REPUBLIC OF KENYA

MINISTRY OF WATER, SANITATION AND IRRIGATION

IMPLEMENTATION OF THWAKE MULTIPURPOSE WATER DEVELOPMENT PROGRAM PHASE 1

Variation of the Project Works:
Environmental and Social Impact Assessment Study Report

May 2025

DECLARATION

I, the undersigned, confirm that I carried out the study to update this ESIA report for the THWAKE MULTIPURPOSE WATER DEVELOPMENT PROGRAM, and to the best of my knowledge, the contents are correct and meet the objectives of the study.

……..……
Name of EIA/EA Lead Expert

Signature Date/Official Stamp:……

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CERTIFICATION BY PROPONENT:

I, the undersigned, confirm that the study to update this ESIA for THWAKE MULTIPURPOSE WATER DEVELOPMENT PROGRAM was conducted to the satisfaction of the Proponent and the content of the report meets the objectives of the study.

Name of Officer ……..Designation ……

Signature Date Official Stamp

SUBMITTED TO:

National Environmental Management Authority (NEMA)

Received by: ……

Signature Date Official Stamp

ACRONYMS

AfDB	African Development Bank
BETA	Bottom–Up Economic Transformation Agenda
BOD	Biochemical Oxygen Demand
CAP	Consolidated Annual Performance
CFRD	Concrete Faced Rockfill Dam
CEAP	County Environmental Action Plan
COD	Chemical Oxygen Demand
EHS	Environmental, Health, and Safety
EIA	Environmental Impact Assessment
EMCA	Environmental Management and Coordination Act
EPP	Emergency Preparedness and Planning
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
FRAP	Full Resettlement Action Plan
GBV	Gender-Based Violence
GRM	Grievance Redress Mechanism
HIV/AIDS	Human Immunodeficiency Virus / Acquired Immunodeficiency Syndrome
IFC	International Finance Corporation
ISS	Integrated Safeguards System
KERRA	Kenya Rural Roads Authority
KURA	Kenya Urban Roads Authority
MCADP	Makueni County Annual Development Plan
NEAP	National Environmental Action Plan
NECC	National Environmental Complaints Committee
NLC	National Land Commission
NEMA	National Environment Management Authority
NOX	Nitrogen Oxides
OSH	Occupational Safety and Health
PIT	Project Implementation Team
PM10 / PM2.5 - Particulate Matter (10 microns / 2.5 microns)	
PMF	Probable Maximum Flood
PPE	Personal Protective Equipment
RAP	Resettlement Action Plan
SDG	Sustainable Development Goal
SEA	Sexual Exploitation and Abuse
SOX	Sulfur Oxides
TMWDP	Thwake Multipurpose Water Development Program
VOC	Volatile Organic Compounds
WBG	World Bank Group
WHO	World Health Organization
WRUA	Water Resources Users Association

EXECUTIVE SUMMARY

E1: OVERVIEW OF THE PROJECT

The Thwake Multipurpose Water Development Program (TMWDP) is a flagship Program under Vision 2030 of the Government of Kenya and a key Project under the Government's Economic Transformation Agenda for Inclusive Growth (BETA). Phase 1 of the Thwake Multipurpose Water Development Program project started in March 2018. It entailed the construction of an 80.5 m high multipurpose dam with a storage capacity of 688 million cubic meters. The objective of the Thwake Multipurpose Water Development Program is to provide water for domestic use, livestock, irrigation, hydropower, and industrial activities within the counties of Makueni and Kitui and the development of Konza City. The main components of the project are CFRD Dam Embankment of height reduction from 84.0m to 80.5m, diversion Tunnels A and B with Low-Level Outlets, Intake Tower, and Access Adit, one extended spillway of width 235m, two saddle dams, and an employer's camp. The main activities of the dam construction involve excavation of rocks, drilling and blasting, stone crushing, haulage of materials from the quarries, and grouting.

During Phase 1 implementation, there were changes in dam design and scope of works following the completion of detailed hydrological and geotechnical studies. Thwake Multipurpose Water Development Program was started based on designs prepared during the feasibility and planning stages of the dam development before hydrological and geotechnical investigations required for design review and update had been completed. The original design documentation relied on the feasibility stage designs based on a Possible Maximum Flood (PMF) of 7,500m^3/s, two spillways, and a dam crest level of 918.5 masl. The PMF was revised after geotechnical and hydrological studies were completed in 2018. They increased the PMF from 5,393m^3/sec, determined at the feasibility stage, to 11,480m^3/s, requiring substantial changes from feasibility design to detailed design. With the new hydrological and geotechnical changes and for dam safety purposes, the following new dam design changes and scope of works were required and proposed as follows:

- Expunging the emergency spillway and adopting a single dam spillway to discharge the PMF, widening the weir's width from 224m to 235m. The length of the spillway slab increased from 535m to 618m, and the entire spillway to the river increased from 885m to 1,500m.

- The EIA study report done in 2013 and the NEMA license issued in December 2013 used the SAMEZ design which pegged the dam height at 84.0m. SMEC used CAS designs done in 2014 to prepare tender documents which pegged the dam height at 77.5m. A new PMF study was done and consequently, designs were changed with the following amendments being adopted: increased PMF and adoption of a single service spillway, the maximum flood level at the spillway was still maintained at 912 above sea level. Dam safety and maintaining the structural integrity of the embankment required a height increase to ensure no floodwaters would overtop the embankment. As a result, the embankment height increased from 77.5m to 80.5m but still under 84.0m which was in the initial acquired EIA/NEMA license. For stability reasons, the dam's footprint was increased from 285 m to 320m at the river bed section. Additionally, the length of the dam axis increased from 1495m to 1560m.

- The new maximum flood level of 920.5m above sea level at the embankment necessitated the establishment of two saddle dams at the low points immediately after the dam axis on both ends. Saddle 1 is 250m, and saddle dam 2 is 200m long has been proposed.

- The widening of the spillway width at the weir section necessitated an increase in the spillway bridge, automatically affecting the road approach road. The permanent access road for the project has increased from 8.6km to 11.2km.

- The alternatives regarding implementing the new design and scope changes include maintaining the dam height at 77.5m instead of 80.5m, constructing one spillway or two saddle dams, alternative technological design, and energy sources. The No alternative means the new changes are not implemented, thus the status quo. The PMF increase from 5000m^3/s to 11480m^3/s would compromise the dam's safety and stability due to increased PMF. The increased storage capacity of 688 million cubic meters will not be realized, thus less water available for multiple uses.

E2: OBJECTIVE AND JUSTIFICATION OF ESIA

This ESIA report is a requirement by NEMA and the AfDB Integrated Safeguards Systems (ISS), 2023, following dam design variations effected on phase 1 construction. The study aims to assess and propose mitigation measures for all the potential environmental and social impacts arising from the new scope of works after dam design changes (introduction of a saddle dam and expanded spillway), to inform the decision-making process. The report is compiled as per the NEMA guidelines in the Environmental Management Coordination Act, 1999, Legal Notice No.101 of Environmental (Impact Assessment and Audit) Regulations, 2003, and the African Development Bank Group's Integrated Safeguards Systems (ISS), 2023.

E3: SCOPE OF THE STUDY

This study includes assessing the environmental and social impacts of the project variation works, including constructing the increased 3m dam wall height, one spillway, two saddle dams, and the employer's camp. The impacts are investigated at all three 3 phases of project development: during construction, operation, and decommissioning on the following aspects: physical environment, flora and fauna, and socio-economic aspects.
The study is guided by the Environmental Management & Coordination Act (EMCA) (1999), the Environmental (Impact Assessment and Audit) Regulations 2003, and the requirements of the AfDB's ISS. The scope of the study, as established under these guidelines includes:-

- Description of the proposed location and objectives of the project
- A concise description of the national environmental legislative and regulatory framework, baseline information, and other relevant information related to the Project.
- A description, relevance, and application of the AfDB Groups Integrated Safeguards Systems to the Project
- The technology, procedures, and processes to be used during the project implementation.
- A description of the potentially affected environment.
- The Project's environmental, social, and cultural effects are classified as direct, indirect, cumulative, irreversible, short-term, and long-term impact anticipated.
- Analysis of alternatives, including project site, design, and technologies and reasons for preferring the proposed site, design, and technologies.

- An ESMP proposes measures for eliminating, minimizing, or mitigating adverse environmental impacts, including the cost, time frame, and responsibility to implement the standards.
- The measures are to prevent health hazards, ensure security in the working environment for employees, and manage emergencies at all project stages.
- An indication of whether the environment of any other state is likely to be affected, the available alternatives, mitigating measures, and other matters the Authority may require, including public consultation with various stakeholders through focus group meetings.

E4: ESIA APPROACH AND METHODOLOGY

This study used the following methods to collect and analyze relevant data:

Desk review:

The following documents were reviewed: the ESIA Study Report 2013, project progress reports, monthly E&S reports, ESMP implementation, gazette notices on legislative, policy, and administrative frameworks, and AfDB Integrated Safeguards System (ISS), 2023 were reviewed to ensure the proposed project adhere to established environmental and social standards to promote sustainability and mitigate negative consequences, etc.

Site Visits and Photography:

The team visited the spillway, dam embankment, saddle dam locations, and neighboring villages. Observations and photography were used to confirm information collected via desk review. Checklists were used during the site visits to collect the project's relevant environmental and social aspects. Checklists are study instruments that aid in assessing possible ecological impacts during a project's construction and operational phases. The screening exercise is focused on evaluating and identifying the potential social and environmental impacts associated with proposed projects and assessing the applicability and relevance of AfDB safeguard policies and national policies and laws to ascertain compliance and provide a foundational basis for evaluating the eligibility and appropriateness of proposed projects. The checklist is appended in Appendix 2.

Stakeholders Engagement: Stakeholder meetings and consultations were organized at the community and County levels in 3 locations in the project area's Kanyangi, Kalawa, and Kyusyani areas. Community meetings were mobilized through the Community Liason Officer and area Chiefs. The meeting included key informant interviews with chiefs and religious leaders; structured questionnaires were administered during barazas to gather community views and concerns regarding the project and its environmental and social impacts. A total of 64 participants attended (43 males and 21 females). Stakeholder meetings for County government officials and interested parties, such as representatives of various NGOs & CBOs, faith-based organizations, educational and health institutions, and youth, were held on 03/04/25 and 04/04/2025. A total of 46 stakeholders attended, including 31 males and 15 females. Meeting notices were sent to area chiefs who mobilized the representatives of the various groups.

Impacts Identification and Rating:

Identifying and assessing environmental and social impacts is a multi-faceted process using a combination of quantitative and qualitative descriptions and evaluation. The approach involves using a

magnitude-sensitivity matrix, professional judgment, and reasoned argument to determine the significance of environmental impacts associated with the proposed project.

Once a potential risk or impact has been determined, it is necessary to identify which project activity will cause the effect, the probability of occurrence of the impact, and its magnitude and extent (spatial and temporal). The effects identified were categorized as negative and positive. Further, negative impacts were weighted and rated based on the impact's consequence and likelihood.

ESIA Project Report Preparation:

This report was prepared based on the Environmental Impact Assessment and Audit (EIA/EA) Regulations 2003. The Legal Notice No. 32 of 2019 determines the minimum content of the ESIA report. The Thwake Dam project falls under the prescribed list of projects, a high-risk category for which an Environmental Impact Assessment is mandatory before implementation. The Program Implementation Team's (PIT) Environment, Health and Safety Expert, and Gender and Social Development Expert prepared the report for submission to the African Development Bank, the Project's financier.

E5: BRIEF DESCRIPTION OF THE PROJECT SITE AND BASELINE INFORMATION

E5.1. Location

Thwake Multipurpose Dam is located 180 km south of Nairobi, 1km immediately downstream from the confluence of the Athi and Thwake rivers, in Makueni and Kitui Counties. Its coordinates are 1°46'0" S and 37°43'0" E. The area suffers perennial water shortages. Thus, the region has lagged in terms of socio-economic development. The dam will store water from the seasonal Thwake River and overflow from the permanent Athi River. The dam will provide water for domestic use, livestock, irrigation, hydropower, and industrial activities within the counties of Makueni and Kitui, the development of Konza City, and regulation of flows on River Athi downstream of the dam for flood control and drought mitigation.

The dam is accessible from Wote Town in Makueni County through an earth road to the Mavindini shopping center. The dam is also accessible from the Kitui side by earth road from Kwa-Vonza, Kiusyani – Kanyangi road. The dam wall is across the Athi River at Mavindini in Makueni County and Kanyangi in Kitui County. The dam location is shown in Figure 1. The dam barrier cuts across the Athi River, thereby joining Kilisa Hill, part of the Yatta plateau, in Syomunyu sub-location (Kanyangi location) and Kathukuni hill in Kathukuni village, Katithi sub-location of Mavindini location (Mavindini Ward). The dam reservoir will physically cover 2,900 hectares, spanning from the embankment to about 12 Km upstream and an estimated catchment area of 10,276 square km^2. The catchment area covers about 35% arable and 65% semi-arable land. Thwake Dam water is earmarked to cover a total land area of 2,900 hectares across the three counties of Makueni, Mbooni East, and Kitui.

The dam is shown in figure 1 below:

Figure 1: Thwake Dam with the additional scope incorporated (saddle dams, expanded spillway, employers camp, and access road)

E5.2. Baseline information

Physical and Biological Environment

The Thwake Dam project area is within Kenya's lower eastern (Makueni, Mbooni East, and Lower Yatta) ASAL areas, with limited rainfall, relatively elevated temperatures, and high evaporation levels. As a result, vegetation is generally withered, though soils are reported to be fertile. Most parts of Makueni County typically lie within a water-scarce zone with limited water resources, e.g., Kaiti, Thwake, Thange, Uani, Muoni, Tawa, Kiboko, and Kiangini have rivers with very low flows that traverse the area, which mainly have seasonal tributaries. Suitable sites for earth dams are few and far apart, with inadequate catchments. At the same time, groundwater potential is generally poor in most locations due to poor recharge except for low-lying areas and river flood plains.

Rainfall - The project area receives scarce rain throughout the year, with an average of 500mm per annum spread over two seasons, contributing to the area's severe scarcity of surface water sources. Rainfall is also unevenly distributed over time and space with long periods of dry weather. Makueni and Kitui Counties, in general, experience homogenous climatic conditions characterized by high temperatures during the day measuring up to 32^{o}C and low temperatures at night at an average of about 25^{o}C. During the dry season between May and October, extreme heat is experienced in the low-lying zones, while the high-altitude zones experience relatively cool temperatures. The high temperatures experienced in the low-lying areas cause high evapotranspiration and moisture losses from soils and plants.

Topography - The dam project area is located on relatively undulating terrain with a general slope running in a north-easterly direction and an elevation of 600m above sea level in the southeastern to 1,900m above sea level in the northwestern. Among the notable physical features dominating the area and the adjoining regions include Unoa Hills (1,280m above sea level), Malivani Hills (1,340m above sea level), and Nzueni Hills (1,403m above sea level). Further north are highlands constituting surface

water sources, among them Nthangu, Kitondo, and Iuani Hills, where seasonal streams originate flowing south and east, draining into the Kaiti River and eventually into the Athi River.

Drainage System - The project area falls within the Tana and Athi drainage basin, which mainly includes the central and eastern parts of the country. The water resources management in this drainage primarily falls under the Tanathi Water Services Board in Kitui Town. However, the upper sections of the Athi River basin are under the Athi Water Services Board, which is in Nairobi. The hydrology is, therefore, influenced by the flows from Nairobi's river system (Nairobi, Ngong, Mbagathi, Ruaka, Ruiru, etc.) in the upper reaches of the catchment that spans as far as Ngong hills, Kikuyu Plateaus, and the lower slopes of the Aberdares. Nearer the project area are notable rivers (most of them seasonal), including Thwake, Tawa, Kaiti, Iuani, and Kalawa rivers upstream of the proposed site, while Kiboko, Makindu, Muoni, Kiangini, Mbanya, Mtito Andei, Kibwezi, Kambu and Thange rivers discharge into Athi River downstream of the dam location. From the Kitui side, the streams discharging into the Athi River include seasonal rivers Tiva and its tributary Mwitasyano and their smaller streams. Tsavo and Voi rivers join the river far downstream of Kitui in Taita Taveta.

Geology and Soils - Achaean gneisses of the Basement system characterize the geology of Makueni and the neighbouring areas. These are the oldest rocks in the area, comprising *quartz-felspathic gneisses* and *biotite gneisses* beneath the recent soils. The project area overlays a basement system, which is characterized by low groundwater yields in the low-lying areas. Deep sandy alluvium, red sandy soils, and patches of black cotton soils and murram at the project site generally cover most areas around the Makueni and Kitui Counties. Typical soils are sandy (eroded from the base sedimentary rock) and contain little organic matter, resulting in low fertility. However, valleys and river flood plains have notable productive soils due to the accumulation of silt and minerals, although limited by lack of adequate rainfall.

Water Sources and Quality- Primary water sources in the region include earth dams, boreholes, and seasonal rivers (only the Athi River is permanent). Only about 29% of households in Makueni County have access to adequate water in dry seasons and 41% in wet seasons (a similar situation experienced in the neighbouring areas. Many sources providing water are unsafe; only 18% to 22% of the population can access safe water in the dry and wet seasons. Athi River is physically coloured (brown) due to inflows from the catchments upstream and other pollutants from as far as Nairobi city, as well as upstream urban settlement effects. Groundwater is perhaps the most reliable water source in Makueni County, though unsustainable depths, poor yields, and associated costs limit exploitation.

Biological Diversity - The project area has a homogenous mix of plant species adapted to dry conditions and low rainfall experienced throughout the year. About 80% of the area anticipated to be inundated has a rich accumulation of life and dead biomass that will not be allowed to be covered underwater due to the implications on water quality. Forested areas are confined to the hilltops (approximately 2% of the forest cover), while lower areas have been cleared to pave the way for commercial, residential, and institutional activities. At the site, elevated areas (Kathukuni Hill, Kilisa Hill slopes, and Kanyangi Hill) are among zones with very high biomass accumulation comprising indigenous trees and shrubs. Among the significant notable plant species include:

i) Grasses – *Chloris gayana, Common star* grass and *Themeda thriandra*,
ii) Poisonous weeds – *Solanum incanum* and *Datura stramonium*,
iii) Acacia species – *Acacia tortilis, Acacia melifera* and *Acacia Karki*
iv) Shrubs – *Banalities aegypttica* and *Lantana Kamara*,
v) Horticultural crops like pawpaw, mangoes, maize, oranges, and bananas, among others,

vi) Indigenous trees - *Croton megalocarpus* and exotic trees

The main wildlife species in the project area are snakes, squirrels, monkeys, birds, and guinea fowl. The domestic animals at the project site include mainly goats and Zebu cattle (drought-resistant animals), which are found grazing on the withered grass. The Thwake – Athi River confluence point has a small, unique riverine ecosystem with species, including crocodiles, flying snakes, rare birds, and microorganisms.

Socio-economic Environment

The main socio-economic aspects include information on the socio-economic factors, which will assist in determining how the project works will affect the social component of the environment. The impact areas for the socio-economic assessment are within the dam site area and the neighbourhood. Thwake Multipurpose dam, once fully completed, is earmarked to produce hydropower and water for domestic and irrigation purposes.

Road Network - The project site and its surface area can be accessed through the road network on foot or by public vehicles, motorbikes, and bicycles. The main roads serving the dam location and its surface area include the Nairobi-Machakos-Kathonzweni and the Nairobi-Mombasa road, where one has to divert at Makindu junction and proceed to Kathonzweni Market; the Machakos - Kitui road through Masii-Tawa road or using the Kwa Vonza - Yatta plateau road to Syomunyu Kanyangi Markets (on the banks of Athi River) in Yatta; from Kathonzweni market through Mavindini via Mathemba market or through Kyemuole market junction via Muusini market. From Wote market, the project site can be accessed through Mavindini via Kikumini and Ngosini markets in Makueni or Kathulumbi market via Kalawa town in Mbooni East.

Agriculture - The agriculture sector is the most significant contributor to the Gross County Product in Makueni County at 29.5% (Makueni County Annual Development Plan, 2024 (MCADP, 2024). Failure in the short and long rains has greatly affected food production in the County. There are rising food and nutrition insecurity cases, with more households unable to meet three meals daily. The county faces deteriorating food insecurity due to the ongoing rise in food prices and the failed rains**.** Subsistence farming is dominant in the area, with most farmers growing food crops: maize, sorghum, beans, green grams, beans, cow peas, sorghum, millet, cassava, sweet potatoes, pigeon peas, and black-green grams. Farmers are expected to practice commercial irrigation farming after project completion.

Livestock Keeping - Livestock farming is a key economic activity in the project area. The primary livestock includes cattle, sheep, goats, donkeys, poultry, rabbits, and bees. The livestock kept are mainly indigenous breeds that withstand harsh environmental conditions.

Land Tenure and Land Use - The project area land was part of the initiative and support of the Makueni settlement scheme, which started in 1948 to settle retired Akamba soldiers. The average sizes of land parcels owned by individual households ranged between 0.8 to 16.0 hectares. All land in the project area, except Katumbua Hill – trust land, is individually and privately owned. There are three types of land acquisition: inheritance, purchase, and lease.

Labour - Regarding the labour force, the project areas have a total labour force (those aged 15 – 64 years) of 117,601 persons. This provides a pool of workers for the construction of Thwake Dam. Those in self-employment mainly own small businesses in the respective markets within the target areas and are mostly the younger generation.

Poverty Levels -The KNBS Comprehensive Poverty Report 2022 In 2021, Kitui County had an overall poverty rate of 55.2%, while Makueni County's poverty rate was 39.7%, while the average poverty rate in Kenya was 39.8% (The Poverty Report 2022).

Education - Education is considered an essential tool in Makueni County in alleviating poverty and is also key in determining the quality of the available labour force, which is helpful in all other sectors of the local economy. The area has many educational institutions including universities, early childhood development (pre-primary) centers, primary and secondary schools, and polytechnics. Learning in these institutions is affected by water shortages; thus, the dam will alleviate this problem in the institutions.

Health and Sanitation - Health Institutions serving people within the project area include Mavindini, Kanyangi, and Kalawa Health Centres, as well as Kathulumbi and Mumbeeni Dispensaries. In addition, some mobile clinics usually serve people at different destination markets. The most typical diseases in the project area are Malaria/fever (40%), Respiratory Diseases (16%), Cholera (5%), and Typhoid (10%), according to responses given during community meetings.

Gender and Gender Mainstreaming - In the 2019 census, Makueni County had a total population of 987,653, with 497,942 females and 489,691. More women than men are in the project areas, accounting for 54% of the total population. The reason is that most men migrate to the big towns for employment and other income opportunities. Gender disparities are also found between the rural and urban populations, where 54.9% of all urban populations were women, while they accounted for 54.5% of the rural population. Ownership and access to productive resources mainly benefit the man. Women and men will benefit equally from the employment opportunities created and safe access to drinking water. Women often run shops and bars in the area. During the construction period, there are income-generating activities for women, such as food catering/restaurants for workers on the construction sites, more bars, and selling local products to construction camp workers. These activities will mainly benefit women, who are often the sole supporters of their families. It is recommended that the contractor give equal employment opportunities to women and men within the project skills requirements and maximize the procurement of local products and services.

Cultural Issues - All the project service areas are mainly occupied by the Akamba community, which forms approximately 99% of the total population. However, there is still a substantive percentage of people from other communities, especially in Wote, Kalawa, Makindu, Kibwezi, and Mtito Andei. The community has elaborate cultural practices, including strong kinship linkages with organizations spanning from localized merry–go–rounds to strong clan relations and burial societies, as well as social interactions mainly during religious ceremonies. They have strong beliefs in traditions, including witchcraft, the state, and their relationship with their departed ancestors. More members from non-Kamba communities are expected to immigrate into the project area during and after the completion of the proposed dam to exploit the emerging opportunities in fishing, farming, and transport.

