governments	44,100	
6.6	Residual chlorine testing tablets	Tablet	7					25,200	
Sub-Total								83,126,700	83,126,700

7 Intervention: Water level Monitoring									
7.1	Rehabilitate and automate water level monitoring stations	Number	12				WRA	36,000,000	
7.2	Operationalize water quality monitoring system in all the lakes	WRA Sub Region	12				WRA	9,600,000	
7.3	Demarcation of highest water marks and riparian reserves	Lakes	12				WRA	120,000,000	
Sub-Total								165,600,000	165,600,000

8 Intervention: Support Irrigation									
8.1	Supply of rice seedlings to affected farmlands for rural community resilience in West Kano, Budalangi, Ewaso Nyiro South and other lake Victoria basin	Kilograms	113200				Ministry of Water/ NIB	11,320,000	

No.	Activity	Unit of measure	Qty	Time Frame (Months)			Actor	Activity Cost (KSh)	
				1	2	3			
8.2	Supply of fertilizer to affected farmlands for rural community resilience in West Kano, Budalangi, Ewaso Nyiro South and other L Victoria basin	Bags	11320				Ministry of Water/ NIB	33,960,000	
8.3	Rotavation / land preparation of affected farmlands for rural community resilience in West Kano, Budalangi, Ewaso Nyiro South, and other in L Victoria basin	Acres	5640				Ministry of Water/ NIB	18,048,000	
Sub-Total								63,328,000	63,328,000
Water, Sanitation and Irrigation Total								248,726,700	

9 Intervention: Provision of Emergency Shelter Kits									
9.1	Procurement of Kitchen sets including branding	Pieces	24339				Ministry of Devolution	54,519,360	
9.2	Procurement of Tarpaulins including branding	Pieces	48678				Ministry of Devolution	55,492,920	
9.3	Procurement of Mosquito Nets	Pieces	48678				Ministry of Devolution	19,471,200	
9.4	Procurement of Sleeping Mats	Pieces	48678				Ministry of Devolution	12,169,500	
9.5	Storage for NFI	County	12				Ministry of Devolution	600,000	
9.6	Transportation costs for NFI and distribution	County	12				Ministry of Devolution	6,000,000	
Emergency Shelter Total								148,252,980	148,252,980

10 Intervention: Support Education									
10.1	Procurement of temporary outdoor learning tents/construct temporary mabati structures for primary schools	County	60				Ministry of Education/ County Governments	30,000,000	
10.2	Procurement of temporary outdoor learning tents//construct temporary mabati structures for secondary schools	County	60				Ministry of Education/ County Governments	30,000,000	
10.3	Procure and distribution of facemasks for the vulnerable school going children	County	12				Ministry of Education/ County Governments	6,000,000	
Education Total								66,000,000	66,000,000

11 Intervention: Support Agriculture and Food Security (Irrigation)									
11.1	Repair of pipelines and intake works	County	10				State Dept & concern County government	15,000,000	
11.2	Replacement/repair of damaged pumps	County	10				State Dept & concern County government	5,000,000	
11.3	Purchase and supply of recovery seeds – Maize	Tons	296				State Dept & concern County government	8,880,000	
11.4	Purchase and supply of recovery seeds – Beans	Tons	482				State Dept & concern County government	16,870,000	

No.	Activity	Unit of measure	Qty	Time Frame (Months)			Actor	Activity Cost (KSh)	
				1	2	3			
11.5	Purchase and supply of recovery seeds – Sorghum	Tons	113				State Dept & concern County government	3,390,000	
11.6	Purchase and supply of recovery seeds/ seedlings - Rice	Tons	436				State Dept & concern County government	15,260,000	
11.7	Purchase and supply of recovery seeds/ seedlings - Vegetables	Kgs	1374				State Dept & concern County government	2,748,000	
11.8	Purchase and supply of recovery seeds/ seedlings - Root crops	Kgs	6077				State Dept & concern County government	60,770,000	
11.9	Distribution (agric. Institutions and counties to provide trucks.	County	10				State Dept & concern county government	1,000,000	
11.1	Diagnosis, treatment and control of zoonotic diseases in animals	County	10				State Department of Livestock/ County Governments	30,000,000	
11.12	Animal feed distribution to flood affected herding communities	County	10				State Department of Livestock/ County Governments	15,000,000	
11.13	Pasture and fodder Development	County	10				State Department of Livestock/ County Governments	10,000,000	
Agriculture/Food Security Total								183,918,000	183,918,000