HIV/AIDS - Makueni and Kitui Counties are mainly rural setups with some urban centres such as Wote, Kitui, and Mwingi and the majority of inhabitants are the Akamba. Therefore, social interactions and related implications are expected to be relatively low. The influence of significant towns, including Machakos and Nairobi, in terms of HIV/AIDS (and other social diseases) could be substantial. Makueni County has a population of 949,298, representing 49% males and 51% females. HIV prevalence in Makueni is (5.1%) lower than the national prevalence of 5.9% (Kenya HIV Estimates 2015).

Climate Change Concern - The construction and operation of the Thwake multipurpose dam should be seen within the context of global climate change, which might significantly affect the Project's physical Environment. Climate change could affect project operation through, for example, higher temperatures and, therefore, higher water demands, more intense rainfall and thus more intense floods, or reduced rainfall and lower water availability. However, the Project itself will significantly increase the security of water supply to farmers and improve flood control, thereby mitigating the potential impacts of climate change.

E6. POLICY, LEGISLATION AND INSTITUTIONAL FRAMEWORK

The Environmental and Social Impact Assessment is guided by existing legislative, policy, and administrative frameworks that guide the process. According to the EMCA, the law guiding environmental management in Kenya, it is mandatory that projects of such magnitude must undergo ESIA before implementation. Further, legislative provisions have been considered relevant due to the project area's prevailing biophysical and socio-economic conditions. The subsequent sections review the relevant national policies, legal and administrative framework, International Conventions, and the AFDB Integrated Safeguards System (ISS).

The national regulations reviewed but not limited to include:

i. Constitution of Kenya 2010
ii. Environmental Management and Coordination Act (EMCA) 1999
iii. The Environmental (Impact Assessment and Audit) Regulations, 2003
iv. Environmental Management and Coordination (Water Quality) Regulations, 2006
v. Waste Management Regulations, 2006
vi. Noise and Excessive Vibration Pollution (Control) Regulations, 2009
vii. The Environmental Management and Coordination (Air Quality Regulations 2014)
viii. Land Act 2012
ix. Occupational Safety and Health Act 2007
x. Water Act 2016
xi. County Government Act No. 17 of 2012
xii. The Public Health Act (Cap.242)
xiii. Employment Act (Cap. 226)
xiv. Children's Act 2022

The study considered the African Development Bank Group's adopted Integrated Safeguards System (ISS) 2023. Safeguards are a powerful tool for identifying risks, reducing development costs, and improving project sustainability, thus benefiting affected communities and helping to preserve the Environment. This Project triggers operational safeguards as follows:

OS 1: Environmental and Social Assessment: The project is assigned Category 1 based on the project activities. The project's interaction with the natural and human environment qualifies the applicability of this policy, which seeks to prioritize environmental, social, and climate change vulnerability in any project development for sustainable development. The project requires an ESIA.

OS2: Labour and Working Conditions: the project adheres to fair labour standards by ensuring that all workers involved in the project are treated relatively and have adequate wages and benefits. Additionally, this OS strictly prohibits child labor and forced labor, ensuring that all community workers are of legal working age and that employment is voluntary.

OS3: Resource Efficiency and Pollution Prevention and Management: This applies to the project by encouraging sustainable materials and efficient construction methods to minimize waste and reduce resource consumption. More so, this emphasizes effective waste management practices to handle construction debris, ensuring that waste is minimized, reused, or recycled wherever possible. Thus, measures for waste management and pollution are being implemented.

OS4: Community Health, Safety, and Security: The policy outlines the project safety protocols for workers and nearby residents during construction. This includes managing construction noise, dust, and traffic to minimize disruption. The Standard aims to build trust with residents and contribute to a positive living environment, ultimately fostering social cohesion and well-being.

OS5: Land Acquisition, Restrictions on Access to Land and Land Use, and Involuntary Resettlement. This standard outlines the need for a fair and transparent process when acquiring land for the project. Besides, the standards emphasize the need to avoid involuntary resettlement whenever possible. The proposed dam's additional scope of works does not trigger this safeguard as the land has already been acquired and 9 PAPs compensated. The land is available and there will be no displacement. That notwithstanding, the OS5 will guide the closure of the pending RAP implementation during the project.

*OS6: Habitat and Biodiversity Conservation and Sustainable Management of Living Natural Resources***:** This policy advocates for minimizing habitat destruction and ensuring local biodiversity conservation. This policy recognizes the need for biodiversity conservation, sustainable use, and management of natural resources and ecosystem services. This policy has been used to manage and utilize locally available resources in the project area.

OS7: Vulnerable Groups – such as female-headed households, the landless, the elderly, youth and children, persons with disabilities, groups who are marginalized based on ethnicity, religion, language, sexual orientation, and gender identity, and highly vulnerable rural minorities (HVRM). This Standard focuses on ensuring the needs and rights of vulnerable populations are recognized in the project. Thus, the project acknowledges the needs of the vulnerable groups within the local populations. The project has ensured no discrimination among men and women when recruiting workers and no child labour. Currently, there are no physically disabled persons due to the nature of work at the construction site.

OS8: Cultural Heritage: The safeguard emphasizes protecting and preserving cultural heritage in the project area. The OS is relevant because the project involves excavations, demolition, earth profile movement, and changes in the physical environment. However, no cultural heritage site is identified at or near the project area. If found during the excavation of saddle dams and in consultation with stakeholder(s), the project will apply the OS8 standard accordingly.

OS9: Financial Intermediaries: This is not triggered by the project.

OS10: Stakeholder Engagement and Information Disclosure: This safeguard recognizes the importance of involving stakeholders and ensuring project transparency. A participatory approach discloses relevant project information at stakeholder engagement forums. This policy is triggered in the stakeholder engagements conducted and in future meetings. Pertinent information about the project's progress will be disclosed to stakeholders. The proponent has prepared SEP for the project.

In line with the financier's African Development Bank (AfDB)'s Integrated Safeguards System (ISS), the Project is categorized as Category 1. Category 1 includes projects' operations likely to cause significant environmental and social impacts. Category 1 projects are likely to induce substantial and/or irreversible adverse ecological and/or social impacts or to significantly affect environmental or social components that the bank or the borrowing country considers sensitive.

International Conventions - Some of the international Conventions that are relevant to this Project include the African Convention for the Conservation of Nature and Natural Resources (2003), the Convention on Biological Diversity (1992), the UNESCO Convention for the Protection of the World Cultural and Natural Heritage (1972), Convention on the Conservation of Migratory Species of Wild Animals (1985), The Agreement on the Conservation of African-Eurasian Migratory Water birds (AEWA), Convention on Wetlands of International Importance (the Ramsar Convention 1971), Convention on Persistent Organic Pollutants (2001) etc.
The dam project implementation is guided by the national legal, policy, and regulatory framework, the AfBD ISS, and the International Conventions.

E6: STAKEHOLDERS ENGAGEMENT

The stakeholder engagement process involved interviewing stakeholders using structured questionnaires, public barazas, and focus group discussions. At the community level, meetings were held from 11th - 13th February 2025 at 3 locations in the project areas: at Kyusyani Catholic church in Mavindini Ward, Kanyangi Chiefs Camp in Kanyangi Ward, and at Africa Brotherhood Church (ABC) in Kathulumbi, Kalawa Ward *(The Minutes of the meeting are attached Appendix 3).*
At the county level, the meetings were held between 3/4/25 and 4/4/25 in Makueni and Kitui counties. The meeting comprised County government officials and interested parties such as representatives of various NGOs & CBOs, faith-based organizations, educational and health institutions, and youth were held on 03/04/25 and 04/04/2025.
The following is a summary of the benefits as foreseen by the different stakeholders.

Positive benefits to the community

- Employment is seen as a predominant benefit to the community during the construction phase, with complementary activities like business activities due to the supply of construction materials.
- Boost local business opportunities due to increased incomes from business initiatives, e.g., the sale of agricultural products and brick making leading to an improved regional economy.
- The provision of water for irrigation will improve livelihoods and food security.
- Access to reliable, clean, and safe water supply will reduce water-borne disease incidences like cholera.
- Local tourism will be boosted as visitors come to see the dam,
- Better infrastructure, e.g., roads, increased water points, and electricity connections.
- Improved standards of living/ social status, e.g., better housing conditions for those compensated.
- Improved local climate due to water availability to grow trees at household levels and rehabilitation of areas cleared off vegetation for the Project.
  The following are the negative concerns raised by the community.

The following are the main concerns raised by the stakeholders and responses given by PIT.

1. Land displacement – Will the new dam design change lead to more land acquisition?
   Response: No. The land initially acquired in Phase 1 will be enough to accommodate the

saddle dams and the employer's houses.

2. Human-Wildlife conflicts –There has been an increase in the number of water animals in the Athi area, i.e., the hippos and the crocodiles. The animals threaten the health & safety of communities and destroy their crops, thus affecting food security. What is the Project doing to curb the menace?
   Response: Two KWS Wardens have been deployed to the site to monitor the movement of the hippos and ensure the safety of workers and the community. The project leadership will engage KWS to create awareness and resolve human-wildlife conflicts. A KWS office has also been proposed to be set up in the project area to focus more on the hippos and crocodiles. The project has not planned to install an electric fence to prevent the hippos from reaching community farms.
3. Cracked houses – Many houses near the dam site have been reported to have cracked due to excessive vibration emanating from blasting operations at the dam site. Is there any plan to compensate?
   Response: Yes. Many complaints from the neighbouring communities have been reported to the project. All houses reported cracked will be assessed, and complaints will be resolved based on the assessment report before the closure of the project.
4. There will be a possible increase in malaria cases; how will this be addressed?
   Response: There will be consultations with the County governments to create more awareness of malaria prevention and equipment in the nearby hospitals to handle the likely increase in malaria cases.
5. Closed Roads- Some access roads have been closed, forcing the residents to walk long distances, particularly from Kitui to Makueni.
   Response: The roads at the dam site are closed for security reasons. Water points access roads have been planned to be done in Feb or March 2025
6. Buffer Zone- Is the buffer zone enough to accommodate the new dam design change?
   Response: The design provided an adequate buffer zone for the dam. Surveyors and engineers who designed the dam, leading to the variation of the dam, did not provide an increased buffer zone; hence, flow back will be accommodated with the existing buffer zone.
7. Flooding – There was flooding in my farm/residence during the recent rains. What is the project going to do to ensure no more flooding?
   Response: Dam water flow back to flooded community land is new information and will be shared with the Engineers and surveyors to investigate and advise if the buffer zone needs to be expanded. Where extra land will be required to accommodate the expanded buffer zone will be compensated accordingly.
8. Water use and management conflicts – Water conflicts might occur during dam operation. How will this be handled?
   Response: Farmers will be encouraged to join the Water Users Association (WRUA) or Irrigation Water Users Association (IWRUAs), which are mandated to help resolve water conflicts at the lowest level of water management.

9. The stakeholder wanted to know whether, in the likelihood of water flow back and flooding caused by dam height, Project Affected Persons (PAPs) who own farms and houses would be paid.
   Response: The PIT indicated there would be no likelihood of water flow since the Employer already proposed constructing an extra saddle dam and spillway.

Grievances Redress Mechanism (GRM)

The community members suggested a mechanism should be developed where community grievances can be reported and resolved to the parties' satisfaction. A grievance redress mechanism is being implemented at the site, aiming to solve disputes as soon as possible in the interest of all parties concerned. The GRM includes a Community Grievances Committee composed of local chiefs of the Kanyangi, Kathulumbi, and Mavindini locations, led by the committee's chairman, the Chief of the Mavindini location. The committee meets once a month to consider grievances reported and resolutions reached. If grievances require higher leadership's attention, they are escalated as necessary. Community members are encouraged to report their grievances directly to the respective Chiefs or project leadership. All negative issues the communities raise will be addressed in the best practicable ways.

E7: ANTICIPATED ENVIRONMENTAL AND SOCIAL IMPACTS OF THE PROJECT

Here is a discussion of the cumulative impacts of the expanded scope of the existing design of the Thwake Multipurpose Water Development Program (TMWDP) project, building on the gaps identified in the ESIA report (disclosed in 2013). This section presents additional environmental and social impacts identified during the post-revision review of the Thwake Multipurpose Water Development Program Phase 1 ESIA. These supplementary issues are critical for ensuring the full scope of environmental and socio-economic risks are assessed and managed in alignment with international best practices, including the African Development Bank's Integrated Safeguard System (AfDB ISS).

The cumulative impacts arising specifically from the revised design of the Thwake Multipurpose Water Development Program Phase 1, which includes: widening of the spillway and introduction of two saddle dams. This analysis highlights the incremental and combined effects across environmental, hydrological, social, and regional development dimensions.

The impacts are discussed below:

No.	Impact	Change introduced	Cumulative impact
1	Increased inundation area and ecosystem loss	Adding saddle dams increases reservoir capacity and surface area.	• Expanded inundation zone leads to further submergence of terrestrial ecosystems, including woodlands, grasslands, and agricultural land that were previously outside the inundation footprint. • Loss of biodiversity corridors due to increased fragmentation and restriction of wildlife movement. • When combined with other regional land use changes (e.g., roads, agriculture), this may push endangered species toward extinction and permanently alter the ecological character of the region.
2	Land acquisition, resettlement,	The enlarged reservoir footprint necessitates additional land	• Fragmentation of community structures as nine (9) additional homesteads fall within the new inundation zone.

No.	Impact	Change introduced	Cumulative impact
	and livelihood displacement	acquisition beyond the original RAP (Resettlement Action Plan) boundaries. The proponent has already acquired additional land where 9PAPs have been fully compensated.	• Increased number of Project Affected Persons (PAPs) beyond originally scoped (1839PAPs) RAP. The additional land displaced 9PAPs bringing the the total number of PAPs to 1848. It is worth noting that the proponent has compensated the 9PAPs and there will be no further displacement.
3	Alteration in Downstream Flow Dynamics and Ecological Regimes	Widened spillway and dam reservoir adjustment may alter the flood attenuation and seasonal discharge pattern.	• Reduced peak flows downstream could affect aquatic habitat rhythms (e.g., fish breeding cycles), riparian farming, and sand harvesting. • In conjunction with upstream water abstractions (irrigation), this creates a compounded drying effect along the Athi River, reducing its ability to support downstream wetlands and communities. • Altered sediment trapping increases geomorphological change downstream.
4	Structural risk and cumulative engineering pressures	The introduction of saddle dams and spillway modifications increases structural complexity and risk.	• Greater engineering stress and need for intensive long-term maintenance. • When combined with regional seismic risk and climate variability (e.g., extreme rainfall), the likelihood of dam safety concerns increases. The change in the design of the dam has mitigated the anticipated dam safety concerns. • Spillway expansion may unintentionally change erosion patterns at the outlet point, affecting nearby land.
5	Induced Development Pressure and Buffer Zone Encroachment	The visual scale and physical footprint of the expanded dam structure attract speculative interest.	• New infrastructure may encourage illegal settlements and commercial activity around the enlarged reservoir. • In combination with population growth and poor land enforcement, this results in buffer zone degradation, illegal sand harvesting, and pollution hotspots. • The saddle dams may open access routes into previously isolated zones, intensifying land use conversion.
6	Cumulative Impacts on Reservoir	A larger reservoir capacity implies longer retention	• Greater sediment deposition, requiring more frequent dredging and reducing effective reservoir lifespan.

No.	Impact	Change introduced	Cumulative impact
	Operations and Sedimentation	times and a wider catchment input area.	• When combined with upstream deforestation, gully erosion, and climate-induced runoff variability, this accelerates reservoir siltation. • Also increases the potential for eutrophication and algal blooms from nutrient-rich runoff.

After a review of the ESIA report (2013) and analysis of the impacts due to the change in scope, a comparative analysis has been summarized in the table below.

Comparative Summary of original vs. revised scope impacts

Impact Area	Impacts as per original scope (As per ESIA report, 2013)	Revised Scope (anticipated impacts)	Cumulative impacts
Inundation & Ecosystem Loss	High (controlled basin area)	Moderate (No change as the initial EISA had a dam height of 84m while the current scope is 80.5m)	High
Land Acquisition & Resettlement	High (RAP implementation complete and 1843 PAPs compensated except 5PAPs with succession issues(4) and 1No. pending documentation)	Moderate (additional land has been acquired and 9 Parcels and 28 pAPs compensated during the RAP implementation process)	High (1872) PAPs affected
Downstream Flow Effects	Moderate - High	Moderate (spillage regime changes + abstraction pressures)	High (spillage regime changes + abstraction pressures)
Dam Safety & Engineering Risk	High	Moderate (complex saddle dams + climate risk)	High (Dam + climate risk)
Induced Land Use Pressure	Moderate (around the main dam)	Low (around saddle dams, reservoir fringe)	Moderate (around saddle dams, reservoir fringe)
Cultural Heritage Disruption	High	Low (the new zones affected though no cultural sites)	High (no change as per original scope)
Sedimentation & Water Quality	High	Moderate	High (extended residence time + sediment and nutrient load)
Occupational & Health Risks	High	Moderate (though there will be increased exposure and health demands)	High (there will be increased exposure and health demands)
GHG & Climate Footprint	Moderate	Low	Moderate

E8. ENVIRONMENTAL AND SOCIAL IMPACTS DURING CONSTRUCTION AND OPERATION PHASES

The positive socio-economic and environmental impacts arising from the additional scope of works construction activities of the proposed dam height increment, spillway, saddle dams, and employers' camp include the following.

No.	Positive impact	Description
1.	Labour	Skilled and unskilled men and women, like artisans, plumbers, masons, and carpenters, will get temporary job opportunities to provide manual labour for excavation, masonry, carpentry, and other work. Other professional skilled labour like engineers and consultants will also benefit.
2.	Training and skills development	Local workers involved in construction gain skills and experience, enhancing their employability and potentially leading to long-term economic benefits.
3.	Local Economic Stimulus	Construction materials will be sourced from local markets, supporting local businesses such as hardware shops in the project area.
4.	Gender Empowerment	Both men and women are given equal work opportunities during the pre-construction, construction, and decommissioning phases.
5.	Community Engagement	The construction phase often involves community engagement, consultation, and participation, fostering a sense of ownership and collaboration.
6.	Revenue to the government	The Project will generate increased revenue for the national government and contribute to the national kitty through various taxes such as VAT and income tax accrued for supplies and contractors. The contractor, suppliers, and proponents will pay Value Added Tax (V.A.T) when purchasing materials for the Project. Construction workers will also pay income tax on their earnings while working on the Project.

During the operation phase of the dam, the following positive socio-economic benefits are anticipated.

No.	Positive impact	Description
1.	The provision of water for irrigation to the community will lead to improved household food security and livelihood.	Farmers in Makueni and Kitui counties can grow high-value horticultural and food crops for subsistence and commercial use, leading to improved nutritional values and enhanced household incomes at the household level due to the variety of crops grown.
2.	Increased Land Values in the Project Area	Providing irrigation infrastructure is an additional value for properties, especially land and commercial plots in the target project area. The project will attract more regional investment, leading to accelerated business growth.
3.	Access to water will result in improved hygiene practices and public health.	Access to reliable, safe water supply for domestic use will promote better hygiene practices, improve personal and community health, and reduce water-borne diseases such as cholera and typhoid, contributing to overall public health.
4.	Contribution to Competency-Based Curriculum (CBC) learning outcomes-	The current education curriculum is practical-oriented, with agriculture as one of the critical subjects. The pupils from local schools will have an added advantage and ability to translate theory into practice since they will be exposed to irrigated agriculture technologies, both on the farms and in kitchen gardens in their

No.	Positive impact	Description
		homes. School farms can be used as demonstration sites or learning centres.
5.	Social Equity	Equitable water access for the local community facilities promotes social inclusion and reduces disparities, fostering a sense of community well-being.
6.	Enhanced Community Resilience	access to water will help the community withstand climate shocks such as prolonged droughts, thus contributing to community resilience in the face of an unpredictable changing climate. Additionally, the Project will ease the current water deficit in Machakos (Konza City), Makueni, Kitui counties, and the environs, consequently promoting the country's and national economic growth.

Other Positive environmental impacts include flood control and drought mitigation, improved ecological conservation and protection, climate change vulnerability, adaptability, and resilience.

The impacts during the construction, operation and decommission phases of the additional scope is rated between low to moderate as compared with the impacts for the construction of the dam (original scope). Though some of the impacts are discussed in the ESIA report (2013), the cumulative impacts will be significant due to the additional works.

The anticipated negative impacts during the construction phase include:

- ✓ Increased extraction of raw construction materials such as sand, gravel, e.t.c
- ✓ Local Air Quality Pollution -Due to dust and vehicle emissions
- ✓ Noise and Vibration Impacts due to vehicles' movement and blasting operations
- ✓ Water Quality degradations, river flows and soil resources due to excavation activities, diversions, oil leaks and spillages from the construction site
- ✓ Increased solid and liquid waste generation -from the camp houses and construction site
- ✓ Impacts on Ecology, Biodiversity, and Habitat Loss at the impoundment areas due to soil and vegetation cover disturbance
- ✓ Traffic Flow and Transport Impacts- from heavy commercial vehicles during delivery of raw materials
- ✓ Gender-Based Violence –Sexual Exploitation, Abuse, and Harassment (GBV-SEAH) at the construction site or in the communities
- ✓ Child Labour, Exploitation and Abuse- in the neighbouring communities or site
- ✓ Workplace, Community Occupational Safety and Health Impact – Accidents and injuries, disease outbreaks at the site or in the communities.

The anticipated negative impacts during the operation phase include:

- ✓ Increased Water Resources Use – Water availability may trigger the overuse of water for domestic use in the communities' irrigation farms by farmers.

- ✓ Water Quality Impacts – may result from alteration of physio-chemical water characteristics of dam water, thus impacting downstream ecology and users.
- ✓ River Hydrology and Morphology Changes – Due to dam control releases and regulation
- ✓ Local Air Quality Pollution – Minimal air pollution during operation and maintenance activities at the dam.
- ✓ Noise pollution and Vibration - Minimal air pollution during operation and maintenance activities at the dam.
- ✓ Workplace and Community Occupational Safety, Health and Security Issues
- ✓ Ecology and Biodiversity Change due to the presence of the dam
- ✓ Visual and landscape impacts – The physical appearance of the area will change.
- ✓ Human-Wildlife Conflicts – Water availability may attract wildlife from neighbouring parks
- ✓ Cumulative Impacts – Will likely increase to planned future construction activities of the dam.

The anticipated negative impacts during the decommissioning phase include:

- ✓ Employment Opportunities
- ✓ Solid Wastes Generation
- ✓ Air Pollution
- ✓ Noise & vibration impacts
- ✓ Workplace Occupational Safety and Health Risks.

The potential environmental and social impacts and level of risks are summarised in Table E7.1.

Table E7.1: Summary of Potential Negative Environmental and Social Impacts - Construction, Operation and Decommissioning Phases

Negative Environmental and Social Impacts During Construction				
Activities	**Impacts**	**Direct/Indirect/ Cumulative**	**Level of Significance**	**Mitigation measures**
i) Excavation of rocks, sand mining from the locality	i) Increased extraction of resources	Direct	Medium	• Ensure accurate budgeting and estimating of construction material requirements to ensure no excess is ordered. • Ensure that damage or loss of materials is minimal through proper storage. • Use at least 5%-10% recycled, refurbished, or salvaged materials to reduce the use of raw materials. • Material recycling and reuse are practiced.
ii) Vehicle movement and blasting operation releasing dust and emissions, concrete mixing	ii) Local Air Quality	Direct	Low	• Control speed and operation of construction vehicles to 30 km/h or less. • Transport of construction materials in designated trucks is done in covered. trucks • Periodic road wetting is being done. • Conduct regular air quality surveys and air quality surveys done annually.
iii) Construction works vehicle servicing leading to oil/diesel spillages	iii) Impact on Water Resources Quality	Direct/Indirect	Low	• Recycling water during construction • A waste management plan is implemented to avoid polluting the nearby water sources. • Control oil and diesel spillages at the site • Disturbed areas will be rehabilitated as soon as possible to prevent erosion and pollution of surface water. Construction vehicles and equipment will be serviced regularly and off-site.

iv) Excavation works, stock piling,	iv) Impacts on Soil Resources	Direct	Medium	• Control earthworks and compact loose soils • Landscaping should be done after project completion • Rehabilitate disturbed areas by planting trees and grass as soon as possible to prevent erosion.
v) Improper solids and waste disposal	v) Impacts on Wastes Generation	Direct	Medium	• A Waste Management Plan exists and has been implemented, including waste segregation procedures. • Maintain the NEMA-licensed waste handler to collect the waste from sites.
vi) Soil disturbance through excavations	vi) Impacts on Ecology and Diversity	Direct	Medium	• Immediate rehabilitation of disturbed areas during the excavation of saddle dams • Induction programs for workers must include requirements to protect the natural Environment.
vii) Vehicular movement and blasting operations	vii) Impacts on Noise and Vibration	Direct	Medium	• Blasting activities to daytime hours only • A 30km/h speed limit is imposed on all vehicles transporting construction equipment and materials. • Regular noise and vibration measurements should be taken, and the dam site and quarries must be monitored.
viii) Unsafe and unhygienic working conditions, wrong tools for workers during construction, lack of training	viii) Workplace and Community Safety and Health	Direct	Low	• Train workers on environmental, safety, and health issues • Apply speed limits within the project site access roads • Use barricade tapes with open trenches and at other active construction sites. • Employ qualified mobile equipment operators • Provision of adequate sanitary facilities for workers • Provide Personal Protective Equipment (PPEs) for workers

ix) Transport vehicles movement to and from the site	ix) Traffic & Transport Impacts	Direct	Low	• A speed limit of 30 km/hr is imposed.
x) Hiring of workers and community interaction with migrant workers	x) Gender-Based Violence GBV)	Direct	Low	• Maintain training sessions for all construction workers, supervisors, and contractors on recognizing, preventing, and responding to GBV and SEA. • Established clear codes of conduct and policies that prohibit GBV and SEA, including harassment, exploitation, and discrimination, will be maintained. • Engage with local communities to raise awareness about GBV and SEA, respectful behaviour, and gender equality, as well as available support services.
xi) The influx of migrant workers and community interaction	xi) Child Labour, Exploitation and Abuse	Direct	Low	• The contractor has signed a code of conduct that covers child protection, ensuring no children are employed on-site under national labour laws. • Ensure that any child sexual relations offences among contractors' workers are promptly reported to the police. • Employ workers 18 years and above with a valid national ID at the time of hire.
xii) The influx of workers at the site in the local area	xii) Labour Conditions	Direct	Low	• Review, update and implement a Labour Management Plan • Include minimum criteria for employment to be implemented by the contractor and subcontractors. • Regular monitoring of contractor and subcontractors' staff to ensure compliance with the labour laws
xiii) Construction civil works	xiii) Community Occupational Safety and	Direct	Low	• Regular safety training for all workers, maintain toolbox training, emphasizing hazard awareness, safe work practices, and

	Health			emergency procedures. ● Ensure appropriate use of PPE, such as hard hats, safety glasses, gloves, and respiratory protection. ● Regular inspections and audits should be conducted to identify and address potential hazards on the construction site. ● Review, communicate and implement emergency response plans to address potential accidents or incidents promptly.
Negative Environmental and Social Impacts During Operation				
Increased domestic and irrigation usage	Overuse of Water Resources	Direct	Medium	● Water recycling and use of other water harvesting measures, such as roof catchment farm-ponds storage, to reduce dependency on river water during the operation stage ● Awareness creation of water demand management measures ● Regularly inspect pipeline connections to ensure there are no leakages
Changes in dam water characteristics due to lack of mixing, sedimentation biomass and heavy metal accumulation may bring water quality issues.	Water Quality Impacts	Direct	High	● Strategic pollution control and prevention upstream of the dam (Athi and Thwake Rivers) ● Wastewater treatment before discharge ● Collaboration among stakeholders, including environmental and conservation agencies, Ministry of Water, NEMA, WRA, and private bodies.
Dam release and controls may affect the river flow regime	Hydrological and Morphological Changes	Direct	High	● Ensure compliance with the water resources regulations at all times. At least 30% of the base flow should always flow in the stream to sustain ecological and social requirements downstream. ● With effects on the level of flood heights downstream, it may be necessary to review the riparian land and extent of the sub-aquatic ecosystem downstream,

				• River gauging stations around the dam and downstream may require to be reactivated to monitor the effects of the dam on the river basin over time.
Vehicles moving in and out of the site area	Minimal local Air Quality pollution	Direct	Low	• Maintain control speed and operation of construction vehicles to 30 km/h or less to reduce dust and exhaust emissions.
Vehicles moving in and out of the site area during operations and maintenance.	Noise and Vibration	Direct	Low	• Impose a speed limit of 30km/h for all vehicles transporting visitors to the dam site.
Dam release and control may lead to changes in ecological changes and habitats.	Ecological and Biodiversity changes	Direct	Medium	• Habitats conservation • Collaboration among stakeholders, including County governments and conservation agencies.
Increased migration of animals into the area of influence	Human-Wildlife Conflicts	Direct	High	• Use of electric fences • Educating the local communities on how to co-exist with the animals • KWS to open an office in the area to help in emergencies and rescue missions
Reservoir water storage may trigger breeding grounds	Water-borne Diseases (Malaria)	Direct	Medium	• Use of treated mosquito nets to prevent bites • Improved access to community health services.
Community interactions with migrant workers residing in the employer's houses and use of access roads where transport vehicles pass.	Community Occupational Safety and Health - transmission of diseases, accidents and injuries on the roads.	Direct	Low	• Regular inspections and audits should be conducted to identify and address potential risks at the dam site. • Develop and communicate emergency response plans to address potential accidents or incidents.
Increased construction	Cumulative	Direct	Low	• Developing measures to avoid, minimize, or remedy impacts

activities in future	Impacts			• Develop action-specific measures, establish policies, and consult with stakeholders.
Negative Environmental and Social Impacts During Decommissioning				
Demolitions of camps, buildings and other temporary structures at the site and transport or disposal of remains.	Solid wastes generation	Direct	Low	• Review and monitor the implementation of the existing Waste Management Plan, including waste segregation procedures. • A contracted NEMA-licensed waste handler collects the waste from sites.
Demolition of structures may cause accidents and injuries	Community and Workers Occupation Safety and Health	Direct	Low	• Safety and health induction of workers • Use of the right tools and equipment • Use of PPE • Emergency preparedness and response plan
Due to demolitions and dismantling of materials, vehicles transporting materials	Noise and Vibration	Direct	Low	• Impose a speed limit of 30km/h for all vehicles transporting solid remains, e.g. wood, metals e.t.c

	Risk Rating		**Color Code**
	Low		
	Medium		
	High		

E9: ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)

The Environmental and Social Management and Monitoring Plan (ESMP) will be implemented by the proponent/contractor to prevent or reduce significant adverse impacts to acceptable levels. Environmental monitoring is an essential component of project implementation. An ESMP is a tool that provides a mechanism for managing and monitoring the ecological results of a project during its execution and operation to reduce their adverse effects and to introduce standards of good practice to be adopted for all project works. The ESMP facilitates and ensures the follow-up of implementing the proposed mitigation measures.

One of the AfDB objectives of OP 1, Environmental and Social Assessment Safeguards, is to ensure the effective management of environmental and social risks in projects during and after implementation. The development of the ESMP is a requirement under OP 1 to help the Bank achieve its objective. Once the impacts have been identified and assessed, a comprehensive and implementable ESMP with a realistic timeframe must be developed, incorporating the necessary organizational capacity (including further training requirements) and financial resources to address and manage the environmental and social risks that may occur during the project cycle.

The proposed ESMP is shown in Table 8.1.

E9.1 Management Responsibility

The responsibility for implementation of the ESMP lies with the Ministry of Water, Sanitation and Irrigation. The Ministry of Water, Sanitation, and Irrigation, through the PIT, will oversee, guide, and coordinate the implementation of the environment and management aspects, including dam conservation, soil erosion control, re-vegetation whenever appropriate, water conservation and equity in distribution, and enhanced sanitation and hygiene measures throughout the project area. The PIT is resourced with qualified and experienced experts in EHS and Gender and Social matters to monitor, provide liaisons, report implementation, and propose improvements to environmental and social management aspects during construction and post-tracking audits.

The contractor will be responsible for implementation and compliance with the ESMP at the site and related activities. At the same time, the supervising consultant will oversee and ensure the contractor complies with the requirements of this ESIA and ESMP.

The contractor and Supervising Consultant will hire qualified E&S personnel to support the implementation of the ESMP and will:

i) Enhance the integration of environmental, social, and economic functions in the Project's implementation.
ii) Under the guidelines, preventive measures for possible social and economic disruptions arising from the project implementation should be considered.
iii) The contractors and other players in the project activities prevailed upon to implement the EMP through sustained supervision and continuous consultations.

The County governments will issue required licenses and enforce compliance with the conditions outlined in the permits and other County Government laws. The primary role of the county is to issue permits and monitor compliance with the conditions. The relevant county departments to issue licenses include NEMA, WRA, Public Health Licence for Food Handlers-Kitui & Makueni; Excessive Noise License-Makueni County; and Medical Health Clinic-Kitui County.

E10 CONCLUSION AND RECOMMENDATION

E10.1 Conclusion

This ESIA covers the new scope of works, including the increment of dam height, spillway extension, construction of two saddle dams and employers' houses. The Project will have direct and indirect benefits. It will also negatively impact the surrounding bio-physical and social environments, including extraction of natural, noise pollution and dust emissions, solid wastes and effluent generation, worker accidents, and injuries during construction. During operation, the negative impacts include possible changes in river flow regimes downstream, increased water use, water management conflicts, waste generation from camps, increased malaria cases, and introduction of new plant and animal species. To mitigate the negative impacts, the proponent shall commit to maintaining and integrating the current mitigation measures throughout the project life cycle and implement the Environmental and Social Management and Monitoring Plan (ESMP). The proponent shall also adhere to all relevant national and AfDB environmental, health, and safety standards and policies and regulations governing establishing and operating such huge water infrastructural projects in Kenya.

The project has provided for a budget during pre-construction of Kenya Shillings (KES) 25,913,105 for the finalization of demarcation of the project land (final survey) and issuance of title deeds to the PAPs whose land was partially acquired. The ESMP costs for construction, operation and rehabilitation phase costs are of 9,500,000, 6,450,000 and 2,050,000 respectively, while stakeholder engagement plan costs of 7,000,000.

Therefore, main ESMP and SEP costs are 25,000,000 and finalisation of land acquisition legacy issues costs are 25,913,105.

E9.2 Recommendation

It is recommended that the dam design and scope changes, including dam change, spillways extension, two saddle dams and employers camps, be implemented to increase water storage to uplift the living standards of the beneficiary communities. The following broad recommendations are proposed to minimize the environmental and social impacts of the proposed construction works and dam operation.

- Review and implement the Standard Operation Procedures currently being implemented, e.g. Emergency Response and preparedness, Traffic Management, Labour Management, Waste Management Plans, Occupation Safety and Health Plans e.t.c

- There is a need to educate the communities on co-existence with wildlife to ensure community and public safety. Adopting economic activities that co-exist with wildlife, such as eco-tourism, should be initiated.

- The community should be organized into a strong unit to control local resources and social and economic benefits from the dam's construction, including sand harvesting and marketing products such as fish, crops, and livestock.

The social and economic rating for this Project is highly positive, and the execution of the Project does not pose any significant/severe adverse environmental and social impacts. As such, it is *recommended that the Project be allowed to proceed. The Project Proponent will strictly adhere to this report's environmental & social management and monitoring plan. The proponent commits to managing and monitoring the project's environmental and social risks and impacts throughout the project life cycle to meet the Environmental and Social Safeguards (ESSs) requirements.*

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CHAPTER ONE: BACKGROUND INFORMATION

1.1 Project Background and Objectives

Article 43 (b) and (c) of the Constitution of Kenya (CoK) 2010 on economic and social rights provides for the enjoyment of clean and safe water in adequate quantities and access to reasonable standards of sanitation as a fundamental right for every Kenyan citizen. The government of Kenya has been continuously seeking to expand access to services to promote the progressive realization of the right to water and sanitation. The ultimate goal of the sector is to achieve the Kenya Vision 2030, Agenda 2063 on 'Africa We Want,' Sustainable Development Goal (SDG) No. 6, and the Ngor Declaration on Sanitation and Hygiene of universal access to safe and affordable water and sanitation by the year 2030. Kenya aims to access safe and affordable water and sanitation by 2030, in the progressive realization of the rights to water and sanitation provided in the Constitution of Kenya, 2010. Most rural areas are in the Arid and semi-arid lands (ASALs), constituting up to 89% of Kenya and covering 29 counties.

The semi-arid counties of Kitui and Makueni have the highest incidence of poverty in Kenya. They are characterized by low rainfall of less than 700mm per annum with unreliable patterns, thus rendering them food deficit regions. In 2021, Kitui County had an overall poverty rate of 55.2%, while Makueni County's poverty rate was 39.7%, while the average poverty rate in Kenya was 39.8% (The Poverty Report 2022). Little is developed despite the significant potential of land that could be irrigated. Also, there are a few rural electrification programs. Residents in rural areas depend on hand-dug excavations into riverbeds for water for a large portion of the year to have potable water. Increased hydro-climatic variability due to climate change has intensified water stress in the area.

The Government of Kenya (GoK) has adopted the Thwake Multi-purpose Water Development program as its primary solution to address these challenges. This program aims to enhance food security, improve access to safe drinking water and potable sanitation, and provide electricity to rural populations, aligning with the government's targets. Additionally, the proposed program supports bulk water supply for the development of the new ICT City of Konza. The proposed program is set to build resilience to climate change, boost food security, and drive socioeconomic development.

The Thwake Multipurpose Water Development Program (TMWDP) is a flagship Program under Vision 2030 of the Government of Kenya and a key Project under the Government's Economic Transformation Agenda for Inclusive Growth (BETA). The project started in 2018; the first phase is 94% complete. However, there were changes in the original dam design after completing detailed designs in phase one of the project. The changes include increasing the dam height by 3 metres from 77.5m to 80.5m (relative to CAS design report but still under 84.0m in the licence), constructing one spillway instead of two spillways, constructing two saddle dams, one in Kitui and the other in Makueni County, construction of employer's houses and a road (2.6Km). This Environmental and Social Impact Assessment (ESIA) study assessed the potential impacts of the new/additional scope of work and proposes mitigation measures to avoid, minimize the project impacts or risks.

1.2 Requirements for ESIA and Justification

Environmental and social impact assessment (ESIA) identifies and assesses the environmental and social risks and impacts of a proposed project, set of activities, or other initiatives, evaluates alternatives, and designs appropriate mitigation, management, and monitoring measures. The initial ESIA study was undertaken in April 2013 during preliminary design, and a license was issued on 19th December 2013. The Environmental and Social Management Plan (ESMP) that was developed formed the basis for the

on-site implementation and monitoring of E&S programs regarding compliance with local legislation and AfDB E&S requirements.

The change in dam design and additional scope of works is classified as high risk and thus falls in category 1 as per the Bank Integrated Safegirds System (ISS) Operational Safegurd (OS) 1 on Assessment and Management of Environmental and Social Risk and Impact, and Legal Notice 31 of 2019 of the The Environmental Management And Coordination Act (EMCA). Section 58 of the EMCA 1999 and Legal Notice 32 of 2019 directs that any project specified under the Second Schedule of the Act should be subjected to an EIA study and a report of the same submitted to The National Environment Management Authority (NEMA) to process an EIA license before commencement. The 2019 Amendment of the Act (Legal Notice No.31) provides an updated list of projects that require EIA. It assigns projects to three categories, depending on the seriousness of their likely effects: low-risk, medium-risk, and high-risk projects. This project's additional works is categorized as a high-risk project.

1.3 ESIA Objectives

The objectives of the study include, to provide:

i) A clear description of the proposed project, including its objectives, design concepts, proposed water uses and anticipated environmental and social impacts,
ii) Description of the baseline conditions in the project areas that cover the physical location, environmental setting, social and economic issues,
iii) A description of the legal, policy and institutional framework within which the proposed dam project will be implemented,
iv) Description of the project alternatives and selection criteria
v) For public participation and comments from stakeholders on the additional scope.
vi) Details of the anticipated impacts on the environmental, social and economic aspects of the area covered by the project.
vii) Appropriate mitigation and/or corrective measures,
viii) An environmental and Social management plan (ESMP) presenting the project activities, potential impacts, mitigation actions, targets and responsibilities, associated costs and monitoring indicators.

1.4 Scope of the Study

This study includes assessing the potential environmental and social impacts of the project variation and additional work, including constructing the additional 3m dam height, one extended spillway, two saddle dams, and the employer's camp. The impacts are investigated at 3 phases of project development: during construction, operation, and decommissioning on the following aspects:

- Physical environment
- Flora and Fauna
- Social and economic aspects

The study assesses the impacts of the proposed development on the environment under the EMCA (1999), the Environmental (Impact Assessment and Audit) Regulations 2003 (Amendment 2015, Environmental (Impact Assessment and Audit) (Amendment) Regulations, 2019 and other related laws. The scope of the study, as established under these regulations, includes:-

1. The proposed location of the Project

2. A concise description of the national environmental legislative and regulatory framework, baseline information, and other relevant information related to the project.
3. The objectives of the project
4. The technology, procedures, and processes to implement during the project.
5. A description of the potentially affected environment.
6. The project's environmental, social, and cultural effects are classified as direct, indirect, cumulative, irreversible, short-term, and long-term impact anticipated.
7. Analysis of alternatives, including project site, design, and technologies and reasons for preferring the proposed site, design, and technologies.
8. An E.S.M.P. proposes measures for eliminating, minimizing, or mitigating adverse environmental impacts, including the cost, time frame, and responsibility to implement the standards.
9. The measures to prevent health hazards, ensure security in the working environment for employees and manage emergencies at all project stages.
10. An indication of whether the environment of any other state is likely to be affected, the available alternatives, mitigating measures, and other matters that the Authority may require, including public consultation with various stakeholders through focus group meetings.

1.5 ESIA Approach and Methodology

The Project will apply a complete set of environmental and social safeguards to protect against adverse impacts on the bio-physical and social environments. All of the Thwake Multipurpose Dam activities, particularly the construction and operational requirements for infrastructure works, will be implemented in compliance with Kenya's environmental laws and regulations, other relevant laws and policy frameworks, and international and AfDB guidelines and Integrated Safeguards System (ISS) standards. This E.I.A. followed the procedures and protocols in the legal Notice 32 of 2019 that provides for the contents of the EIA report, Legal Notice No.101 of Environmental (Impact Assessment and Audit) Regulations, 2003, and Environmental Management Coordination Act, 1999. The approach and methods for collecting data and relevant information are outlined below.

1.5.1 Desk review

The following documents were reviewed: the ESIA Study Report 2013, project progress reports, monthly E&S reports, ESMP implementation, gazette notices on legislative, policy, and administrative frameworks, project technical and financial appraisal reports of 2023 on the additional scope,[1] and AfDB Integrated Safeguards System (ISS), 2023 were reviewed to ensure the proposed project adhere to established environmental and social standards to promote sustainability and mitigate negative consequences, etc.

1.5.2 Site Visits and Photography

The team visited the spillway, dam embankment, saddle dam locations and neighbouring villages. Observations and photography were used to confirm information collected via desk review. Checklists were used during the site visits to collect the project's relevant environmental and social aspects. Checklists are study instruments that aid in assessing possible ecological impacts during a project's construction and operational phases. The screening exercise is focused on evaluating and identifying the potential social and environmental impacts associated with proposed projects and assessing the applicability and relevance of AfDB safeguard policies and national policies and laws to ascertain

[1] By both SMEC consultants and the Dam panel of experts

compliance; and provide a foundational basis for evaluating the eligibility and appropriateness of proposed projects. The checklist is appended in Appendix 2.

1.5.3 Stakeholders Engagement

Stakeholder meetings and consultations were organized at the community and stakeholder levels in 3 locations in the project area's Kanyangi, Kalawa, and Kyusyani areas on 12th and 13th February and 3rd and 4th April 2025. Community meetings were mobilized through the Community Liason Officer and area Chiefs. The meeting included key informant interviews with chiefs and religious leaders; structured questionnaires were administered during barazas to gather community views and concerns regarding the project and its environmental and social impacts. A total of 64 participants attended (43 males and 21 females). Stakeholder meetings for County government officials and interested parties, such as representatives of various NGOs & CBOs, faith-based organizations, educational and health institutions, and youth, were held on 03/04/25 and 04/04/2025. A total of 46 stakeholders attended, including 31 males and 15 females. Meeting notices were sent to area chiefs who mobilized the representatives of the various groups.

1.5.4 Impacts Identification and Rating

Identifying and assessing environmental and social impacts is a multi-faceted process using a combination of quantitative and qualitative descriptions and evaluation. The approach involves using a magnitude-sensitivity matrix, professional judgment, and reasoned argument to determine the significance of environmental impacts associated with the proposed project.

Once a potential risk or impact has been determined, it is necessary to identify which project activity will cause the effect, the probability of occurrence of the impact, and its magnitude and extent (spatial and temporal). The effects identified were categorized as negative and positive. Further, negative impacts were weighted and rated based on the impact's consequence and likelihood.

1.5.5 ESIA Project Report Preparation

This report was prepared based on the Environmental Impact Assessment and Audit (EIA/EA) Regulations 2003 and Bank ISS OS 1. The Legal Notice No. 32 of 2019 determines the minimum content of the EIA report. The Thwake Dam project falls under the prescribed list of projects, a high-risk category for which an Environmental Impact Assessment is mandatory before implementation.

CHAPTER TWO: PROJECT DESCRIPTION, LOCATION AND DESIGN CHANGES

2.1 Project Location

Phase 1 of the Thwake Multipurpose Water Development Program project started in March 2018. The African Development Bank (AfDB) and the Government of Kenya (GoK) jointly fund the project through the Ministry of Water, Sanitation and Irrigation. The main contractor is China Gezhouba Group Company Ltd, which SMEC International Pty Ltd. and SMEC Kenya consultants supervise. The dam is currently at 94% complete. Additional financing is required to complete Phase I due to further works in the project, including increasing the dam height from 77.5m to 80.5m (relative to CAS design but still under 84.0m in the NEMA licence) to enhance water storage capacity, additional two saddle dams, widening the spillway, constructing employers camp/houses and a road, 2.6 Km.

The dam is located at the confluence of the rivers Athi and Thwake in Makueni and Kitui Counties and has a distance of about 180 km southeast of Nairobi. Its coordinates are 1°46'0" S and 37°43'0" E in DMS (Degrees Minutes Seconds) or -1.76667 and 37.7167 (in decimal degrees). The dam is accessible from Wote Town in Makueni County through an earth road to the Mavindini shopping centre. The dam is also accessible from the Kitui side by earth road from Kwa-Vonza, Kiusyani – Kanyangi road. The dam reservoir will physically cover an area of 2,900 Hectares spanning from the embankment to about 12 Km upstream and an estimated catchment area of 10,276 square km^2. The catchment area covers about 35% arable and 65% semi-arable land.

The program's objective of the project is to provide water for domestic use, livestock, irrigation, hydropower, and industrial activities within the counties of Makueni and Kitui and the development of Konza City. The dam will store water from the seasonal Thwake River and overflow from the permanent Athi River. It will also provide regulation of flows on River Athi downstream of the dam for flood control and drought mitigation.

Figure 2.1 shows the location of the dam.