12 Intervention: Support Wildlife and Tourism									
12.1	Undertake relocation of endangered wildlife in the flooding Protected areas including giraffes and zebras to safer locations - Lakes Baringo, Naivasha & LNNP	County	3				Ministry of Tourism and Wildlife	10,500,000	
12.2	Undertake Human Wildlife Conflict mitigation quick responses in Baringo, Busia, Homa Bay, Kisumu, Nakuru, Nyahururu, Migori	County	7				Ministry of Tourism and Wildlife	21,000,000	
12.3	Undertake the rehabilitation of the Electric Fence around Lake Nakuru National Park	KWS	1				Ministry of Tourism and Wildlife	16,000,000	
12.4	Undertake Roads Rehabilitation and upgrading in Lake Nakuru National Park	KWS LNNP	1				Ministry of Tourism and Wildlife	200,000,000	
12.5	Undertake the Rehabilitation of Tourism infrastructure in Lake Nakuru National Park (includes the airstrip at Naishi Campsites, Signages)	KWS LNNP	1				Ministry of Tourism and Wildlife	150,000,000	
12.6	Undertake construction of classrooms and laboratories for Aquatic Sciences KWSTI	KWS WRTI	14				Ministry of Tourism and Wildlife	21,000,000	
12.7	Support and establish temporary administration facilities and infrastructures in higher grounds for the submerged Lake Bogoria National Reserve to bolster continuation in operations and revenue collection	County	1				Ministry of Tourism and Wildlife	35,000,000	

No.	Activity	Unit of measure	Qty	Time Frame (Months)			Actor	Activity Cost (KSh)	
				1	2	3			
12.8	Undertake community sensitization foras, that will keep informing the communities living with wild animals, the importance of living with wildlife in harmony. Includes preparation and dissemination of Educational materials, engaging in Electronic and print media	County	3				Ministry of Tourism and Wildlife	6,000,000	
Tourism and Wildlife Sector Total								459,500,000	459,500,000

13 Intervention: Support Fisheries									
13.1	Rehabilitation/reconstruction/relocation of fish landing sites affected by rising lake levels by provision of: (a) sanitary facilities—toilets, hand washing facilities, solid and liquid waste water areas. (b) preservation facilities—fish drying racks, fish smoking kilns, cool boxes, deep freezers. (c) fish handling facilities—hygienic temporary fish handling sheds, portable water (raised water tanks), temporary prefab offices (patrol units, BMUs, health certificates)- at 79 landing sites (Lakes Victoria—50; Naivasha—3; Turkana—19; Baringo 7) in Busia, Siaya, Kisumu, Homabay, Migori, Nakuru, Baringo, Turkana, Marsabit Counties.	Fish landing sites	79				S DFA&BE, Ministry of Interior, Kenya Fisheries Services (KeFS), County governments, Beach Management Units (BMUs), UNDP	395,000,000	
13.2	Rapid assessment of effect of flooding on cage culture (in Lake Victoria)	Surveys	1				S DFA&BE, Kenya Marine & Fisheries Research Institute (KMFRI), Counties, BMUs, UNDP	3,000,000	
13.3	Rapid assessment of effect of rising lake levels on capture fisheries or wild fish stocks on food security (Lakes Victoria, Naivasha, Baringo, Turkana and Turkwell Gorge dam)	Surveys	5				KMFRI, Counties, BMUs, UNDP	17,500,000	
13.4	Rapid assessment on the effect of rising water levels on distribution of obnoxious weed (water hyacinth) on Lakes Victoria, Naivasha, Baringo	Surveys	3				KMFRI, Counties, BMUs, UNDP	4,500,000	
13.5	Sensitization and Dissemination of information on flooding effect to fisher-folk communities (Busia, Siaya, Kisumu, Homabay, Migori, Nakuru, Baringo, Turkana, Marsabit, West Pokot)	Meetings/ County	10				S DFA&BE, Ministry of Interior, Counties, BMUs, UNDP	8,000,000	
Fisheries Sector Total								428,000,000	428,000,000

14 Intervention: Provision of Energy									
14.1	Re-routing submerged sections of 33kv lines at Lake Baringo						Ministry of Energy	5,146,908	

No.	Activity	Unit of measure	Qty	Time Frame (Months)			Actor	Activity Cost (KSh)	
				1	2	3			
14.2	Re-routing submerged sections of 33kv lines at Kampi ya Samaki						Ministry of Energy	1,989,305	
14.3	Re-routing 132 kv double circuit at lake Nakuru						Ministry of Energy	189,863,787	
14.4	Re-route 11kv line South Ex Kihoto						Ministry of Energy	3,500,000	
14.5	Re-route 11kv line North Ex Marula						Ministry of Energy	20,000,000	
14.6	Re-site the North Ex DCK & South Ex DCK at lake Naivasha						Ministry of Energy	7,195,334	
Energy Sector Total								227,695,334	227,695,334
Grand Total for Immediate								3,133,547,436	