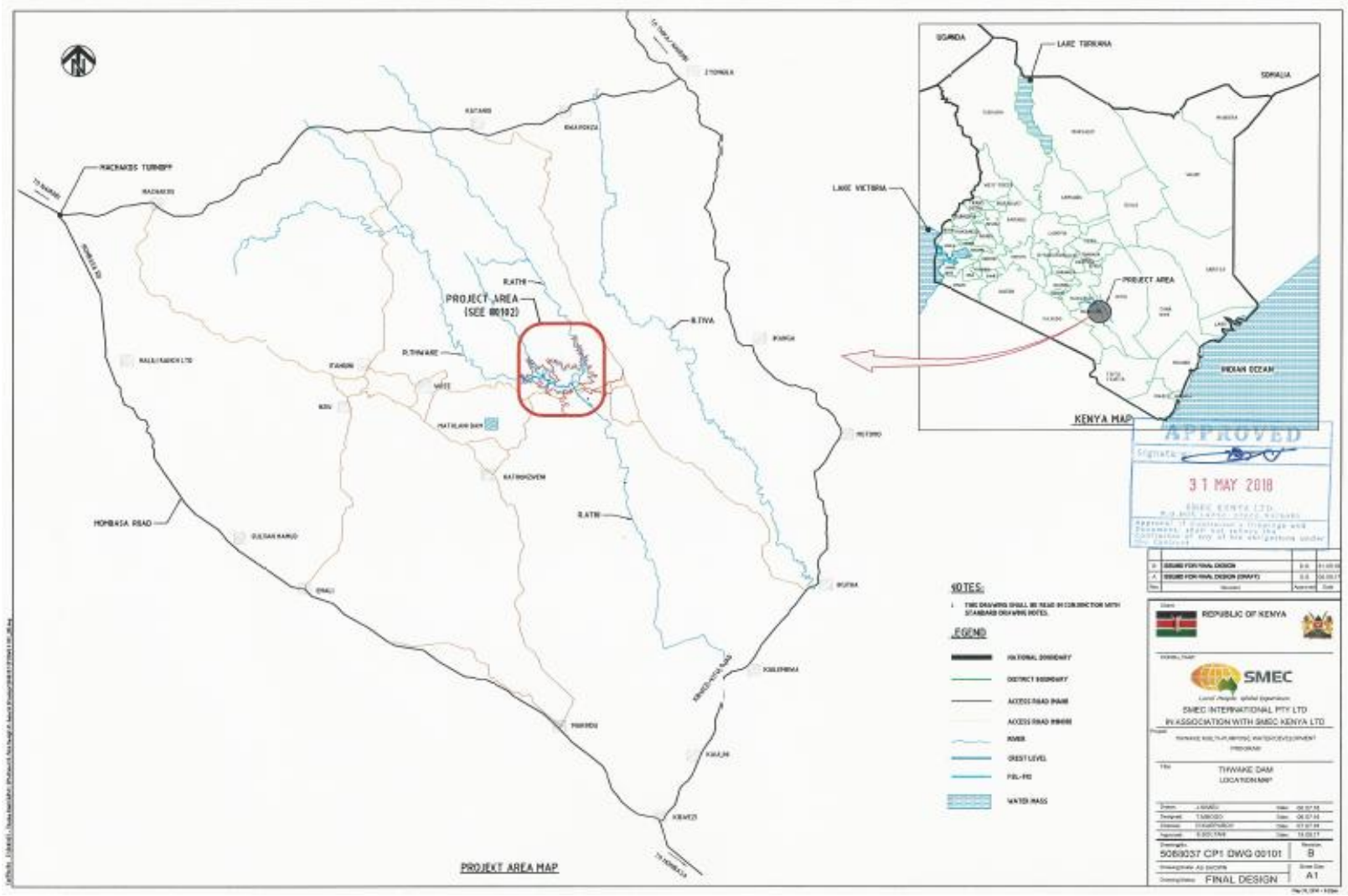


Figure 2.1: Location of Thwake Dam

The Reservoir of the dam will extend as shown in figure 2.2 below:

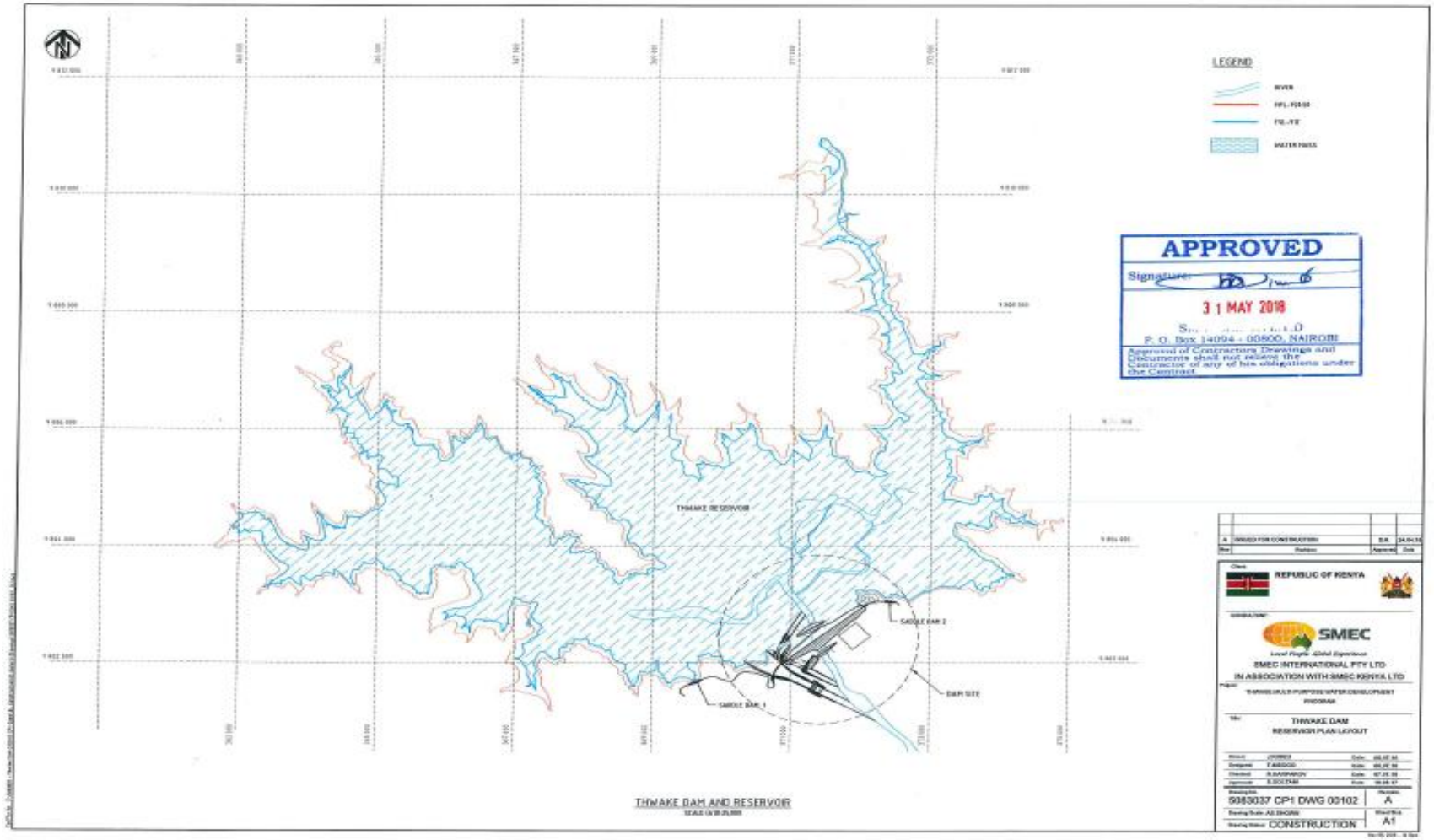


Figure 2.2: Location of Thwake Reservoir

2.2 Initial Thwake Dam Project Design

The initial ESIA study was prepared based on Thwake Dam Preliminary Design prepared Samez Consultants Ltd in year 2009. The preliminary designs were inched on a Feasibility Study Report prepared by the same consultant in 2006.

The main parameters of the dam as per the 2009 preliminary design are as follows:

Reservoir

- Catchment area 10,276km^2
- Reservoir storage 825MCM
- Full supply level 912m above sea level
- Freeboard 9m
- Maximum flood level 921m above sea level

Dam Embankment

- Dam height 84m
- Type of embankment Earth fill dam with clay core
- Crest length 1,600m
- Crest width 7m
- Upstream slope 1:3
- Downstream slope 1:2.5

Saddle dams

- Crest length 1,230m

Open Channel Spillway

- Probable Maximum Flood 5,393m^3/sec
- Location RHS, Makueni side

River Diversion

- No. of diversion tunnels 6
- Diameter of tunnels Culverts of 4m diameter

Source of Construction Material – Clay and Earth Material

- Mikisi located about 6km from the dam

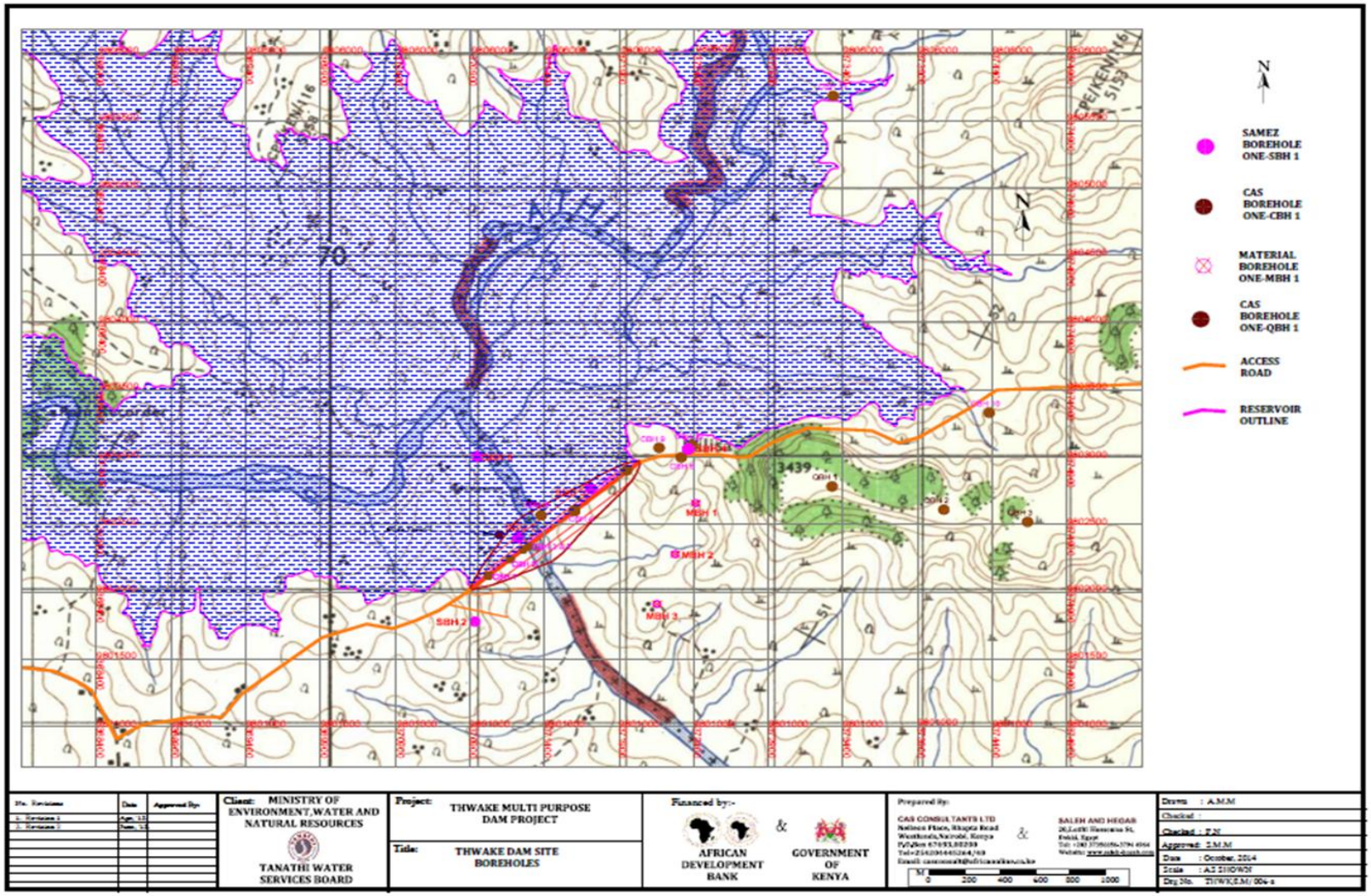


Figure 2.3: Dam Layout as per Samez Design 2009 (Note: Improved by CAS Design 2014)

The Samez design was reviewed by CAS Consultants in 2014. The review concluded as follows

- On optimizing the dam height, a financial modeling was done for dams of 84m, 77m, 67m, and 57m. The finding was that a 77m high dam is the most optimum and it is capable of meeting the project objectives.
- Based on the financial model, CAS review settled on a 77m high dam as the most optimum that would meet the project objectives in terms of water supply, irrigation and hydropower generation being the principal project objectives.
- This dam height of 77m eliminated the saddle dam between Nduyu and Kilisa Hills
- Introduction of emergency spillway and service spillway

SMEC Consultants reviewed the 2014 CAS design and submitted a detailed design in May 2018. The ongoing construction of the dam is based on the SMEC's detailed design of 2018. The final design concluded that:-

- Given the volume of water required to run the water supply, hydropower and irrigation and represented in full supply level of 912MASl and the confirmation of PMF of 11,480m3/sec, the only available room for changes was upward to contain the flood within the spillway confinement. Retaining the height of 77m would have resulted in the risk of flood overtopping the embankment or even a much wider spillway. This therefore resulted to increase in the dam height to 80.5m
- SMEC design reviewed the need for 2No. spillways (service and emergency). Arising the review and in consultation with Dam Safety Panel of Experts, SMEC design (2018) found it more economical and much easier to maintain the dam with one spillway; the service spillway. Geological and cost factors contributed to the dropping of the emergency spillway.
- Once the dam height was varied, and by the mere fact that the two adjacent valleys were low, the ground conditions necessitated the proposals for 2No. saddle dams.

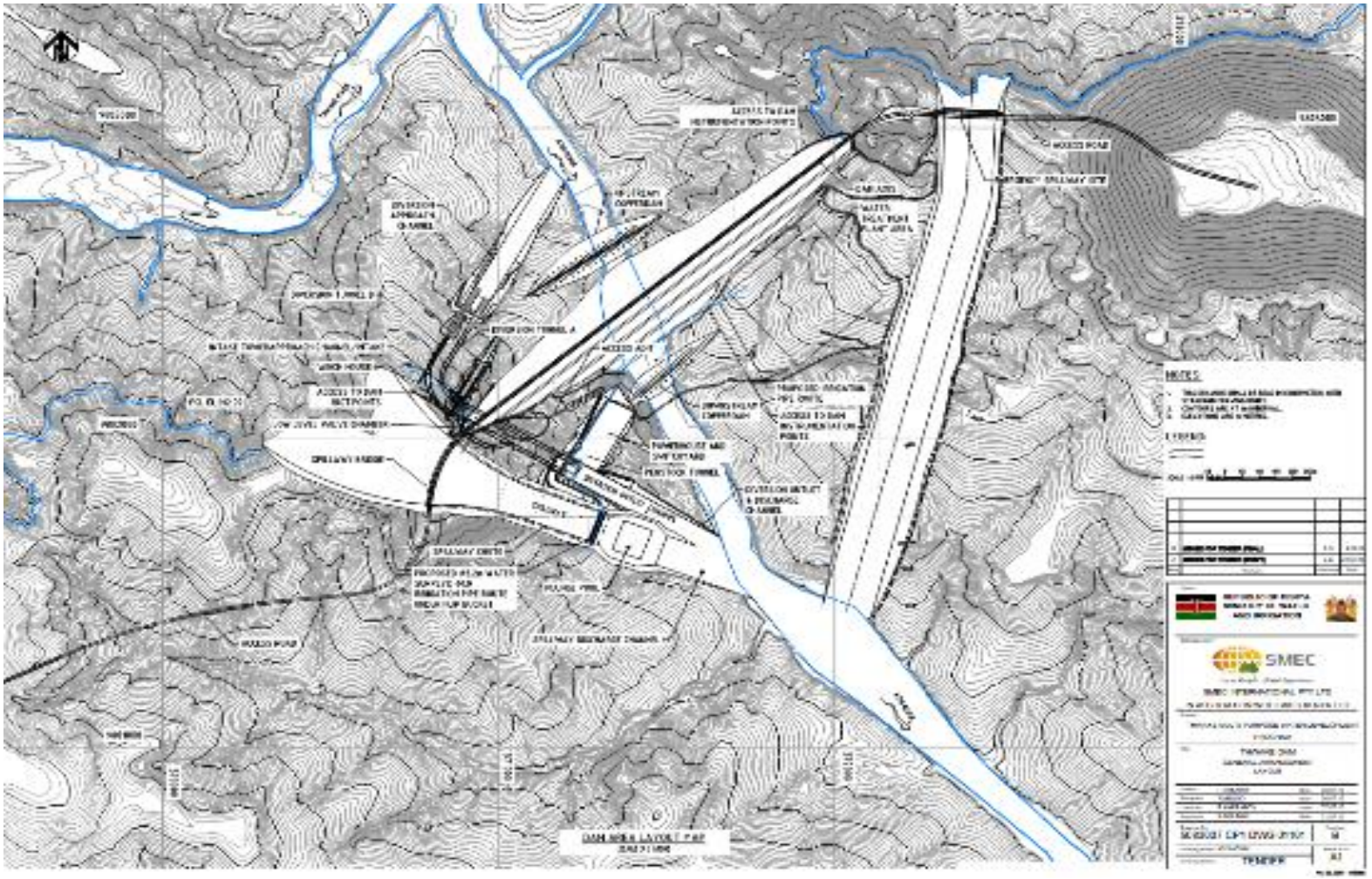


Figure 2.4: Original Dam Layout

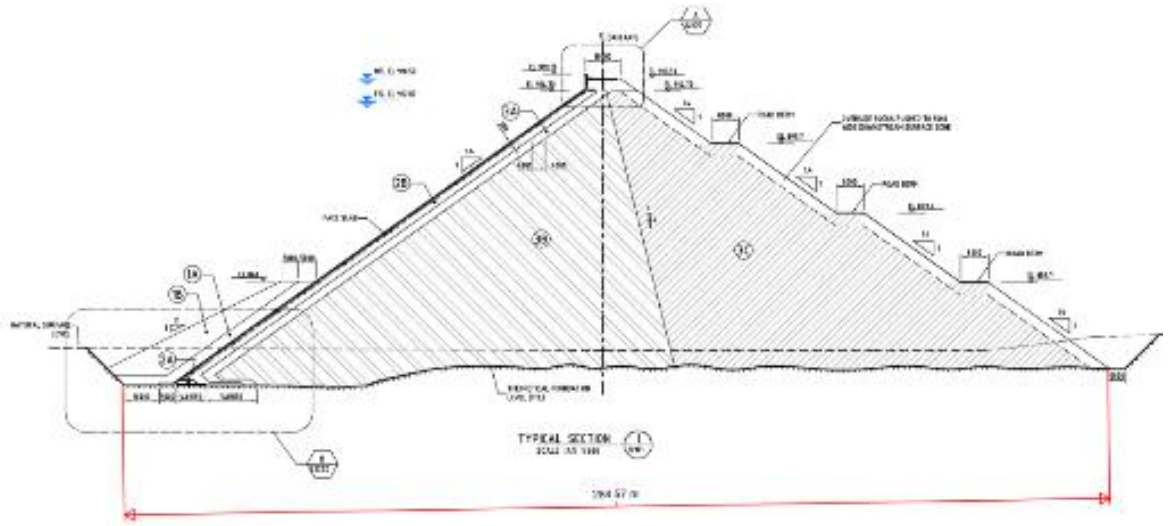


Figure 2.5: Original Dam Cross-section with 285m Footprint

2.3 Change in Dam Design, Scope and Justification

Thwake Multi-Purpose Water Development Programme tender documents were prepared and based on designs prepared during the feasibility and planning stages of the dam development. The Ministry requested the Consultant, SMEC, to prepare the tender documentation before the hydrological and geotechnical investigations required for design review and update had been completed. The Tender documentation, therefore, relied on the feasibility stage designs, which were based on a probable Maximum Flood (PMF) of 5,000m^3/s and a maximum flood level of 918.5m above sea level.

The summarized original scope of work for the construction works includes construction of;

I. CFRD Dam Embankment, whose height is 77.5m from the lowest point of the river bed and 1495m long. Maximum flood level of 918.5m above sea level.
II. Dam footprint 285m wide
III. Diversion Tunnels A (731m) and B (797m) with Low-Level Outlet, Intake Tower, and Access Adit
IV. Spillway of 224m wide and 535m long. The total length of the spillway, considering the discharge channel back to the river, was 885m long.
V. Employers Camp
VI. Emergency spillway, 190m wide and 1.8km long

Tender documentation was submitted to the Ministry on 22nd August 2016; however, geotechnical and hydrological studies ran in parallel and were not completed at the time of tender document submission. The final dam design was completed in 2018, once the hydrological and geotechnical studies had been completed. The hydrological studies revised and increased the PMF from 5,000m^3/s, determined at the feasibility stage, to 11,480m^3/s, which would require substantial changes from feasibility design to detailed design.

The geotechnical investigations concluded that the emergency spillway's geological formation was characterized by moderately weathered rock and that the excavated material could not supply sufficient quantities of rock materials for the dam embankment.

Arising from the studies and analysis, several design changes and new scope of works were proposed as follows:

- Expunging the emergency spillway and adopting a single dam spillway to discharge the PMF, widening the weir's width from 224m to 235m. The length of the spillway slab increased from 535m to 618m, and the entire spillway to the river increased from 885m to 1,500m.
- As a result of the increased PMF and adoption of a single service spillway, the maximum flood level was raised by 2m (from 918.5 to 920.5 m above sea level). Dam safety and maintaining the structural integrity of the embankment required a height increase to ensure no floodwaters would overtop the embankment. As a result, the embankment height increased from 77.5m to 80.5m. For stability reasons, the dam's footprint was increased from 285 m to 320m at the river bed section. Additionally, the length of the dam axis increased from 1495m to 1560m.
- The new maximum flood level of 920.5m above sea level necessitated the establishment of two saddle dams at the low points immediately after the dam axis on both ends. Saddle 1 of, 250m and saddle dam 2 of 200m long has been proposed.
- The widening of the spillway width at the weir section necessitated an increase in the spillway bridge, automatically affecting the approach road. The permanent access road for the project has increased from 8.6km to 11.2km.

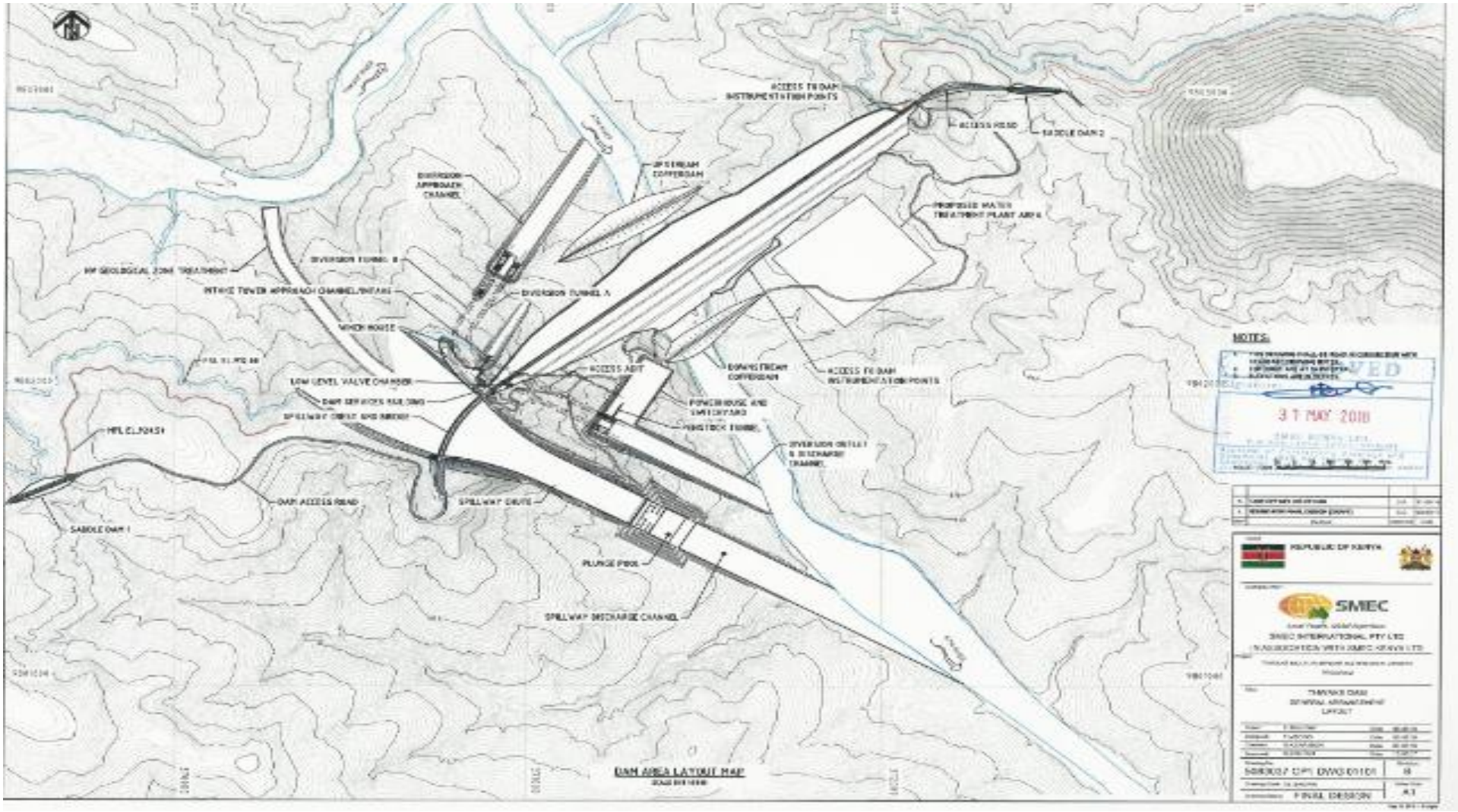

ACCESS TO DAM INSTRUMENTATION POINTS
ACCESS ROAD
SADDLE DAM 2
UPSTREAM COFFERDAM
DIVERSION APPROACH CHANNEL
PROPOSED WATER TREATMENT PLANT AREA
DIVERSION TUNNEL B
INTAKE TOWER APPROACH CHANNEL/INTAKE
DIVERSION TUNNEL A
INTAKE TOWER
ACCESS ADIT
DOWNSTREAM COFFERDAM
ACCESS TO DAM INSTRUMENTATION POINTS
LOW LEVEL VALVE CHAMBER
DAM SERVICES ROAD
POWERHOUSE AND TRANSFORMER
HEADRACE TUNNEL
DIVERSION OUTLET & DISCHARGE CHANNEL
DAM ACCESS ROAD
SPILLWAY CHUTE
SADDLE DAM 1
PLUNGE POOL
SPILLWAY DISCHARGE CHANNEL
NOTES:
APPROVED
31 MAY 2010
REPUBLIC OF KENYA
SMEC
SMEC INTERNATIONAL PTY LTD
IN ASSOCIATION WITH SMEC KENYA LTD
TARAVAZI DAM
GENERAL ARRANGEMENT
LAYOUT
FINAL DESIGN
A3
DAM AREA LAYOUT MAP

Figure 2.6: Revised Dam Layout

Plate 1: A View of Thwake Dam Spillway ongoing works /Picture/Courtesy/PIT

Plate 2. Side view of Dam Embankment area during settling /Picture/Courtesy/PIT

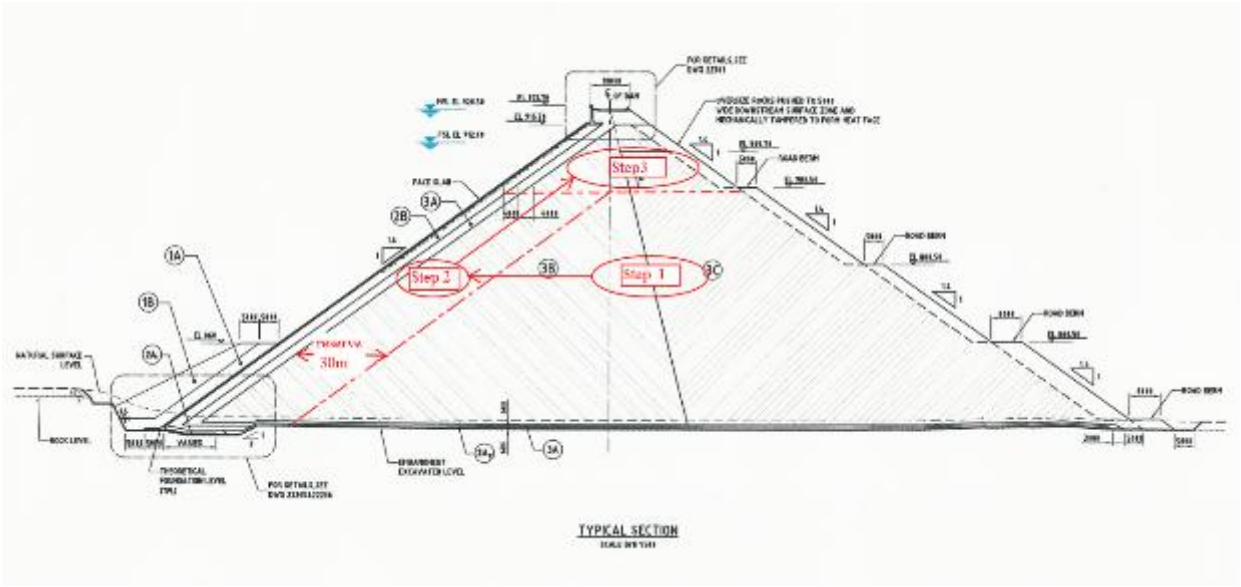


Figure 2.7: Revised Dam Cross Section with 920.5 Maximum Flood Level

2.4 New Design Parameters

The final parameters of the dam arising from the reviews and currently under construction is provided below:-

Reservoir

- Catchment area 10,272km^2
- Reservoir storage 688MCM
- Full supply level 912m above sea level
- Freeboard 8.5m
- Maximum flood level 920.5m above sea level

Dam Embankment

- Dam height 80.5m
- Type of embankment Rockfill dam with reinforced concrete face
- Crest length 1,500m
- Crest width 10m
- Upstream slope 1:1.4
- Downstream slope 1:1.4

Saddle dam – 2No.

- Crest length 250m for Makueni side and 200m for Kitui side

Ogee Spillway

- Probable Maximum Flood 11,480m^3/sec
- Location RHS, Makueni side

River Diversion

- No. of diversion tunnels 2
- Diameter of tunnels Tunnels of 12m diameter each

2.5 Activities covered in Additional Scope

The main activities of the additional scope of works include:

i. Site clearance and construction for the saddle dams
ii. Construction of increased embankment wall – drilling and grouting, blasting, excavation of rocks, loading and haulage of rocks from quarries to the embankment wall, casting of the concrete dam face slab.
iii. Construction of extended spillway - Blasting and excavation, casting and erection of concrete slabs along the spillway, construction and casting of weir, construction of bridge across the spillway.
iv. Construction employer's camp
v. Construction and tarmacking of entire length of approach road on both sides of Kitui and Makueni road - 2.6 Km.

2.6 Project Cost

The original cost estimate was as per the tender/contract signed with the Contractor in November 2017, totaling **KES 36,971,358,148**. The additional works requires additional materials and effort, and therefore, an increase in the agreed contract sum. Thus, an extra sum of **KES 4.2 billion** is necessary to effect the design changes.

CHAPTER THREE: PROJECT ALTERNATIVES

2.1 Introduction

This study analyzed various alternatives regarding project dam design and scope changes. The changes were motivated by detailed hydrological and geotechnical investigations. The hydrological studies revised and increased the PMF from 5,000m^3/s, determined at the feasibility stage, to 11,480m^3/s. The geotechnical investigations concluded that the geological formation for the emergency spillway was characterized by moderately weathered rock and that the excavated material could not supply sufficient quantities of rock materials for the dam embankment. The new changes led to the proposed design, such as the increment of dam height (relative to CAS design but still under 84.0m granted in the NEMA licnce), adopting a single dam spillway to discharge the 11,480m^3/s, hence widening the spillway width at the weir from 224m to 235m. The length of the spillway slab increased from 535m to 618m, and the entire spillway to the river increased from 885m to 1,500m. With the increased PMF and adoption of a single service spillway, the maximum flood level was raised by 2m (from 918.5 to 920.5 m above sea level).

For dam safety and maintenance of the structural integrity of the embankment, a height increase is triggered to ensure no floodwaters would overtop the embankment. Thus, the embankment height increased from 77.5m to 80.5m (relative to CAS design but still under 84.0m granted in the NEMA licence). For stability reasons, the dam's footprint was increased from 285m to 320m at the river bed section. Additionally, the length of the dam axis increased from 1495m to 1560m. The new maximum flood level of 920.5m above sea level necessitated the establishment of two saddle dams at the low points immediately after the dam axis on both ends, Kitui and Makueni sides. The proposed Saddle Dam 1 is 250m, and Saddle Dam 2 is 200m long. Further, widening the spillway width at the weir section has led to an increase in the spillway bridge, automatically affecting the approach road. The permanent access road for the project has increased from 8.6km to 11.2km. With the new design, the dam will now impound a 688million cubic meters of water due to increased storage capacity. This means an improved socio-economic status in communities in the Area of Influence due to increased water availability for domestic, irrigation, and hydropower uses. Various engineering design alternatives or options were investigated to incorporate the new hydrological and geotechnical findings into the ongoing dam works, and the best alternative was adopted.

2.2 'No-project 'Alternative

The ‘No-project Alternative’ means “no action,” no dam design changes will be implemented, and the original dam design based on feasibility figures will be retained. Though this alternative presents no increased environmental and social-economic impacts, it poses a risk of the dam overtopping with water due to the increased Probable Maximum Flood, 11,480m3/s, double the original PMF. In addition, the option will deny the proponent, contractors, and other workers some income and the government revenue from the tax obtained on materials and licenses related to the implementation of the new scope of work. Therefore, from an environmental and socioeconomic viewpoint, the “no-action” alternative is not preferable to new design and scope implementation because the status quo is retained.

2.3 Dam Height Variation Alternative

The project considered retaining the dam height at 77.5m instead of 80.5m (relative to CAS design but still under 84.0m granted in the NEMA licence), given that a given volume of water is required to run the water supply, hydropower, and irrigation. The contour line 912MASl represents this volume. This elevation was set as the outflow point (fixed). The tender design was based on an assumed PMF. Upon confirmation of PMF through the detailed hydrological studies, the only option for changes was upward to contain the flood within the spillway confinement. Retaining the height of 77.5m would have resulted in the risk of flood overtopping the embankment or even a much wider spillway, thus the proposed changed in height was adopted. The main environmental impact of this alternative leads to a larger inundation area, submerging more land including forests, agricultural areas, wildlife habitats, and potentially wetlands. Therefore, loss of terrestrial biodiversity, habitat fragmentation, and ecosystem disruption. The benefits of increasing the dam height outweighs the impacts, hence, the ESIA report has developed mitigation measures to minimize this impact.

2.4 One Spillway and Two Spillways Alternative

The additional scope of work includes the option of having one extended spillway or two spillways (one for emergency and the other normal spillway). By adjusting the main spillway, the designers found it more economical and much easier to maintain the dam with one spillway than two. Note also that the emergency spillway cost would be much higher than that of the saddle dams at the exact location (Concrete vs soil/rock fill).

The Environmental Impacts associated with the one spillway; the concentrated flow increases risk of localized erosion, sediment scouring, and habitat destruction downstream. In addition, it requires significant land clearance in a single location; may affect riparian vegetation and riverbanks more intensely. On the other hand, two spillways leads to distributed flow which reduces peak velocity and energy per spillway outlet. Also, the less localized erosion but may widen affected downstream areas. In the revised dam design, one spill way was chosen because the cost consideration and the available space. This report has developed the mitigation measures to reduce this impacts.

2.5 The Saddle Dams Alternative

Once the dam height was varied, and because the two adjacent valleys were low, the ground conditions necessitated the construction of the saddle dams. Saddle dams controls water at low-lying peripheral areas or saddles at the left and right hand sides of the dam axis. This alternative was necessary when the dam design to increase the height from 77m to 80.5 was chosen as opposed to retaining the lack of saddle dams which could encourage flooding. Their inclusion can expand the flooded zone further, affecting additional ecosystems that were not initially under threat. The expansion of inundated areas can fragment previously continuous habitats. This fragmentation reduces connectivity necessary for wildlife movement and gene flow, increasing the risk of local species decline or extinction. The additional barriers from saddle dams can modify natural water flow patterns. These changes may affect groundwater recharge and surface runoff, thereby influencing nearby wetlands and riparian areas. Building saddle dams often involves extensive earthmoving and excavation. This activity can disturb soil profiles, elevate erosion risks, and release sediments into nearby water bodies during construction. Having considered these impacts *vis a vis* the introduction of the saddle dams, the option of saddle dams was chosen because the increase in dam height will not have been achieved without the saddle dams. This report has proposed the mitigation measures to minimize these impacts.

2.6 Alternatives for Technology, and Energy Sources

For the Thwake dam, the CFRD option was economically the best. As considered in the feasibility design, both zoned rock-fill and earth-fill would result in a considerable volume and a long construction period. The 2013 ESIA was prepared for an earthfill dam with clay core. However, the dam under construction is a reinforced concrete face rockfill dam. The earthfill dam required gentle slopes implying that footprint of the dam was quite wide. Wide footprint necessitates huge volumes of earthworks hence costly water infrastructure. Slopes for rockfill dam are steeper that the earthfill meaning that footprint is less in terms of width hence less costly.

The source of material for the earthfill dam as stated in the scope of work was Mikisi area located about 6km from the dam. Material for the rockfill dam is wholly obtained from the reservoir area, about 2km from the dam embankment.

Other reasons that favoured the rockfill concrete face dam include:

- Rock materials for zone 3C is obtained from the spillway and the tunnel excavations.
- The quarry area located 2km from the embankment is the main source of ballast for the dam in addition to material for Zone 3A and 3B.

- Less interruptions with the movement of the community considering that sand, ballast/ aggregates is obtained within the dam reservoir.

The project is design in a manner that during it operational phase, the project will be self-sustainable in terms of energy source. The project once completed will generate 20MW to energize the systems. The system is a gravity-hydropower system.

The dam is also designed with to be operated using a SCADA system maximizing on the dam instrumentation done. Main instrumentation houses have been constructed at the dam berms (Level 1, 3 and 3).

In summary, in terms of scope, the dam height has reduced from 84m (NEMA licenced height) to 80.5m and maintaining the full supply level of 912m above sea level. The effective crest length has reduced from 1,230m to 450m and the number of spillway has remained to be 1No. The source of construction material has changed from 6km away from the dam to within the reservoir, a positive change in terms of community impacts.

The main substantial change is the type of dam; earthfill dam with clay core to rockfill dam with reinforced concrete face.

In terms of energy sources, assuming the pumping water to the Konza City and dam environs, the dam hydropower component was designed to provide energy cheaply. The project can ultimately run without depending much on an external energy source.

2.7 The "Yes Alternative"

The "Yes Alternative" means implementing the new design changes for increased water storage capacity for multiple water uses, thus enhancing the socio-economic status of the local communities. In addition, there will be improved food security and diversified livelihoods. This option will also ensure the dam's safety & stability are maintained. The proponent will implement the Environmental and Social Management Plan (ESMP) to avoid, minimize, or mitigate the negative impacts of implementing the new dam design and scope changes.

CHAPTER THREE: POLICY, LEGISLATION AND INSTITUTIONAL FRAMEWORK

3.1 General Overview

Implementing the Environmental and Social Impact Assessment is guided by existing legislative, policy, and administrative frameworks that guide the process. According to the EMCA, the law guiding environmental management in Kenya, it is mandatory that projects of such magnitude must undergo ESIA before implementation. Additionally, it outlines relevant international conventions, treaties, and protocols ratified by the country, as well as the African Development Bank's (AfDB) Operational Safeguards policies and standards. The subsequent sections provide a review of the applicable provisions.

3.2 LEGISLATIVE FRAMEWORK

3.2.1 The Constitution of Kenya

The constitution of Kenya is the country's supreme legal document. It provides legal guidance on all the fundamental aspects of the nation. The preamble to the Constitution states that 'the people of Kenya are respectful of the environment, which is Kenya's heritage, and are determined to sustain it for the benefit of future generations.' Several provisions of the Constitution reflect this elevation of broad environmental principles. Article 10 entrenches the principle of sustainability as one of the national values and principles of governance. In contrast, Article 42 guarantees the right to a clean and healthy environment, including the right to protect the environment for the benefit of present and future generations.

Chapter five of the new constitution covers "Land and Environment" and includes articles 69 and 70. Article 69 states that;

The State shall:

i. Ensure sustainable exploitation, utilization, management, and conservation of the environmental and natural resources, and ensure the equitable sharing of the accruing benefits
ii. Work to achieve and maintain a tree cover of at least ten percent of the land area of Kenya
iii. Protect and enhance intellectual property in, and indigenous knowledge of, biodiversity and the genetic resources of the communities.
iv. Encourage public participation in environmental management, protection, and conservation; e) protect genetic resources and biological diversity.
v. Establish systems of environmental impact assessment, environmental audit, and monitoring of the environment.
vi. Eliminate processes and activities that are likely to endanger the environment; and
vii. Utilize the environment and natural resources for the benefit of the people of Kenya.

Relevance to the project

The proponent project will ensure that the rights of the host community are observed in observing the right to a clean and healthy environment. This ESIA is prepared to mitigate possible impacts.

3.2.2 Environmental Management and Coordination Act, 1999 (Amendment 2015 and 2019)

The Government enacted the Environmental Management and Coordination Act (EMCA) in 1999 to provide a legal and institutional framework for environmental management in the country. The Act was amended in 2015 to align with the New Constitution (2010). Thereafter, it was amended in 2019 to update the Second Schedule list of projects that require EIA study.

The following are key elements of the EMCA law:

i. It stipulates at the outset that "Every person in Kenya is entitled to a clean and healthy environment and must safeguard and enhance the environment" and that anyone has the right to take a person breaching this law to court

ii. It defines illegal activities within several areas, including waste management and pollution and degradation of rivers, lakes, wetlands, coastal zones, agricultural areas, forests, and biodiversity, and it sets down the principles for Environmental Impact Assessment (EIA.

Section 58 of the Act directs that any project specified under the Second Schedule of the Act should be subjected to an EIA study and a report submitted to NEMA to process an EIA license. The 2019 Amendment of the Act (Legal Notice No.31) provides an updated list of projects that require EIA. It assigns projects to three categories, depending on the seriousness of their likely effects: low-risk, medium-risk, and high-risk projects. This project is categorized as a high-risk project.

Relevance to the project

The preparation of this ESIA complies with Legal Notice 31 and 32 of 2019, which require all high-risk projects to prepare an ESIA using data and relevant information.

3.2.2.1 Environmental (Impact Assessment and Audit) Regulations, 2003

These regulations are under section 147 of the EMCA, 1999 (Amendment 2019) and provide the general guidelines for undertaking EIA, Environmental Auditing (EA), and monitoring in Kenya. Regulation 3 provides that the EIA/EA Regulations should apply to all policies, plans, programs, projects, and activities specified in Part IV, Part V, and the Second Schedule of the EMCA, 1999 (Amendment 2019). Regulation 4(1) states that no proponent should implement a project likely to have a negative environmental impact or for which an EIA is required under the Act or these Regulations unless an EIA has been concluded and approved under these Regulations.

Regulations 11 and 12 state that EIA should be conducted under Terms of Reference (ToR) developed during the scoping exercise by the proponent and approved by NEMA. The assessment should be performed per the general EIA and sector EIA guidelines in the Third Schedule to these Regulations.

According to Regulation 17 (1), the proponent shall, in consultation with the Authority, seek the views of persons affected by the project. In seeking the opinions of the public, after the approval of the project report by the Authority, Regulation 17(2) directs the proponent to:
Publicize the project and its anticipated effects and benefits by:

i. Posting posters in strategic public places in the vicinity of the site of the project informing the affected parties and communities of the project
ii. Publishing a notice on the project for two successive weeks in a newspaper that has a nationwide circulation and
iii. Making an announcement of the notice in both official and local languages on a radio with nationwide coverage at least once a week for two consecutive weeks
iv. Hold at least three public meetings with the affected parties and communities to explain the project and its effects and receive their comments.
v. Ensure that appropriate notices are sent out at least one week before the meetings and that the venue and times of the meetings are convenient for the affected communities and the other concerned parties and

vi. In consultation with the Authority, ensure that a suitably qualified coordinator is appointed to receive and record both oral and written comments and any translations thereof received during all public meetings for onward transmission to the Authority.

Relevance to the project

The proponent has prepared this ESIA report in compliance with the stipulations of EMCA, 1999 (amendment 2015, 2019)) including undertaking public participation as outlined in Chapter 6, and will conduct an Environmental audit every 12 months during the project execution.

3.2.2.2 Environmental Management and Co-ordination (Waste Management) Regulations, 2006

These Regulations guide the appropriate waste-handling procedures and practices. It is anticipated that the project will generate a large quantity of solid waste during construction, and this will need to be managed through reduction, reuse, recycling, or appropriate disposal. It is therefore anticipated that the amount of materials to be discarded as waste during the project implementation will be minimal.

Regarding waste reduction, it is recommended that the proponent put measures in place to ensure that construction materials requirements are carefully budgeted to ensure minimal construction materials are left on site after construction. It is further recommended that the proponent consider using recycled or refurbished construction materials, including those excavated near the dam site. Purchasing and using once-used or recovered construction materials will lead to financial savings and a reduction of the amount of construction debris disposed of as waste.

In addition to the recommendations mentioned above and to comply with the requirements of these regulations, the proponent should undertake the following:

i. NOT allow disposal of any wastes on the highway, street, road, recreational area, and public places;
ii. Encourage segregation of wastes and grouping them according to their similarity, for example, plastics, toxics, organics, etc;
iii. Ensure the local authority approves all wastes deposited in designated dumping sites;
iv. Ensure NEMA licenses all waste handlers engaged by the proponent and possess all relevant waste handling equipment and documentation, such as waste transport license, tracking documents, license to operate a waste yard, insurance cover, and vehicle inspection documents, amongst others;
v. Implement cleaner production principles of waste management, namely reduce, reuse and recycle;
vi. Label all hazardous wastes as specified in Section 24 (1-3) of the regulation.

The fourth schedule lists hazardous wastes, including solvents, emulsifiers/emulsions, waste oil/water, and hydrocarbon/water mixtures. The dam project involves inputs likely to generate the wastes above; thus, these must be handled as required by the regulations.

Relevance to the project

Products– Products and Waste

The project's construction will generate inert, non-hazardous, and hazardous waste over the construction period. Dam operation will result in relatively small volumes of routine waste generation, particularly from the Employer’s houses. Maintenance and repair activities during the project's operational lifetime may generate limited waste volume.

How the Project will comply:

Project Waste Management Strategy

The existing Project Waste Management Plan (PWMP) will be reviewed and updated to ensure all wastes are corrected. The PWMP will: -

i. Propose a minimization, collection, storage, treatment, re-use, and disposal route for each waste stream.
ii. Identify potential third-party re-users.
iii. Propose the location of waste storage and the duties of site personnel regarding waste management.
iv. Identify and describe possible locations of disposal sites or long-term storage sites.
v. State the methods for adequately managing (i.e., training, storing, containerizing, labeling, transporting, disposing) wastes.

Project Waste Management Principles

Standards

The waste management standards for dam construction, operation, and decommissioning should be based on the legal notice 121: Waste Management Regulations 2006. If these regulations do not cover certain aspects of the project, then the Contractor and county governments shall comply with international rules on environmentally sound waste management.

Duty of Care

The principles of 'duty of care' (i.e., the responsibility of a generator or owner of waste to ensure that it is handled, transported, and disposed of appropriately) for garbage and waste ownership by the waste generator will be adopted by the project throughout the construction, commissioning, and operation of the project. During construction and commissioning, the contractor will be responsible for duty of care, whereas during operations, the contractor will be the duty holder.

Waste Inventories and Classification

Waste inventories will be created to quantify and characterize waste streams at each project stage. Separate inventories will be developed for construction wastes and commissioning / operational wastes.