SHORT TERM INTERVENTIONS (Time Frame 4 to 12 Months)

No.	Activity	Unit of measure	Qty	Time Frame (Months)			Actor	Activity Cost (KSh)	
				4-Jun	7-Sep	10-Dec			
15 Intervention: Support Agriculture									
15.1	Sensitization of farmers on climate change	County (3 per county)	36				State dept & concerned county government	18,000,000	
15.2	Sensitization of farmers on climate smart agriculture	County	36				State dept & concerned county government	18,000,000	
15.3	Sensitize of farmers on agriculture land use planning	County	36				State dept & concerned county government	18,000,000	
Sub-Total								54,000,000	54,000,000

16 Intervention: Support Fisheries									
16.1	Undertake frame surveys in Lakes Victoria, Turkana, Baringo, Naivasha, Solai and Turkwel gorge dam (inventory of; fish landing sites, facilities supporting fishing services at landing sites including accessibility, number of fishers, number and types of fishing boats and fishing gears, beach management units, alternative livelihoods etc) to guide development and management of the fisheries resources	Survey	6				SDFA&BE, KMFRI, KeFS, Counties, Universities, BMUs	35,000,000	
16.2	Support fish farmers to acquire inputs for the rehabilitating severely destroyed ponds	No.	75				SDFA&BE, Counties	19,500,000	

No.	Activity	Unit of measure	Qty	Time Frame (Months)			Actor	Activity Cost (KSh)	
				4-Jun	7-Sep	10-Dec			
16.3	Supporting fish farmers to acquire fingerings for stocking ponds	No.	755				SDFA&BE, Counties	7,285,500	
16.4	Restocking of public dams affected by floods	No.	55				SDFA&BE, Counties	30,800,000	
16.5	Sensitize fish farmers on adoption of climate smart and resilient technologies in aquaculture	Counties	11				SDFA&BE, Counties	11,000,000	
Total for Short-Term Fisheries								84,085,500	84,085,500

17 Intervention: Secure and Protect Riparian Lands									
17.1	Undertake participatory surveys in Lakes Victoria, Turkana, Baringo, Naivasha, Solai and Turkwel gorge to establish Highest and Lowest Water Marks to prevent encroachment and guide development within these lands	Survey	6				NLC	35,000,000	
17.2	Undertake mapping and delineation of boundaries and pegging of riparian lands (land between highest and lowest water marks)	Mapping	6				NLC	35,000,000	
Land Short-Term Sub-Total								70,000,000	70,000,000

18 Intervention: inter-Community Conflicts									
18.1	Conduct conflict risk assessment, surveillance and reporting	County	5				State Department for ASALs /State Department for Interior/County Governments	2,500,000	
18.2	Community sensitization and awareness on sharing of natural resources and importance of peaceful coexistence	County	5				State Department for ASALs /State Department for Interior/County Governments	10,000,000	
18.3	Establish and strengthen peace committees in affected counties						State Department for ASALs /State Department for Interior/County Governments	4,500,000	
	Support coordination of interventions at county and sub-county level	Meetings	10				State Department for ASALs /State Department for Interior/County Governments	8,000,000	

No.	Activity	Unit of measure	Qty	Time Frame (Months)			Actor	Activity Cost (KSh)	
				4-Jun	7-Sep	10-Dec			
Devolution and ASAL Sub-Total								25,000,000	25,000,000
Grand total Short-Term Measures								233,085,500	233,085,500

**MEDIUM TERM INTERVENTIONS
(Time Frame 12 to 36 Months)**

No.	Activity	Unit of measure	Qty	Time Frame (Months)			Actor	Activity Cost (KSh)	
				12	24	36			
19 Intervention: Support Education									
19.1	Improvement of infrastructure for the hosting schools and relocation of some schools to new sites	County	60				Ministry of Education/ County Govts	104,500,000	
19.2	Improvement of infrastructure for the hosting schools and relocation of some schools to new sites	County	60				Ministry of Education/ County Govts	104,500,000	
Education Total								209,000,000	209,000,000

20 Intervention: Support Agriculture									
20.1	Sensitization of farmers on climate smart agriculture	County	36				State dept & concern county government	18,000,000	
20.2	Implementation of conservation agriculture (KSh 1,000 per h/h)	House holds	20,000 (25% of H/H)				"	20,000,000	
20.3	On farm water harvesting (3000m ³ @KSh 300,000)	House holds	8,000 (10% of H/H).				State dept, county government & irrigation	2,400,000,000	
Total Support Agriculture								2,438,000,000	2,438,000,000