Table 3.1: Layout of the Thwake Multipurpose Dam

No.	Waste Type	Waste Standard & Description
1.	Inert	Waste as defined by EMCA Act - Waste Management Regulations.
2.	Hazardous Waste	Waste is classified as hazardous according to the EMCA Act - Waste Management Regulations.
3.	Non-hazardous Waste	Waste that is neither inert nor hazardous nor wastewater. It includes 'municipal waste' defined by the EMCA Act - Waste Management Regulations.
4.	Wastewater	Fresh water that is contaminated as a result of project activity.

Further sub-divisions of these classifications may be developed and adopted based on each waste material's treatment requirements (e.g., incineration) and ultimate disposal point (e.g., reuse, recycling, and landfill).

The principal waste disposal options for each waste stream will be as indicated in the table below:

Table 3.2: Waste Disposal Options According to Type

No.	Waste Stream	Principal Disposal Option
1.	Inert Waste	Transfer to a third party for recycling or reuse Processed and used for construction and reinstatement purposes Disposal to a recognized disposal site.
2.	Non-Hazardous Waste	Transfer to a third party for recycling or reuse. A special case of this is to spread it on land for agricultural purposes or disposal to a recognized disposal site.
3.	Hazardous Waste	Transfer to a licensed third party for disposal Disposal as prescribed in the EMCA Waste Management Regulations of 2006.

The volumes of waste requiring ultimate disposal will be minimized by controlling waste generation and incineration. Inert and non-hazardous wastes that cannot be reused or recycled may be incinerated in an incinerator designed and operated per Kenya's regulations on County Incinerators.

Hierarchy of Waste Management Practices

Each waste stream will be managed according to the following hierarchy of techniques, in which the method chosen should be the first in the hierarchy that is safe and practicable: -

i. Eliminate or minimize the waste stream by choosing a procedure or technology.
ii. Re-use as a material
iii. Re-use as a fuel
iv. Process and re-use as a material
v. Process and re-use as a fuel
vi. Incinerator or re-use or landfill the ash.
vii. Designated disposal site (Landfill)
viii. Landscape- Landfill with appropriate vegetation planted
ix. Discharge to a receiving water course (applicable only to wastewater)

Transfer of Waste to Third Parties

Potential third parties are expected to receive the waste generated during dam construction. These third parties will include commercial waste disposal contractors and entities (corporate or individual) that can reuse or recycle individual waste materials.

Generally, transfer to third parties for ultimate disposal will only be permitted if the part of their operation used for the project waste is licensed. However, items such as timber wastes and other reusable project wastes may be disposed of by the local population based on a case-by-case review by the contractor.

3.2.2.3 Environmental Management and Co-ordination (Water Quality) Regulations, 2006

The Regulations provide proper water management for domestic, industrial, recreational, and irrigation purposes. It further enumerates the guidelines for the prevention of water pollution. Section 4(2), 6, and Section 24 of the regulation prohibit pollution of water bodies and require that all substances discharged into the water bodies meet the standards set under the Third Schedule of the regulation. Further, the

proponent will be required to observe the requirements of these Regulations that prohibit anyone from undertaking development within a minimum of 6m from the highest-ever recorded flood level.

Relevance to the project

Therefore, the proponent will provide a proper wastewater management plan/measures during construction to prevent water pollution within the project area.

3.2.2.4 Environmental Management and Co-Ordination (Noise and Excessive Vibration Pollution) Regulations, 2009

These Regulations provide guidelines for acceptable noise and vibration levels for different environments during the construction and operation phase. Section 5 of the regulation warns against operating beyond the permissible noise levels, while Section 6 gives guidelines on the control measures for managing excessive noise. In this context, the project team should observe the noise regimes for the different zones, especially for working in silent zones, including institutions and worship places. These areas are permitted exposure to Sound Level Limits of not exceeding 40 dB (A) during the day and 35 dB (A) at night.

The Second Regulations Schedule provides the maximum permissible noise level at construction sites.

Table 3.3: Maximum Permissible Noise Levels for Construction Sites (measured within the facility)

Facility		**Maximum Noise Level Permitted (*Leq) in dB(A)**	
		Day 6.01 am - 6.00 pm (Leq 14h)	Night 6.01 pm - 6.00 am (Leq 14h)
1	Health Facilities, educational facilities, homes for people with disabilities, etc.	60	35
2	Residential	60	35
3	Areas other than those listed in (1) and (2)	75	65

Source: NEMA

***Leq: equivalent continuous sound level**

The regulation states that a day starts from 6.01 a.m. to 8.00 p.m., while night starts from 8.01 p.m. to 6.00 a.m. Construction sites near the silent zones are allowed a maximum noise level of 60 dB (A) during the day, whilst night levels are maintained at 35 dB (A). The time frame for construction sites is adjusted, and the day is considered to start at 6.01 a.m. and end at 6.00 p.m., while the night duration begins at 6.01 p.m. and ends at 6.00 a.m.

Part III of the regulation gives action management guidelines. Sections 11, 12, and 13 of the stated part give noise and vibration management guidelines for machines, motor vehicles, and night-time construction, respectively.

Section 15 requires owners of activities likely to generate excessive noise to conduct an ESIA.

The Contractor will undertake the necessary engineering and administrative control measures to ensure noise and vibration levels are within the limits specified under the Regulations.

National Noise Emission Guidelines

In undertaking the construction activities described above, the Contractor will comply with the following national regulatory air quality standards and WBG noise level guidelines, whichever is stringent. The Supervision Consultant will regularly monitor compliance, and corrective/ mitigation measures will be applied where necessary.

Table 3.4: National Noise Guidelines

Zone	**Maximum Noise level limits dB (A)**		**Time Frame**
	Day	**Night**	
Places of worship	30	25	Day time: 6.01a.m – 8. 00p.m Night time: 8.01p.m – 6. 00p.m
Residential: 1. Indoors 2. Outdoors	35 40	25 25	
Mixed Residential (inclusive of Entertainment and commercial places)	55	45	
Commercial	70	70	
Silent arena	30	25	

Source-NEMA

Table 3.5: Noise levels from a factory or a workshop (Continuous or Intermittent Noise

dB(A)	**Daily**	**Weekly**
85	8 hours	40 hours
88	4 hours	20 hours
91	2 hours	10 hours
94	1 minute	5 hours
97	30 minutes	2.5 hours
100	15 minutes	1.25 hours
103	7.5	37.5 minutes
106	3.75	18.75 minutes
109	1.875 minutes	9.375 minutes

Source-NEMA

N/B: Noise levels should not exceed a level of

- **i.** Factory/Workshops 85 dB (A)
- **ii.** Offices 50 dB (A)
- **iii.** Factory/Workshop Compound 75 dB (A)

Table 3.5: Maximum Permissible Noise Level for Impact or Impulsive Noise

Sound Level dB(A) Max	**Permitted impulses per day**
140	100
130	1,000
120	10,000

Source-NEMA

Vibration level analysis carried out in 2022 at one preselected nearby receptor point of the dam project for characterization of the impact of blasting activities. The vibration measured result was below the Kenyan regulatory stipulated limits as in the Environmental Management and Coordination (Noise and Excessive Vibrations) Regulations, 2009 as shown here below.

Table 3.6: Vibration Level Analysis (ESA, 2022).

Measurement Location	Frequency (HZ)	Obtained Results (cm/s)	Maximum Allowed Limits (cm/s)
Receptor Point	43	**0.09**	0.5

Relevance to the project

The proponent carries noise and vibration survey guided by the Act. The Contractor will undertake the necessary engineering and administrative control measures, e.g., noise and vibration level surveys, to ensure noise and vibration levels are within the limits specified under the Regulations. The project is anticipated to generate excessive noise and/or vibration from excavation, drilling, blasting, and demolition of structures. The prescribed time limits must, therefore, be observed. The Supervision Consultant will regularly monitor compliance, and corrective/ mitigation measures will be applied where necessary.

3.2.2.5 Environmental Management and Coordination (Conservation of Biological Diversity and Resources, Access to Genetic Resources and Benefit Sharing) Regulations, 2006

The Regulations require proponents to conduct ESIA if their activities may adversely impact ecosystems, lead to unsustainable use of natural resources, or/and introduce exotic species. The regulation aims to increase the coverage of protected areas and establish new unique status sites by providing guidelines for protecting endangered species. Section 5 of the regulation provides guidelines on conserving threatened species, and Part III guides access to genetic materials.

The Section states that the Authority shall, in consultation with the relevant lead agencies, impose bans, restrictions, or similar measures on the access and use of any threatened species to ensure its regeneration and maximum sustainable yield.

Relevance to the project

Landscaping programs will involve certified plant species to prevent them from affecting the project area negatively in terms of invading wetlands, vegetation, and even farmlands.

3.2.2.6 Environmental Management and Coordination (Air Quality) Regulations, 2014 (Revised 2016)

These Regulations provide for the prevention, control, and abatement of air pollution to ensure clean and healthy ambient air. The regulations establish emission standards for various sources, such as mobile sources (e.g., motor vehicles) and stationary sources (e.g., industries), and develop the procedures for issuing emissions licenses, measurement of emissions, inspection and monitoring programs, and reporting requirements.

The project will apply the following guidelines:

i) National Air Quality Emission Standards

In undertaking the construction activities described above, the Contractor will comply with the following national regulatory air quality standards and World Bank Group/ World Health Organization (WBG/WHO) Air Emission and Ambient Air Quality guidelines, whichever is stringent. The Supervision Consultant will do regular monitoring to determine compliance and corrective/ mitigation measures will be applied where necessary.

Table 3.7: Ambient Air Quality Tolerance Limits

Pollutant	**Time Weighted Average**			
		Industrial Area	**Residential, Rural & Other Area**	**Controlled Areas**
Sulfur oxides (SOX);	Annual Average	80 ug/m^3	60 ug/m^3	15 ug/m^3
	24 hours	125 ug/m^3	80 ug/m^3	30 ug/m^3
	Annual Average		0.019 ppm/50ug/m^3	
	Month Average			
	24 Hours		0.048ppm /125ug/m^3	
	Instant Peak		500 ug/m^3	
	Instant Peak (10 min)		0.191 ppm	
Oxides of Nitrogen (NOX);	Annual Average	80 ug/m^3	60 ug/m^3	15 ug/m^3
	24 hours	150 ug/m^3	80 ug/m^3	30 ug/m^3
	Annual Average		0.2 ppm	
	Month Average		0.3 ppm	
	24 Hours		0.4 ppm	
	One Hour		0.8 ppm	
	Instant Peak		1.4 ppm	
Nitrogen Dioxide	Annual Average	150 ug/m^3	0.05 ppm	
	Month Average		0.08 ppm	
	24 Hours	100 ug/m^3	0.1 ppm	
	One Hour		0.2 ppm	
	Instant Peak		0.5 ppm	
Suspended Particulate Matter	Annual Average	360 ug/m^3	140 ug/m^3	70 ug/m^3
	24 hours	500 ug/m^3	200 ug/m^3	100 ug/m^3
	Annual Average		100 ug/m^3	
	24 hours		180 ug/m^3	
Respirable Particulate Matter (<10□m) (RPM)	Annual Average	70 ug/m^3	50 ug/m^3	50 ug/m^3
	24 hours	150 ug/Nm^3	100 ug/Nm^3	75 ug/Nm^3
PM2.5	Annual Average	35 ug/m^3		
	24 hours	75 ug/m^3		
Lead (Pb)	Annual Average	1.0 ug/Nm^3	0.75 ug/Nm^3	0.50 ug/m^3
	24 hours	1.5 ug/m^3	1.00 ug/m^3	0.75 ug/m^3
	Month Average		2.5	
	8 hours	5.0 mg/m^3	2.0 mg/m^3	1.0 mg/m^3

Pollutant	Time Weighted Average			
		Industrial Area	Residential, Rural & Other Area	Controlled Areas
Carbon monoxide (CO)/ carbon dioxide (CO_2)	1 hour	10.0 mg/m^3	4.0 mg/m^3	2.0 mg/m^3
Hydrogen sulphide	24 hours	150ug/m^3		
	instant Peak	700ppb		
Total VOC	24 hours	600 ug/m^3		
Ozone	1-Hour	200 ug/m^3	0.12 ppm	
	8 hour (instant Peak)	120 ug/m^3	1.25 ppm	

Source-NEMA

Table 3.8: National Air Quality Standards for General Pollutants

Pollutant	Time Weighted Average	Property Boundary
Particulate matter (PM)	Annual Average	50 ug/m^3
	24 hours	70 ug/m^3
Oxides of Nitrogen (NOX);	Annual Average	80 ug/m^3
	24 hours	150 ug/m^3
Sulfur oxides (SOX);	Annual Average	50 ug/m^3
	24 hours	125 ug/m^3
Hydrogen Sulphide	24 hours	50 ug/m3
Lead (Pb)	Annual/24 hours	0.5 – 2.0ug/m^3
Ammonia	24 hours	100 ug/m^3

Source-NEMA.

Relevance

The proponent carries periodic air quality surveys guided by the regulations. According to Ambient Air Quality carried out in 2022, the results analysis for TSP, PM10 and PM2.5 are presented in the table below; all sampled points recorded concentration within the Environmental Management and Co-ordination (Air Quality) Regulations, 2014 except for TPS and PM10 at the Crusher plant which recorded high levels of concentration compared to the Environmental Management and Co-ordination (Air Quality) Regulations, 2014. The result was greatly influenced by dust from crushing plants.

Table 3.9: Particulate Matter Result Analysis. Source ESA, 2020.

Description	Time	Units	Parameters		
			TSP	PM10	PM2.5
MP 1: Office Site	24 hours	µg/m^3	92.5	59.95	10.89
MP 2: Power House	24 hours	µg/m^3	296.34	136.12	22.05
MP 3: Crusher Plant	24 hours	µg/m^3	**806.2**	**338.35**	49.79
EMC (Air Quality Regulations, 2014	**24 hr**	**µg/m^3**	**500**	**150**	**75**

3.2.3 National Land Commission Act

The Act establishes the National Land Commission (NLC) and outlines its functions, powers, and responsibilities related to land management and administration. It is the primary legal framework for the NLC, providing for the management of public land, land policy recommendations, and addressing land injustices. The objectives and functions of the National Land Commission, as elaborated in the Act, include the management and administration of land by the principles of land policy set out in Article 60 of the Constitution and the national land policy.

Relevance

Land acquisition processes for the project have been carried out in compliance with the provisions of this Act. The commission is working on the final demarcation of land and issuance of title deeds to PAPs whose land was partially acquired.

3.2.4 The Energy Act 2019

Section 75 (1) states that the Minister shall promote the development and use of renewable energy technologies, including but not limited to biomass, biodiesel, solar, wind, and hydropower. These regulations apply to the owner(s) or occupier(s) of industrial, commercial, and institutional facilities using any form of energy. The rules mandate the owner or occupier to develop an energy management policy for the facility. It is the mandate of the occupier of a facility to cause an energy audit to be carried out by a licensed energy auditor at least once every three years. The regulations require the occupier to ensure that within six months from the end of the financial year in which an energy audit is undertaken, an energy investment plan highlighting the energy conservation measures to be implemented is prepared and submitted to the Commission. The energy investment plan will be reviewed every three years to document the measures that have achieved the recommended energy savings.

Relevance

The proponent has an energy management policy with stipulated efficient use and conservation strategies. Alternative energy sources, such as solar energy, are used at campsites. The project has energy use, management, and savings measures in place. Energy savings information is displayed at strategic locations at the site.

3.2.5 The Standards Act Cap

The Standards Act promotes the standardization of commodities and codes of practice, establishes the Kenya Bureau of Standards (KEBS), and defines its functions, management, and control. The Act

provides a mandatory product certification scheme for locally manufactured products, where goods must meet quality requirements specified in Kenya/Approved Standards to acquire the mark.

Relevance

Only project material inputs that meet the set Kenya Bureau Standards will be used.

3.2.6 Penal Code Act (Cap.63)

Chapter XVII on "Nuisances and offences against health and convenience" contained in the Penal Code strictly prohibits the release of foul air into the environment, which affects the health of the persons. It states, "Any person who voluntarily vitiates the atmosphere in any place to make it noxious to the health of persons in general dwelling or carrying on business in the neighborhood or passing along a public way is guilty of a misdemeanour."

Relevance -The project ensures strict adherence to the Environmental Management Plan throughout the project cycle to mitigate against any possible negative impacts of dust, noise, and effluent discharge.

3.2.7 National Museums and Heritage Act, No. 6 of 2006

This Act establishes the National Museums of Kenya as a body corporate and protects national natural and cultural heritage (as defined). The National Museums of Kenya shall, among other things, identify, protect, conserve, and transmit Kenya's cultural and natural heritage. Section 30 highlights the Notification of discovery and states that "Where a person discovers a monument or object of archaeological or paleontological interest, the person shall, within seven days, give notice thereof, indicating the precise site and circumstances of the discovery, to the National Museums, and in the case of an object, shall deliver the object to the National Museums to keep it for any particular purpose or any particular period." Section 31 gives restriction on moving objects and states that "Subject to section 27, no person shall move a monument or object of archaeological or paleontological interest from the place where it has been discovered otherwise than in such manner and to such place as may be allowed by an exploration license, or by written permit from the Minister after consultation with the National Museums".

Relevance

The standard guides the project implementation; therefore, any discovery made will be reported accordingly, and the chance find procedures applied.

3.2.8 Alcoholic Drinks Control Act, 2010

The Alcoholic Drinks Control Act of 2010 provides for comprehensive control of the manufacture, sale, consumption, distribution, and promotion of alcoholic drinks in Kenya. The Act, in addition, contains measures to deal with product safety, control of access and exposure to alcoholic beverages by persons under the age of 18 years, drinking patterns, and control of intoxication.

Relevance

The project has a drug and substance abuse restriction plan during working hours, and capacity building and toolbox training is continuously done. Workers are trained on drugs and substance abuse at work.

3.2.9 County Government Act, 2012

The new constitution grants county governments the power to grant or renew business licenses or refuse the same. To ensure the implementation of the new constitution's provisions, the county governments are empowered to make by-laws concerning all such matters that are necessary or desirable for the maintenance of the health, safety, and well-being of the general public.

The County Government Act mandates that county governments carry out spatial planning within their counties. Section 110 provides that a spatial plan for the county should contain a strategic assessment of the environmental impact of the spatial development framework.

Relevance to the project

The Act gives the County Government officers the right to access private property at all times, and for inspection purposes, the proponent shall comply with the requirements. The county government is a mandate.

3.2.10 Climate Change Act, 2016

The Climate Change Act 2016 aims to provide a regulatory framework for an enhanced response to climate change and mechanisms and measures to improve resilience to climate change and promote low-carbon development. The Climate Change Act adopts a mainstreaming approach, provides a legal basis for climate change activities through the National Climate Change Action Plan, and establishes the National Climate Change Council and the Climate Fund.

Relevance to the project

The contractor shall reference the Act's provisions to mainstream climate change adaptation measures into the project to ensure reduced carbon emissions.

3.2.11 The Occupational Safety and Health Act, 2007

This Act applies to all workplaces and their associated workers, whether temporary or permanent. The main aim of the Act is to safeguard the safety, health, and welfare of workers and non-workers. It was signed into law in October 2007 to repeal and replace the Factories and Other Places of Work Act Cap 514. It came into force on December 20, 2007.

The Act makes provisions for the safety and health of workers in all workplaces in Kenya. All rules made under the previous Act remain in force under the new Act. The Act requires developers to notify the Director of Occupational Health and Safety of their intended development before commencement. The act also sets minimum standards for such workplaces to safeguard workers' health, safety, and welfare. These are all aimed at eliminating workplace hazards. The act further requires all workplaces to display the abstract of the act so that all workers can read it and remind themselves how to protect themselves from risks.

The Act also makes it mandatory for occupiers or employers to provide personal protective equipment and all practicable means to prevent injury to the health of workers who are exposed to any potentially harmful substances or conditions. Section 9(1) demands that every occupier establish a safety and health committee at the workplace under regulations prescribed by the Minister if twenty or more persons are employed.

The Act further requires all workplaces to have stocked first aid boxes under the charge of trained first aid attendants. The Factories (Building Operations and Works of Engineering Construction) Rules of 1984 are more specific on standards and requirements for the construction works. The said Act requires that before any premises are occupied or used, a certificate of registration be obtained from the chief inspector. The occupier must keep a general register with provisions for workers' health, safety, and welfare on-site. For safety, fencing of the premises and dangerous areas must be done. There should be provision for clean and sanitary working conditions.

Moreover, portable drinking water must also be provided. The act requires the Contractor to keep a general register at the workplace to record accidents or occupational diseases. Despite being repealed, the Factories and Other Places of Work Act (Cap 514) regulations are still operational under the Occupational Safety and Health Act, 2007, and shall apply, where appropriate. The laws relevant to the project shall also be enforced fully.

Relevance to the project

All sections of the Act will be observed, especially the provision of protective clothing, fire safety, clean water, use of explosives, and insurance coverage for staff to protect all involved from work-related injuries or other health hazards.

3.2.12 HIV AND AIDS Prevention and Control Act. 2006

This Act prohibits various forms of sexual violence offenses committed against men and women. These include sexual assault, indecent acts, sexual harassment, child pornography, child prostitution, exploitation of prostitution, and deliberate transmission of HIV and AIDS, among others. It provides that no person shall be denied access to employment for which he is qualified, transferred, denied promotion, or have his employment terminated on the grounds of his HIV status. Section 3 of The Act highlights that the purpose of the legislation includes public awareness and rights for people living with HIV/AIDS. Public awareness shall be achieved through education, public campaigns, and workplaces.

Relevance to the project

The Contractor shall comply with the law by implementing regular HIV and AIDS sensitization programs at the workplace. No person is discriminated against in matters of employment due to his HIV status.

3.2.13 The Employment Act, 2007

An Act of Parliament to repeal the Employment Act, declare and define the fundamental rights of employees, provide basic conditions of employment of employees, regulate employment of children, and provide for matters connected with the foregoing.

Relevance to the project

TMWDP will ensure that the appointed contractor(s) comply with the Act. The project proponent is expected to comply with the provisions of this Act as they relate to terms of employment and working hours. Equal opportunity is given to all communities around the project area to improve the local community's socio-economic status. No person under 18 years shall be employed throughout the project construction period.

3.2.14 The Work Injury Benefits Act, 2007

This Act of Parliament compensates employees for work-related injuries and diseases contracted during employment and for connected purposes. The Act includes the provision of compulsory insurance for employees. The Act also defines an employee as any worker on contract of service with an employer.

Relevance to the project

The contractor will ensure that all workers contracted during the project implementation phase have insurance coverage to compensate them in case of injuries at work. Employee compensation will comply with the provisions of the Act.

3.2.15 Public Health Act Cap 232

Part IX Section 115 of the Act states that no person or institution shall cause nuisance or conditions liable to be injurious or dangerous to human health. Any noxious matter or wastewater flowing or discharged into a watercourse is deemed a nuisance. Section 116 requires local authorities to take all lawful, necessary, and reasonably practicable measures to maintain their jurisdiction, keeping it clean and sanitary to prevent the occurrence of nuisance or conditions liable to cause injuries or just being dangerous to human health.

Part XII Section 136 states that all collections of water, sewage, rubbish, refuse, and other substances that permit or facilitate the breeding or multiplication of pests shall be deemed a nuisance. The Act

addresses sanitation, hygiene, and general environmental health and safety related to water projects and associated activities.

Part XII Section 136 is complemented by the Malaria Prevention Act (Cap246), which provides measures to curb the breeding of mosquitoes at development sites. Measures proposed in the Act to control the breeding of the vector include maintenance of free drainage channels, removal of stagnant water from any land to prevent larvae breeding, and removal of wastes and broken bottles, amongst others.

Relevance to the project

The project is implementing measures to safeguard the health of the workers and the public during project implementation, e.g., health issues are integrated into the project to ensure that occupational and public health issues are adequately addressed.

3.2.16 Sexual Offences Act No. 3 of 2006

This is an Act of Parliament that provides for sexual offenses, their definition, prevention, and the protection of all persons from harm from unlawful sexual acts, and for connected purposes. The Act on Section 23 states that anyone in a position of authority or holding a public office who persistently makes any sexual advances or requests which are unwelcome is guilty of the offence of sexual harassment and shall be liable to imprisonment for a term of not less than three years or to a fine of not less than one hundred thousand shillings or both.

This Act gives the public and project employees the right to report indecent behavior to a court of law. It protects children and young girls from defilement and other adult persons from harassment and discrimination. The Act prohibits a wide range of sexual offenses, including rape of all kinds, indecent acts, incest, pornography, child trafficking, etc.

Relevance to the project

To comply, the contractor will not discriminate based on sex during the hiring of workers and has created awareness of sexual harassment among the workers, including the available reporting mechanisms.

3.2.17 Water Act 2016 and the Subsidiary Water Resources Regulations, 2021

These Regulations implement provisions of the Water Act, no. 43 of 2016. They shall apply to the regulation, management, use, and development of the territorial sea's perennial or seasonal water resources. The issues covered by these Regulations include the prescription of water use activities; the issue of approvals, permits, and authorizations for water use and waterworks; guidelines on surface water, including declaration of a watercourse, wetlands, land reclamation, water use for irrigation and works associated for protection and control of fish; groundwater development, including borehole and issue of specific permits and authorizations; water quality monitoring and liquid waste disposal, including control of water pollution, water quality monitoring; inspection and controls concerning waterworks; water use charges, including penalties for misuse or over-abstraction; roles and powers of water resource users associations and basin water resources committees; identification of protected and designated groundwater conservation areas; composition of reserve; categories of water sector professionals and contractors and issue of related permits and licenses.

Relevance to the project

The Contractor will obtain water permits for any abstraction during construction. The contractor shall also ensure that the construction activities do not compromise water quality in the project area by avoiding disposing of waste materials in water bodies and controlling water pollution.

3.2.18 EMCA (Fossil Fuel Emission Control) Regulations, 2006

These Regulations set emission standards for internal combustion engines, provide for the licensing of persons who treat fuel and for the appointment of environmental inspectors for emission inspection, and authorize the National Environment Management Authority to enter into partnerships for emission inspection purposes.

Relevance to the project.

The contractor shall ensure that all mechanical equipment that uses fuel complies with the set standards on emissions through regular maintenance and servicing

3.2.19 Land Act (Amended) 2019;

It provides for assessing the land value index concerning compulsory land acquisition and connected purposes.

Relevance to the project.

The project will be constructed on the land acquired from local communities, and compensation has already been undertaken.

3.2.20 Physical and Land Use Planning Act (2019).

This Law provides the principles, procedures, and standards for preparing and implementing physical and land use development plans at the national, county, urban, rural, and city levels and the administration and management of physical and land use planning in Kenya, amongst other things. The Law mandates that any person engaged in the physical and land use shall foster principles for the overall public good; for instance, the physical planning and use shall promote the sustainable use of land and that this shall integrate economic, social, and environmental needs of present and future generations. The Act stresses the importance of controlled development per county and national physical planning. County approval for user change is required, and the county may charge fees for developments where the user change is needed. In some instances, the user shift involves the amendment of the County's physical plan.

Relevance to the project.

The proponent will operate within the provisions of this Act during development execution. The project construction activities must align with national and county land use and planning rules.

4.2.23 National Construction Authority Act, 2011

The National Construction Authority Act of 2011 established the National Construction Authority (NCA) to oversee the construction industry and coordinate its development. In addition, NCA is also responsible for stimulating and streamlining the development of the construction industry through capacity building, registration of contractors, and regulation of their conduct and quality assurance for improved performance of the construction industry.

Relevance to the project.

The NCA registers the contractor and has the requisite qualifications and capacity to undertake such levels of work as prescribed. They will undertake renewal of their practicing license as and when required.

3.2.21 Sustainable Waste Management Act, 2022

The Act provides a new governance framework in waste management by establishing the Waste Management Council, the expanded role of County Governments, and Extended Producer Responsibility Schemes. In addition, the Act prescribes the need to develop new infrastructure for waste management, such as segregation at source, proper transportation, material recovery facilities, closure of dumpsites, sanitary landfills, and a national waste information system.

Relevance to the project

Projects ESMP and C-ESMP contain provisions for managing all the waste generated by the contractor during the project's construction. The ESMP also provides site restoration procedures.

3.2.22 Children's Act 2022, No. 19 of 2022

The Children's Act of Kenya is the essential instrument in Kenya's laws that spells out children's rights while caring for their safety, protection, and development—section 18. (1) No person shall subject a child to child labor, domestic servitude, economic exploitation, or any work or employment which is hazardous, interferes with the child's education, or is likely to be harmful to the child's health or physical, mental, moral or social development—section 22. (1) States that no person shall subject a child to — (a) psychological abuse or (b) child abuse. Section 24. (1) No person shall subject a child to— (a) the use of hallucinogens, narcotics, alcohol, tobacco products, glue, psychotropic drugs, or any other drugs that are declared harmful to health.

Relevance to the project

Protection of child rights as envisioned in this Act will be complied with at all times by the project proponent and other stakeholders in the construction process. The contractor demands all workers produce a national ID to show they are above age 18 before employment. The contractor has sensitized the community to report cases of child abuse or exploitation by the project workers.

3.2.23 Traffic Act (Cap 403)

The Act prohibits obstruction of traffic, either by persons or facilities constructed in such a way as to interfere with the flow of traffic on roads or road reserves. The law also regulates the quality of exhaust emissions from such mobile vehicles.

Relevance

Vehicles and machinery to be used for project implementation shall comply with provisions of the Traffic Act as it relates to the use of public roads.

3.3 NATIONAL POLICY FRAMEWORK AND ENVIRONMENTAL GUIDELINES

3.3.1 Vision 2030

Vision 2030 was launched in 2008 as Kenya's development blueprint covering 2008–2030. It aimed to make Kenya a newly industrializing 'middle-income country providing high-quality life for all its citizens by 2030'. The Social Pillar of Vision 2030 explicitly states that Kenya's journey towards widespread prosperity involves building a just and cohesive society that enjoys equitable social development in a clean and secure environment.

Vision 2030 is a Kenyan government's developmental policy that reflects the government's commitment to achieve low-carbon and climate-resilient development. Vision 2030 was launched in 2008 as Kenya's development blueprint covering 2008–2030. It aimed to make Kenya a newly industrializing 'middle-income country providing high-quality life for all its citizens by 2030'. The vision of a clean and sustainable environment by 2030 is to be attained with improved pollution and waste management, improved capacity to adapt to global climate change, and the harmonization of environmental laws for better ecological governance and planning

3.3.2 National Environment Policy 2014

The policy provides a framework for an integrated approach to planning and sustainable management of Kenya's environment and natural resources, strengthening the legal and institutional framework for effective coordination and management of the environment and natural resources. The policy guidelines aim to achieve socio-economic well-being and survival of citizens and humans through proactive measures in protecting the environment.

The salient features of the policy include:
Under paragraph 3.2(n), one of the principles to be applied in implementing the policy is that communities should be involved in decision-making and empowerment in implementing decisions flowing out of the policy.
The policy takes cognizance of high population growth (which leads to higher human activity), shrinking productive land, and technological changes as some of the factors that dictate a change in strategy and planning to safeguard the environment.

Relevance:

Avoidance of pollution of environmental resources during the construction phase of the project will be practiced.

3.3.3 National Policy on Water Resources Management and Development - Sessional Paper Number 1 of 1999

Kenya's National Water Policy, adopted through Sessional Paper No. 1 of 1999, provides the policy framework for water resources management and development, including the regulation, management, and development of water resources and water/sewerage services, as outlined in the Water Act 2016. The policy was established to preserve, conserve, and protect available water resources and allocate them sustainably, rationally, and economically. It also desires to supply water of good quality and sufficient quantities to meet various water needs while ensuring safe wastewater disposal and environmental protection. The policy focuses on streamlining the provision of water for domestic use, agriculture, livestock development, and industrial utilization to realize Vision 2030. To achieve these goals, water supply (through increased household connections and developing other sources) and improved sanitation are required in addition to interventions in capacity building and institutional reforms.

While the National Policy on Water Resources Management and Development (1999) enhances a systematic development of water facilities in all sectors to promote the country's socio-economic progress, it also recognizes the by-products of this process as wastewater. Therefore, development projects should be accompanied by corresponding waste management systems to handle the wastewater and other waste emanating there. The same policy requires that such projects undergo comprehensive EIAs that will provide suitable measures to ensure environmental resources and people's health in the immediate neighborhood and further downstream are not negatively impacted by project development activities.

Relevance

The project's new design changes aim to increase the water storage capacity to meet the community beneficiaries' multipurpose needs (domestic, irrigation and hydropower water uses). Further, the policy call for an environmental impact assessment is fulfilled in this report.

3.3.4 The National Land Use Policy (NLUP) - Sessional Paper, No. 1 of 2017

The National Land Use Policy 2017 (NLUP) is essential in addressing issues of optimal utilization of land and land-related resources by providing principles and guidelines for proper management of land resources to promote public good and general welfare; land use planning to enhance sustainable development; promoting environmental conservation and preservation that minimize environmental impacts, such as deforestation or soil erosion, land and land related conflicts, land tenure, and land degradation, promoting a more just and equitable land system. The NLUP provides the legal, administrative, institutional, and technological framework for optimal utilization and productivity of

land and land-related resources sustainably and desirably at the National, County Sub-county, and other local levels. The policy offers a framework of recommendations and principles designed to ensure the maintenance of a land use system that will provide resource allocation and management for sustainable development to promote public good and general welfare.

Relevance

The project will implement an environmental management plan to ensure the protection of land and water resources and sustainable utilization of locally available construction materials in the project area.

3.3.5 The National Occupational Safety and Health Policy, 2012

The policy mainly seeks to address various challenges related to occupational safety and health in the country, provide guidelines for key legal and institutional reforms, and provide a framework for mainstreaming occupational safety and health at workplaces. This Policy intends to significantly sustain the continual development and implementation of the National Occupational Safety and Health systems and programs to reduce work-related accidents and diseases. In addition, it seeks to offer equitable compensation to those who suffer physical injuries and contract occupational diseases. The policy addresses environmental pollution, recognizing that hazardous wastes and emissions from production processes and work activities may pollute and degrade the environment. Further, other multi-sectoral issues such as gender, HIV and AIDS, drugs, and substance abuse are covered.

Relevance: The project has developed and will implement an Occupational Health, Safety, and Environmental Plan.

3.3.6 National Gender and Development Policy, Sessional Paper N0. 02 of 2019

The National Policy on Gender and Development seeks to create a just, fair and transformed society free from gender-based discrimination in all spheres of life practices.

3.3.7 National Policy for Prevention and Response to Gender-Based Violence, 2014

Gender-based violence (GBV) is an umbrella term for any harmful act that is perpetrated against a person's will and that is based on socially ascribed (gender) differences between males and females. These include sexual violence, domestic or intimate partner violence, trafficking, forced and/or early marriage, and other traditional practices that cause harm.

Sexual Harassment (SH) is defined as any unwelcome sexual advance, request for sexual favor, verbal or physical conduct or gesture of a sexual nature, or any other behavior of a sexual nature that might reasonably be expected or be perceived to cause offense or humiliation to another, when such conduct interferes with work, is made a condition of employment or creates an intimidating, hostile or offensive work environment. It occurs between personnel/staff and involves any unwelcome sexual advances or unwanted verbal or physical conduct of a sexual nature.

Relevance:

The contractor has developed and will implement sexual abuse and harassment awareness measures amongst workers, e.g., existing reporting mechanisms. Further, the contractor will not discriminate based on sex while hiring workers.

3.3.8 Kenya National Youth Policy 2006

The policy recognizes youth as a valuable resource for national development. The Youth Policy aims to empower and involve the young generation in socio-economic and political spheres to promote national development. One of the policy's objectives is to empower youth to realize their potential and engage youth in socio-economic development. It

endeavors to ensure that all young women and men are given meaningful opportunities
to reach their full potential, both as individuals and as active participants in society. The Policy addresses the major concerns and issues critical to young men and women and directs youth programs and services provided by government and non-government organizations.

Relevance:

Both qualified young men and women will be given equal employment opportunities; for example, the project employed a lady as a machine operator at the site.

3.3.9 National Energy Policy

The energy sector plays a vital role in the socio-economic development of a nation. In Kenya, petroleum and electricity as sources of energy are the main drivers of the economy, while biomass is mainly used in the rural areas. The sector currently relies solely on the import of all petroleum products. Policy direction in the energy sector was previously governed by Sessional Paper No. 4 of 2004 which had the objectives of: Providing sustainable quality energy; energy as a tool to accelerate economic empowerment for urban and rural development; improving access to affordable energy; enhancing security of supply; promoting development of indigenous energy resources; and promoting energy efficiency and conservation as well as prudent environmental, health and safety practices in the energy sector.

Kenya's National Energy Policy 2025-2034 aims to ensure a sustainable, inclusive, and resilient energy future by promoting affordable, reliable, and sustainable energy access, focusing on universal electricity access by 2030 and clean cooking solutions. The new policy has been prepared to bring on board emerging issues such as Vision 2030, and more importantly, the functions of county governments in the new Constitutional dispensation. In line with the on-going Thwake Dam Multipurpose Water project and power transmission line - a Renewable Energy Project and evacuating the generated electricity to feed to the National Grid, the policy notes that the government plans to promote and accelerate the exploitation of renewable sources of energy as they have the potential to enhance energy security, mitigate climate change and generate income as well as create the much-needed employment. The overall objective of the energy policy is to ensure affordable, sustainable and reliable supply to meet national and county development needs, while protecting and conserving the environment.

Relevance

The On-going Thwake Multipurpose Water Project will be being implemented in line with this policy as envisaged in 2030 vision.

IFC-EHS GUIDELINES

These guidelines will also guide the Contractor's activities during construction that impact the physical environment.

The guidelines include:

a) **Wastewater and Ambient Water Quality** – These guidelines will be key, particularly in the dam and employer's camp construction and the impacts of sewage released into the surrounding physical environment. The guidelines call for monitoring wastewater from the camp through testing and inspections, for which the Contractor will have to establish a plan for management and monitoring.

Table 3.10: Standards for Effluent Discharge into the Environment

Parameter	Max Allowable (Limits)
1,1,1-trichloroethane (mg/l)	3
1,1,2-trichloroethane (mg/l)	0.06

1,1-dichloroethylene	0.2
1,2-dichloroethane	0.04
1,3-dichloro propene (mg/l)	0.02
Alkyl Mercury compounds	Nd
Ammonia, ammonium compounds, NO3 compounds, and NO2 compounds (Total of ammonia-N times 4 plus nitrate-N and Nitrite-N) (mg/l)	100
Arsenic (mg/l)	0.02
Arsenic and its compounds (mg/l)	0.1
Benzene (mg/l)	0.1
Biochemical Oxygen Demand (BOD 5days at 20 oC) (mg/l)	30
Boron (mg/l)	1.0
Boron and its compounds – non-marine (mg/l)	10
Boron and its compounds –marine (mg/l)	30
Cadmium (mg/l)	0.01
Cadmium and its compounds (mg/l)	0.1
Carbon tetrachloride	0.02
Chemical Oxygen Demand (COD (mg/l)	50
Chromium VI (mg/l)	0.05
Chloride (mg/l)	250
Chlorine-free residue	0.10
Chromium total	2
cis –1,2- dichloro ethylene	0.4
Copper (mg/l)	1.0
Dichloromethane (mg/l)	0.2
Dissolved iron (mg/l)	10
Dissolved Manganese(mg/l)	10
E. coli (Counts / 100 ml)	Nil
Fluoride (mg/l)	1.5
Fluoride and its compounds (marine and non-marine) (mg/l)	8
Lead (mg/l)	0.01
Lead and its compounds (mg/l)	0.1
n-Hexane extracts (animal and vegetable fats) (mg/l)	30
n-Hexane extracts (mineral oil) (mg/l)	5
Oil and grease	Nil
Organo-phosphorus compounds (parathion, methyl parathion, methyl demeton, and Ethyl para nitrophenyl phenyl phosphorothioate, EPN only) (mg/l)	1.0
Polychlorinated biphenyls, PCBs (mg/l)	0.003
pH (Hydrogen ion activity----marine)	5.0-9.0
pH (Hydrogen ion activity—non-marine)	6.5-8.5
Phenols (mg/l)	0.001
Selenium (mg/l)	0.01
Selenium and its compounds (mg/l)	0.1
Hexavalent Chromium VI compounds (mg/l)	0.5
Sulphate (mg/l)	0.1
Simazine (mg/l)	0.03

Total Suspended Solids, (mg/l)	30
Tetrachloroethylene (mg/l)	0.1
Thiobencarb (mg/l)	0.1
Temperature (in degrees Celsius) based on ambient temperature	± 3
Thiram (mg/l)	0.06
Total coliforms (counts /100 ml)	30
Total Cyanogen (mg/l)	Nd
Total Nickel (mg/l)	0.3
Total Dissolved solids (mg/l)	1200
Colour in Hazen Units (H.U)	15
Detergents (mg/l)	Nil
Total mercury (mg/l)	0.005
Trichloroethylene (mg/l)	0.3
Zinc (mg/l)	0.5
Whole effluent toxicity	
Total Phosphorus (mg/l)	2 Guideline value
Total Nitrogen	2 Guideline value

b) **Hazardous Materials Management** - These guidelines will mainly govern the handling and disposal of hazardous materials during the dam construction.

c) **Waste Management** – All construction works are expected to produce one or more forms of waste. Construction and domestic wastes are scheduled from the Contractor's site and the camp. The Contractor will have to prepare a waste management plan using these guidelines that conform to the local legal framework provided in this chapter.

d) **Noise** – Using several equipment and plants is bound to generate noise, harming the surrounding environment and sensitive receptors. These impacts will be short-lived during the construction. The guidelines also provide the maximum noise levels the Contractor should strive to adhere to. The guidelines also call for baseline and annual monitoring of noise generation within the Contractor's site to establish compliance with the policies and local regulations.

Table 3.11 Noise Level Guidelines

Noise Level Guidelines		
	One Hour LAeq (dBA)	
Receptor	Daytime 07:00 - 22:00	Nighttime 22:00 - 07:00
Residential; institutional; educational	55	45
Industrial; Commercial	70	70

Source: International Finance Corporation (IFC)/WBG.

e)**Air Emissions and Ambient Air Quality** provides the air quality standards, limits, and monitoring requirements for construction works. The guidelines incorporate WHO air quality guidelines on the central air pollutants expected from the Contractor's machinery and equipment. Baseline and annual

air quality measurements should be taken to establish the impacts of exhaust from the Contractor's works. The use of several equipment and plants is bound to generate some level of air emissions, which are bound to negatively impact the surrounding environment, particularly sensitive receptors. These impacts will be short-lived during the construction and operation phase of the project, and if minimal mechanization is employed, the impacts can be reduced further. The guidelines also provide the air emission levels the Contractor should adhere to.

Table 3.12: WHO Ambient Air Quality Guidelines

WHO Ambient Air Quality Guidelines 7,8		
	Averaging Period	Guideline value in mg/m3
Sulfur dioxide (SO2)	24-hour 10 minutes	125 (Interim target-1) 50 (Interim target-2) 20 (guideline) 500 (guideline)
Nitrogen dioxide (NO2)	1-year 1-hour	40 (guideline) 200 (guideline)
Particulate Matter PM10	1-year 24-hour	70 (Interim target-1) 50 (Interim target-2), 30 (Interim target-3) 20 (guideline) 150 (Interim target-1) 100 (Interim target-2) 75 (Interim target-3) 50 (guideline)
Particulate Matter PM2.5	1-year 24-hour	35 (Interim target-1) 25 (Interim target-2) 15 (Interim target-3) 10 (guideline) 75 (Interim target-1) 50 (Interim target-2) 37.5 (Interim target-3) 25 (guideline)
Ozone	8-hour daily maximum	160 (Interim target-1) 100 (guideline)

Source: IFC/WBG

Table 3.13: Ambient Air Quality Tolerance Limits

Pollutant	Time Weighted Average			
		Industrial Area	Residential, Rural & Other Area	Controlled Areas
Sulfur oxides (SOX);	Annual Average	80 ug/m3	60 ug/m3	15 ug/m3
	24 hours	125 ug/m3	80 ug/m3	30 ug/m3
	Annual Average		0.019 ppm/50ug/m3	
	Month Average			

Pollutant	Time Weighted Average			
		Industrial Area	Residential, Rural & Other Area	Controlled Areas
	24 Hours		0.048ppm /125ug/m3	
	Instant Peak		500 ug/m3	
	Instant Peak (10 min)		0.191 ppm	
Oxides of Nitrogen (NOX);	Annual Average	80 ug/m3	60 ug/m3	15 ug/m3
	24 hours	150 ug/m3	80 ug/m3	30 ug/m3
	Annual Average		0.2 ppm	
	Month Average		0.3 ppm	
	24 Hours		0.4 ppm	
	One Hour		0.8 ppm	
	Instant Peak		1.4 ppm	
Nitrogen Dioxide	Annual Average	150 ug/m3	0.05 ppm	
	Month Average		0.08 ppm	
	24 Hours	100 ug/m3	0.1 ppm	
	One Hour		0.2 ppm	
	Instant Peak		0.5 ppm	
Suspended Particulate Matter	Annual Average	360 ug/m3	140 ug/m3	70 ug/m3
	24 hours	500 ug/m3	200 ug/m3	100 ug/m3
	Annual Average		100 ug/m3	
	24 hours		180 ug/m3	
Respirable Particulate Matter (<10 m) (RPM)	Annual Average	70 ug/m3	50 ug/m3	50 ug/m3
	24 hours	150 ug/Nm3	100 ug/Nm3	75 ug/Nm3
PM2.5	Annual Average	35 ug/m3		
	24 hours	75 ug/m3		
Lead (Pb)	Annual Average	1.0 ug/Nm3	0.75 ug/Nm3	0.50 ug/m3
	24 hours	1.5 ug/m3	1.00 ug/m3	0.75 ug/m3
	Month Average		2.5	
Carbon monoxide (CO)/ carbon dioxide (CO2)	8 hours	5.0 mg/m3	2.0 mg/m3	1.0 mg/m3
	1 hour	10.0 mg/m3	4.0 mg/m3	2.0 mg/m3
Hydrogen sulphide	24 hours	150ug/m3		
	instant Peak	700ppb		
Total VOC	24 hours	600 ug/m3		
Ozone	1-Hour	200 ug/m3	0.12 ppm	
	8 hour (instant Peak)	120 ug/m3	1.25 ppm	

Source: IFC/WBG

f) Occupational Health and Safety Guidelines

These guidelines aim to ensure the safety of the staff on-site and within the Contractor's camp. The guidelines about occupational health and safety include:

i. General Facility Design and Operation – These guidelines guide the Contractor's workspace. Being that the project area is in the ASALs, characterized by high temperatures, the Contractor will have to provide a suitable potable water supply for the staff, a clean eating area, suitable lavatories and showers, fire precaution measures (extinguishers and safety drills) and first aid services.
ii. Communication and Training – This means providing communication and training for staff and visitors to the site to govern behavior within the site. This is necessary to ensure safety while operating within the site. The Contractor has employed a full-time health and safety officer on site who is in charge of ensuring safety and communication of safety within the site.
iii. Physical Hazards – These guidelines govern the staff's exposure to physical dangers, including deep trenches, noise, dust, welding, manual handling, and work environment temperatures. The guidelines provide fall protection within the trenches and work hour limits (8 hours maximum).
iv. Chemical Hazards - Chemical hazards represent the potential for illness or injury due to acute exposure or chronic repetitive exposure to toxic, corrosive, sensitizing, or oxidative substances.
v. Personal Protective Equipment (PPE) - Personal Protective Equipment (PPE) provides additional protection to workers exposed to workplace hazards in conjunction with other facility controls and safety systems. PPE is considered a last resort that exceeds the other facility controls and provides the worker with extra personal protection. The Contractor has provided the relevant PPE for staff on site for the different job descriptions. In addition, visitors to the site are provided with some minimal form of PPE during their visits.
vi. Monitoring - Occupational health and safety monitoring programs should verify the effectiveness of prevention and control strategies. The selected indicators should represent the most significant occupational, health, and safety hazards and the implementation of prevention and control strategies. The Contractor has employed a health and safety officer who will devise an occupational health and safety monitoring program for implementation by the Contractor. In addition, the Contractor has provided a clinic and log of accidents and incidences on site as a control measure for ensuring health and safety.
vii. Sexual harassment and women's empowerment - Women and men may be exposed to different physical and psychological hazards and risks at the workplace. In addition, exposure to the same risks may also impact women and men differently. Gender differences must be considered in the Occupational Safety and Health (OSH) process design and preventive measures to ensure continued workplace safety and health improvement for women. Gender integration should respond to the specific hazards and risks impacting women, including sexual harassment and GBV, to address gender disparities in OSH.

g) Community Health and Safety Guidelines

These guidelines complement the environmental and occupational health and safety guidelines. However, these guidelines specifically address the impact of the project activities on the surrounding community. The procedures involve the following aspects:

a) Structural Safety of Project Infrastructure –As such, safety measures must be considered. The Contractor will have to provide physical buffers such as cordons to prevent falls into the trenches and safe crossing points across the trenches at suitable intervals to provide safe crossing. In addition, the Contractor should provide concrete barriers or similar to segregate motor traffic from the workspace.

b) Traffic Safety – The Contractor will have to provide a traffic management plan to ensure the safety of motorists and other road users. The traffic management plan will include alternative routes for transport, concrete barriers to separate the work area from vehicles, a traffic controller to divert traffic, and road signage.

c) Emergency Preparedness and Response – These are designed to deal with unplanned events and acts when a project operation loses control or could lose power, resulting in risks to human health, property, or the environment within the facility or the local community. Emergencies do not typically include safe work practices for frequent upsets or events covered by occupational health and safety. The Contractor will prepare an emergency preparedness and response plan, including staff training, drills to gauge responses to readiness, and communication with the local community in case of rinse.

d) GBV, SEA, and the spread of HIV – Interactions both between the project staff and the host community, as well as among members of the community themselves, may enhance the occurrence of GBV, SEA, and the spread of HIV/AIDs due to changes in financial status resulting from the availability of jobs and increased business opportunities or because of cultural contamination arising from immigration. The contractor is required to put in place measures to arrest such ills, including through training on the spread and prevention of HIV and AIDs, provision of robust, effective, and gender-sensitive dispute resolution mechanisms in the event of GBV/SEA as well as linkages with local administration to facilitate arrests and evidence recovery in the event of criminal activities touching on GBV/SEA and child abuse.

h) Construction and Decommissioning Guidelines

These guidelines will govern the project components requiring decommissioning, including the contractor's camp. The Contractor will have to prepare a decommissioning plan for all these features, considering the previous EHS guidelines mentioned above.