21 Intervention: Restoration and Conservation of Watersheds and Catchment Areas									
21.1	Rehabilitation of key water catchment areas and construction of retention structures to reduce soil erosion	County	10				Ministry of Environment/ Ministry of Water /County Governments	1,000,000,000	
21.1	Protection and conservation of river ecosystems	County	10				Ministry of Environment/ Ministry of Water/County Governments	500,000,000	
21.3	Tree seed collection storage and distribution	Tones	50				Ministry of Environment	256,000,000	

No.	Activity	Unit of measure	Qty	Time Frame (Months)			Actor	Activity Cost (KSh)	
				12	24	36			
21.4	Support to community nurseries						Ministry of Environment	500,000,000	
Restoration and Conservation Total								2,256,000,000	2,256,000,000

22 Intervention: Support Fisheries									
22.1	Reconstruction of six modern Fish Landing sites facilities affected by the rising water levels of Lake Victoria. Rehabilitation of landing site facilities in Lake Baringo, Lake Naivasha	Modern Fish facilities	6				SDFA&BE, Ministry of Interior, KMFRI, KeFS, Counties, BMUs (NOTES The six landing sites at Lake Victoria will cost KSh 179m each as estimated by Public Works. This activity is captured in government budget)	1,114,000,000	
22.2	Fish stock assessments (catch assessments – fish species caught by fishermen and their value; fish biomass assessments – quantity of fish (tonnage) available in lakes and by species; fisheries socio-economics surveys – income and employment, trading, social aspects including gender dynamics, contribution to GDP etc) in Lakes Victoria, Turkana, Baringo, Naivasha, Solai and Turkwel gorge dam.	Surveys	8				SDFA&BE, KMFRI, KeFS, Universities, Counties, BMUs	165,000,000	
22.3	Monitoring fish critical habitats (fish breeding and nursery sites, fishing/ cage culture grounds etc) for pollution in Lakes Victoria, Turkana, Baringo, Naivasha, Solai and Turkwel gorge dam.	Surveys	8				KMFRI, KeFS, Counties, BMUs	40,000,000	
Total to Support Fisheries								1,319,000,000	1,319,000,000

23 Intervention: Drilling and Installation of Groundwater Monitoring Boreholes									
	Drilling and installation of groundwater monitoring boreholes across the Rift lakes (L. Turkana 10Bhs, L. Baringo 2 Bhs, L. Bogoria 2Bhs, L. Solai 1Bh, L. OlBolosat 1Bh, L. Nakuru 3 Bhs, L. Naivasha 3Bhs, L. Elementaita 2Bhs, L. Magadi 2 Bhs) including Lake Victoria (7 Bhs) and Turkwel Gorge Dam (1 Bh) to determine episodic recharge against groundwater saturation and potential isostatic adjustments	Boreholes	34				Ministry of Mining, Mines and Geology, Kengen, UoN Geology	116,200,000	
Total For Monitoring Well Drilling								116,200,000	116,200,000

No.	Activity	Unit of measure	Qty	Time Frame (Months)			Actor	Activity Cost (KSh)	
				12	24	36			
24	Intervention: Inventorize Affected Lands Abutting Lakes								
24.1	Conduct an assessment to inventorize and establish databases for various parcels affected by flooding	County	6				NLC	60,000,000	
24.2	Develop and implement a resettlement action plan (RAP) for affected families/ households including exploring and facilitating appropriate compensation options	County	6				NLC	1,500,000,000	
24.3	Document lessons for sustainable land management in view of changing climatic conditions	County	6				NLC	300,000,000	
Land Medium-Term Total								1,860,000,000	1,860,000,000
25	Intervention: inter-Community Conflicts								
	Support to community resilience building initiatives (peace dividends community projects) to promote peaceful coexistence in affected areas	County	5				State Department for ASALs /State Department for Interior/County Governments	75,000,000	
Devolution and ASAL Sub-Total								75,000,000	75,000,000
Grand Total for Medium-Term								8,273,200,000	8,273,200,000

LONG TERM INTERVENTIONS (Time Frame 48 to 72 Months)

No.	Activity	Unit of measure	Qty	Time Frame (Months)			Actor	Activity Cost (KSh)	
				48	60	72			
24	Intervention: Support Agriculture								
24.1	Implementation of conservation agriculture (KSh 1,000 per h/h)	House holds	20,000 (25% of H/H)				State dept & concern county government	20,000,000	
24.2	On farm water harvesting (3000m3 @ KSh 300,000)	House holds	15,000 (20% of H/H)				State dept, county government & irrigation	4,500,000,000	
24.3	Agriculture (Crop/livestock) diversification (KSh 1,000 per h/h)	House holds	23,000 (30% of H/H)				State dept, livestock, & county government	23,000,000	
Sub-Total								4,543,000,000	4,543,000,000

No.	Activity	Unit of measure	Qty	Time Frame (Months)			Actor	Activity Cost (KSh)	
				48	60	72			
25	Intervention: Support Fisheries								
25.1	Development of marine spatial plans for Lakes Victoria, Turkana, Baringo and Naivasha involving all relevant stakeholders	No of plans	4				SDFA&BE, Ministries of Interior, Mining, Transport, Tourism & Wildlife, Environment and Forestry, Culture, Water, Energy, Defence, Regional Development, NEMA, KMA, NMK, KWS, KMFRI, KFS, KFS, Counties	1,100,000,000	
Total Support Fisheries								1,100,000,000	1,100,000,000
26	Intervention: Research on Tectonic Movements and Magmatic Stresses								
26.1	Undertake focused research on tectonic movements and magmatic stresses: including seismic monitoring to detect active zones potentially in distress due to swelling lakes	Tectonic & seismic surveys	11				Ministry of Mining, Mines and Geology, Kengen, UoN Geology	275,000,000	
26.2	The tectonic survey should be conducted together with bathymetric studies to determine the depth to lake bed and sediment topography	Bathymetric surveys	11				Ministry of Mining, Mines and Geology, Kengen, UoN Geology	165,000,000	
Total for Geology Survey								440,000,000	440,000,000
27	Intervention: Supply of Clean and Safe Water								
27.1	Rehabilitation and improvement of water points systems	Water points in 10 Counties	30				Ministry of Water, Sanitation and Irrigation / MDAs	66,000,000	
27.2	Disinfection of water points and wells						Ministry of Water, Sanitation and Irrigation / MDAs	600,000	
27.3	Deployment and operation of emergency water treatment plants, (including water trucking in Baringo, West Pokot, Turkana, Busia, Kisumu, Homabay and Migori)						Ministry of Water, Sanitation and Irrigation / MDAs	2,205,000	

No.	Activity	Unit of measure	Qty	Time Frame (Months)			Actor	Activity Cost (KSh)	
				48	60	72			
27.4	Procurement of chemicals for the emergency treatment plant						Ministry of Water, Sanitation and Irrigation / MDAs	409,500	
27.5	Water quality testing						Ministry of Water, Sanitation and Irrigation / MDAs	36,750	
27.6	Residual chlorine testing						Ministry of Water, Sanitation and Irrigation / MDAs	21,000	
Total for Supply of Clean and Safe water								69,272,250	69,272,250

28 Intervention: Water Level Monitoring									
28.1	Rehabilitate and automate water level monitoring stations						Ministry of Water, Sanitation and Irrigation / MDAs	30,000,000	
28.2	Operationalize water quality monitoring system in all lakes						Ministry of Water, Sanitation and Irrigation / MDAs	8,000,000	
28.3	Demarcation of highest water marks and riparian reserves						Ministry of Water, Sanitation and Irrigation / MDAs	100,000,000	
Total for Water Level Monitoring								138,000,000	138,000,000

29 Intervention: Support Irrigation									
29.1	Supply rice seedlings to affected farmlands for rural community resilience in West Kano, Budalangi.						Ministry of Water, Sanitation and Irrigation / MDAs	5,660,000	
29.2	Supply of fertilizer to affected farmlands for rural community resilience in West Kano, Budalangi, Ewaso Nyiro South and other Lake Victoria basin						Ministry of Water, Sanitation and Irrigation / MDAs	16,980,000	
29.3	Rotavation / land preparation of affected farmlands for rural community resilience in West Kano, Budalangi, Ewaso Nyiro South, and other in Lake Victoria basin						Ministry of Water, Sanitation and Irrigation / MDAs	9,056,000	
Total for Supporting Irrigation								31,696,000	31,696,000
Grand Total for Long-Term								6,321,968,250	6,321,968,250
Short-Term+Medium-Term+Long-Term								14,828,253,750	14,828,253,750

SUMMARY OF INTERVENTION COSTS		
Category	Cost KSH	Cost US\$
Immediate Intervention Measures	3,133,547,436	29,022,916
Short term Intervention Measures	233,085,500	2,158,799
Medium Term Intervention Measures	8,273,200,000	76,624,988
Long Term Intervention Measures	6,321,968,250	58,536,743
Grand Total	17,961,180,119	166,353,433

**Exchange rate is 107.97 per US\$ as at 1/7/21.*