3.4 ADMINISTRATIVE FRAMEWORK

a) County Government of Makueni

Part of the dam is located in Makueni County. The laws of the County apply to the construction and operation of the dam including issuance of licenses and permits. Some of the permits required to be issued by Kitui include a licence to emit excessive noise and vibrations and public health permit for food handlers.

b) County Government of Kitui

The dam occupies parts of Kitui County and as such construction of the dam is subject to laws and regulations of the County. Licences and permit required to be issued by the Kitui County include medical clinic, licence to emit excessive noise and vibrations and others.

c) National Environment Council

The Council is responsible for policy formulation and directions for the development of the EMCA. The Council also sets national goals and objectives and determines policies and priorities for protecting the environment.

d) NEMA

The responsibility of the National Environment Management Authority (NEMA) is to exercise general supervision and coordination of all matters relating to the environment and to be the principal instrument of government in the implementation of all policies relating to the environment. The Authority shall review the ESIA report for the project, visit the project site to verify information provided in the report, and issue an ESIA license if it considers that all the issues relevant to the project have been identified and that mitigation measures to manage them have been proposed.

e) The Standards and Enforcement Review Committee

In addition to NEMA, the Act provides for establishing and enforcing environmental quality standards to be set by a technical committee of NEMA known as the Standards and Enforcement Review Committee (SERC). NEMA, through EMCA, has established standards for the various environmental parameters that require management, including water quality standards, noise and vibration control standards, and waste management standards, amongst others. Through the Compliance and Enforcement Department of NEMA, the committee monitors the compliance level of various projects to ensure pollution control standards are implemented. The committee also follows on pollution complaints reported by the public.

f) The County Environment Committees

The County Environment Committee contributes to the decentralization of activities undertaken by NEMA and thus enables local communities to have access to environmental management information. It also allows the County to Environment Committees to conduct quick site visits and review reports of localized projects on time.

g) Environment and Land Court

This court is established according to Article 162(2) of the Constitution and Section 4 of the Environment and Land Court Act. The court is superior and has jurisdiction throughout Kenya, with original and appellate jurisdiction, to hear and determine disputes relating to environmental planning, climate change issues, and any other land and ecological conflicts as per Section 13 of the Act.

h) National Environment Tribunal

The National Environment Tribunal is established under section 125 of the EMCA with jurisdiction to entertain appeals from parties aggrieved by decisions made by NEMA, such as The grant of a license or permit or a refusal to grant a license or permit, or the transfer of a license or permit, under the EMCA or its regulations; The imposition of any condition, limitation or restriction on a person's license under the EMCA or its laws.

The revocation, suspension, or variation of a person's license under the EMCA or its regulations; the amount of money required to be paid as a fee under the EMCA or its rules and the imposition against a person of an environmental restoration order or environmental improvement order by the NEMA under the EMCA or its regulations

i) National Environmental Complaints Committee

The National Environmental Complaints Committee (NECC) is responsible for investigating allegations or complaints related to the environment, preparing annual reports on the state of the environment, and undertaking public interest litigation on behalf of the citizens in environmental matters. It was established to replace the Public Complaints Committee (PCC).

j) Directorate of Occupational Safety and Health Services

The mandate of the Directorate of Occupational Safety and Health Services (DOSHS) is to ensure compliance with the provisions of the Occupational Safety and Health Act (OSHA 2007) and subsidiary legislations and promote the safety and health of workers. Key functions include:

- Inspecting workplaces to ensure compliance with safety and health law
- Examination and testing of steam boilers, air & steam receivers, gas cylinders, lifts, crane chains and other lifting equipment
- Measurements of workplace pollutants for purposes of their control
- Investigation of occupational accidents and diseases to prevent recurrence
- Medical examinations of workers
- Training on Occupational safety and health, first aid, and fire safety
- Approving architectural plans of buildings intended for use as workplaces
- Disseminating information on occupational safety and health to customers

3.5 AFDB POLICIES

3.5.1 Integrated Safeguards System

In 2023, the African Development Bank Group adopted Integrated Safeguards System (ISS) which established the Bank Group's commitment to sustainable development, consolidating and building on the Environment (2004) and Involuntary Resettlement (2003) safeguard1 policies, as well as cross-cutting policies and strategies on gender (Gender Strategy for 2021–2025, "Investing in Africa's Women to Accelerate Inclusive Growth"), and then the Civil Society Engagement Framework (2012). The current ISS update has been further informed by the African Development Bank's Climate Change and Green Growth Strategic Framework: Projecting Africa's Voice (2021), the Bank's sector policies such as on forestry (1993), agriculture and rural development (1999), and on the water sector (2021), as well as the Strategy for Quality Health Infrastructure in Africa 2021–2030 (2021), and the Bank Group Policy on Program-Based Operations (2012).

The African Development Bank Group (AfDB) Integrated Safeguards System is a cornerstone of its strategy to promote socially inclusive and environmentally sustainable growth. Safeguards are a powerful tool for identifying risks, reducing development costs, and improving project sustainability, thus benefiting affected communities and helping to preserve the environment. The Standards reflects the AfDB's recognition of the importance of sustainable development in achieving economic growth in Africa. By integrating these standards, the AfDB seeks to protect ecosystems, promote social equity, and foster inclusive development, thereby contributing to the bank's overarching goal of improving the quality of life for African populations.

In line with the financier's African Development Bank (AfDB)'s Integrated Safeguards System (ISS), the project is categorized as Category 1. Category 1 are projects likely to cause significant environmental and social impacts. Category 1 projects are likely to induce substantial and/or irreversible adverse ecological and/or social impacts or to significantly affect environmental or social components that the Bank or the borrowing country considers sensitive. Any project requiring a Full Resettlement Action Plan (FRAP) under the provisions of the Bank's policy on involuntary resettlement is categorized here.

The policy goals of the African Development Bank (AfDB) on involuntary resettlement ensure that PAPs are treated equitably and share the project's benefits. The guiding principles of the AfDB policy state that compensation for affected persons in the project must be made at the full replacement cost. Compensation for the loss of lands and other assets should be paid before project implementation to improve the affected population's former living standards, income-earning capacity, and production levels. The improvement of these living standards should also apply to host communities. This will help the affected population improve their living standards and income-earning capacity.

The policy also recognizes that squatters and displaced people, without recognized legal rights, should be compensated and entitled to resettlement assistance in lieu of compensation for land. Particular attention should be given to disadvantaged groups among those displaced, especially those below the poverty line. The following are the basis of the objectives of AfDB policy.

- To avoid resettlement where feasible or minimize resettlement impacts where population displacement is unavoidable, explore all viable project designs.
- Ensure that displaced persons receive resettlement assistance, preferably under the project, so that their standards of living, income earning capacity, and production levels are improved.
- Provide explicit guidance to bank staff and borrowers on the conditions that need to be met regarding involuntary resettlement issues in the bank's operations to mitigate the negative impacts of displacement and resettlement and establish a sustainable economy and society.
- Set up a mechanism for monitoring the performance of involuntary resettlement programs in Bank operations and remedying problems as they arise to safeguard against ill-prepared and poorly implemented resettlement plans.

The AfDB Safeguard policies are designed to help ensure that projects proposed for Bank financing are environmentally and socially sustainable. The applicable operational safeguards are presented in Table 3.14 below:

Table 3.14: ISS Safeguards Applicability

Operational Policy	**Relevance**
OS 1: Environmental and Social Assessment	The project is assigned Category 1 based on the results of assessed project activities. The project's interaction with the natural and human environment qualifies the applicability of this policy, which seeks to prioritize environmental, social, and climate change vulnerability in any project development for sustainable development. The project requires an ESIA, which forms the basis of this report.
OS2: Labour and Working Conditions	This applies by ensuring that all workers involved in the project are treated relatively and have adequate wages and benefits. Additionally, this OS strictly prohibits child labor and forced labor, ensuring that all community workers are of legal working age and that employment is voluntary. The project is being implemented within the labour and working conditions.

OS3: Resource Efficiency and Pollution Prevention and Management	This applies to the project by encouraging sustainable materials and efficient construction methods to minimize waste and reduce resource consumption. More so, this emphasizes effective waste management practices to handle construction debris, ensuring that waste is minimized, reused, or recycled wherever possible. Thus, measures for waste management and pollution will be implemented.
OS4: Community Health, Safety and Security	This applies to the project by highlighting the adoption of safety protocols for both workers and nearby residents during construction. This includes managing construction noise, dust, and traffic to minimize disruption. The Standard aims to build trust with residents and contribute to a positive living environment, fostering social cohesion and well-being. The project recognizes the need to ensure public safety and security during the ongoing implementation stage.
OS5: Land Acquisition, Restrictions on Access to Land and Land Use, and Involuntary Resettlement.	This standard outlines the need for a fair and transparent process when acquiring land for the project. Besides, the standards emphasize the need to avoid involuntary resettlement whenever possible. Land acquisition and displacement processes have been implemented within Kenyan legislation and AFDB safeguards policies and guidelines for resettlement. Land for the additional scope has been acquired pending addressing some issues of issuance of RAP prepared for the current scope for land acquisition.
OS6: Habitat and Biodiversity Conservation and Sustainable Management of Living Natural Resources	This applies to the project in several ways, such as minimizing habitat destruction and ensuring local biodiversity conservation. This policy recognizes the need for biodiversity conservation, sustainable use, and management of natural resources and ecosystem services. This policy will be used to manage and utilize locally available resources in the project area.
OS7: Vulnerable Groups – such as female-headed households, the landless, the elderly, youth and children, persons with disabilities, groups who are marginalized based on ethnicity, religion, language, sexual orientation, and gender identity, and highly vulnerable rural minorities (HVRM).	This Standard focuses on ensuring the needs and rights of vulnerable populations are recognized in the project. Thus, the ESIA acknowledges the needs of the vulnerable groups within the local populations. The project will ensure no discrimination between men and women when recruiting workers and no child labor.

OS8: Cultural Heritage	This emphasizes the protection and preservation of cultural heritage in the project area. The OS is relevant because the project involves excavations, demolition, earth profile movement, and changes in the physical environment. However, no cultural heritage site is identified at or near the project area. If found during the excavation of saddle dams and in consultation with stakeholder(s), the project will apply the OS8 standard accordingly.
OS9: Financial Intermediaries	The project does not trigger this.
OS10: Stakeholder Engagement and Information Disclosure	This Standard recognizes the importance of involving stakeholders and ensuring transparency in projects. A stakeholder engagement plan has been developed.

3.5.2 Policy on *Disclosure* and Access to Information (the "DAI Policy")

The African Development Bank Group (hereinafter referred to as the Bank Group) believes that the sharing of information on its operations nurtures openness and transparency that are crucial to its mandate. Therefore, the objective of the Policy on Disclosure and Access to Information (DAI) is to provide a clear framework for ensuring greater awareness and understanding of the Bank's development function and mission through public outreach, and providing better access to information, particularly on the Bank's operations. Specifically, the new policy is designed to:

- Maximise disclosure of information in the Bank Group's possession and limit the list of exceptions;
- Facilitate access and sharing of information on the Bank Group's operations with a broad range of stakeholders;
- Promote good governance, transparency, and accountability;
- Improve implementation effectiveness and better co-ordinate the information disclosure process;
- Give more visibility to the Bank Group's mission, strategies and activities;
- Support the Bank Group's consultative process, and stakeholder participation in the implementation of projects financed by the Bank Group; and
- Ensure harmonization with other Development Finance Institutions (DFIs) on disclosure of information.

In this regard, the ESIA will be publicly disclosed, and community participation involved

3.5.3 AfDB Gender Policy

The policy requires that gender analysis be an integral part of all Bank's interventions to ensure that such interventions respond to the needs and priorities of both men and women. This

requirement is based on the premise that the absence of specific attention to differences between women and men has been shown to result in the exclusion of women or men as participants or beneficiaries of planned change.

Development practitioners are required under this policy to strive to empower both men and women to transform relations between them by taking into account the needs and interests of both genders and ensuring that they all benefit equally from development.

3.5.4 Climate Change and Green Growth Policy

The mandate of the African Development Bank Group is to contribute to sustainable economic development and social progress of African countries, individually and collectively. The Bank has long recognized that climate action is a core component of the sustainable development that it seeks to promote.

The vision of this policy foresees a climate-resilient, low-carbon, green, inclusive, integrated and prosperous Africa, strongly positioned to meet the challenges posed and harness the opportunities offered by climate change and green growth and justly transformed for the benefit of all Africans. The policy centres on four fundamental pillars. All actions that the Bank takes must be weighed and evaluated in the context of these four overarching priorities. The four policy pillars are the following:

1. Adaptation:boosting climate resilience and adaptation to climate change and reducing fragility.
2. Mitigation:promoting low-carbon development and mitigation.
3. Finance: leveraging climate finance and mobilizing resources for climate action and green growth.
4. Enabling environment: creating enabling environments for climate actions and green investments.

3.6 INTERNATIONAL CONVENTIONS

Relevant international agreements, treaties, and conventions with a social and/or environmental aspect to which Kenya is a signatory or has acceded to/ratified are detailed in the table below.

Table 3.15: International Conventions

Convention	Date Ratified/Acceded to	Relevance to the project
African Convention for the Conservation of Nature and Natural Resources (2003)	Ratified (12 May 1969)	The ESMP contains measures for natural resource protection, including avoiding cutting down trees. Additional trees will be planted under this project to promote nature conservation.

Convention	Date Ratified/Acceded to	Relevance to the project
Convention on Biological Diversity (1992)	Ratified (26 July 1994)	A biodiversity management plan (if required) will be prepared to prevent the degradation of project area biodiversity.
UNESCO Convention for the Protection of the World Cultural and Natural Heritage (1972)	Acceded to (1 May 1964)	This project does not affect any known cultural heritage site. However, the chance find procedure will be applied if any is found.
Convention on the Conservation of Migratory Species of Wild Animals (1985) The African-Eurasian Water-bird Agreement (AEWA). The Agreement on the Conservation of African-Eurasian Migratory Water Birds (AEWA).	Acceded to (26 February 1999)	The project does not affect the habitats of migratory species of wild animals.
Convention on Wetlands of International Importance (the Ramsar Convention 1971)	Only signatory	The project does not affect any wetland
Convention on Persistent Organic Pollutants (2001)	Ratified (24 September 2004)	A waste management plan is in place to avoid environmental pollution.
Basel Convention on the Control of Trans-boundary Movements of Hazardous Wastes and their Disposal (1995)	Acceded to (1 June 2000)	A waste management plan is in place to avoid environmental pollution.
Bamako Convention on the Ban of the Import into Africa and the Control of Trans-boundary Movement and Management of Hazardous Wastes within Africa (1991)	Only signatory	A waste management plan is in place to avoid environmental pollution.
The Paris Agreement on Climate Change (2015)	Ratified (25 February 2005)	This agreement sets overarching global goals to limit temperature increase to below 2 degrees Celsius and pursue efforts to limit growth to 1.5. This project will be implemented in line with the Climate Change Act 2023
Convention on the Elimination of All Forms of Discrimination against Women.	Ratified 1984	The project will ensure job opportunities for both men and women.

Convention	Date Ratified/Acceded to	Relevance to the project
Convention on the Rights of the Child	Ratified 1990	The ESMP has a provision that bars the contractor from engaging in child labor
Convention on the Rights of Persons with Disabilities	Ratified 2008	Any job opportunities that persons can do with disabilities may be availed.
The African Charter on Human and Peoples‟ Rights (African Charter)	Ratified 1981	The construction of the dam and associated structures will not violate human rights.

CHAPTER FOUR: ENVIRONMENTAL AND SOCIAL BASELINE INFORMATION

4.1 Introduction

The Thwake Dam project is within Kenya's lower eastern; Kitui and Makauni and designated as ASAL areas, which have limited rainfall, relatively elevated temperatures, and high evaporation levels. As a result, vegetation is generally withered during dry seasons, though soils are reported to be fertile. Most parts of Makueni and Kitui Counties typically lie within a water-scarce zone. In Makueni, rivers of Kaiti, Thwake, Thange, Uani, Muoni, Tawa, Kiboko, and Kiangini contain rivers with very low flows that traverse the area, mainly seasonal tributaries. Suitable sites for earth dams are few and far apart, with inadequate catchments. At the same time, groundwater potential is generally poor in most locations due to poor recharge except for low-lying areas and river flood plains.
The project area is agricultural (though limited by inadequate rainfall), with cash crops (cotton, horticulture, etc.) and food/subsistence crops (maize, beans, pigeon peas, cowpeas, cassava).

4.2 Topography and Physiography

The dam project area is located on relatively undulating terrain with a general slope running in a north-easterly direction and an elevation of 600m above sea level in the southeastern to 1,900m above sea level in the northwestern. Among the notable physical features dominating the area and the adjoining regions include Unoa Hills (1,280m above sea level), Malivani Hills (1,340m above sea level), and Nzueni Hills (1,403m above sea level). Further north are highlands constituting surface water sources, among them Nthagu, Kitondo, and Iuani Hills, where seasonal streams originate flowing south and east, draining into the Kaiti River, then Thwake river and eventually into the Athi River.

On the Kitui side, the Yatta plateau stands high at an average of 1,170m above sea level. It creates a significant physiological barrier between the larger Makueni and the larger Kitui Counties. The plateau runs in a north-south direction, with the Athi River flowing in the same direction to the south, and sits on complex basements that also determine the drainage trends of the area. Among the outstanding physiological features on the Yatta plateau and within the immediate proximity of the dam project area include Kanyangi Hill (1,160m a.s.l.), Kilisa Hill (1,146m a.s.l.) and Ndandoni Hill (1.056m a.s.l.). This is in addition to numerous depressions, valleys, and notable peaks.

Basement activity has dominated the area's history and controlled the geomorphologic evolution. The area's rocks (mainly tertiary strata) rest directly on the Basement system and generally have a gentle easterly slope. Over the years, human economic and settlement activities have interfered with most land surfaces and related landforms through massive excavations, drainage pattern charges, and vegetation clearing. Notably, the eastern direction of the area is dominated by a gentle slope, while the hill intercalated by ridged valleys entirely dominates the other direction.

4.3 DRAINAGE AND HYDROLOGY

4.3.1 DRAINAGE

The project area falls within the greater Tana and Athi drainage basin, which mainly includes the central and eastern parts of the country. The management of water resources in this drainage primarily falls under the Tanathi Water Services Board in Kitui Town. However, the upper sections of the Athi River basin are under the Athi Water Services Board, which is in Nairobi. The drainage pattern of the greater Makueni (now comprising of Makueni, Mbooni East, Kibwezi, Nzaui and Kathonzweni) is highly influenced by the Athi River and its tributaries (Kambu, Kaiti, Kiboko, Mtito Andei, Thwake, Thange, Uani, Muoni, Tawa and Kiangini among others) rising from the central highlands running eastwards toward the Indian Ocean as the Galana/Sabaki River. The flow route of the river in the area follows the topography trends. Due to the flat terrain, clear catchments, and un-cohesive soils, flush rainfall can flood or wash down infrastructure (roads and bridges), and, therefore, there is evidence of drainage structures (culverts, drifts, and bridges across major river streams). Furthermore, farmers and landowners have internalized soil control measures, including terracing.

The Yatta Plateau is the main influencing physiological feature running east of the dam area on the Kitui side. While the Athi River runs southeasterly along the plateau's western edge following its alignment, part of the watershed and tributaries are to the west of the plateau and join the Athi River far downstream.

4.3.2 HYDROLOGY

Thwake dam falls within the Athi Catchment, which is drained by the Athi River basin and its tributaries. The hydrology is, therefore, influenced by the flows from Nairobi's river system (Nairobi, Ngong, Mbagathi, Ruaka, Ruiru, etc.) in the upper reaches of the catchment that spans as far as Ngong hills, Kikuyu Plateaus, and the lower slopes of the Aberdares. Nearer the project area are notable rivers (most of them seasonal), including Thwake, Tawa, Kaiti, Iuani, and Kalawa rivers upstream of the proposed site, while Kiboko, Makindu, Muoni, Kiangini, Mbanya, Mtito Andei, Kibwezi, Kambu and Thange rivers discharge into Athi River downstream of the dam location.

The Athi River drains a catchment area spanning about 10,276km2 upstream of the dam. The reservoir covers an area of approximately 29 km2 . Thwake River is a seasonal tributary of the perennial Athi River. The project area gets an annual average rainfall of 500 mm per year that is also unevenly distributed over time with long periods of dry weather. From literature review, the Athi River at River Gauging Station 3F02, which is within the dam site has a mean annual mean discharge of 34.04m^3 /sec, maximum annual discharge of 218.89 m^3 /sec and a minimum annual discharge of 1.3 m^3 /sec. This amounts to 2.94M m^3 /day. Water abstraction for the purposes of dam construction ranges between 2,500 – 3,000 m^3 /day, which has been authorised by Water Resources Authority. The water is used both for construction works and for workers domestic use. This amounts to only 0.1% of abstration, leaving the rest 99.9% to flow downstream. Therefore river water abstraction is insignificant and the environmental flow has not been affected by the construction works.

4.4 WATER RESOURCES

A household survey carried out in 2018, indicates the presence of different sources of drinking water within the project area, including stream/rivers, protected wells, unprotected wells, boreholes and rain

harvesting, (Figure 4.1). Majority of the respondents (59%) identified stream/river as the major source of drinking water followed by rain water harvesting (14%) and unprotected well (10%).

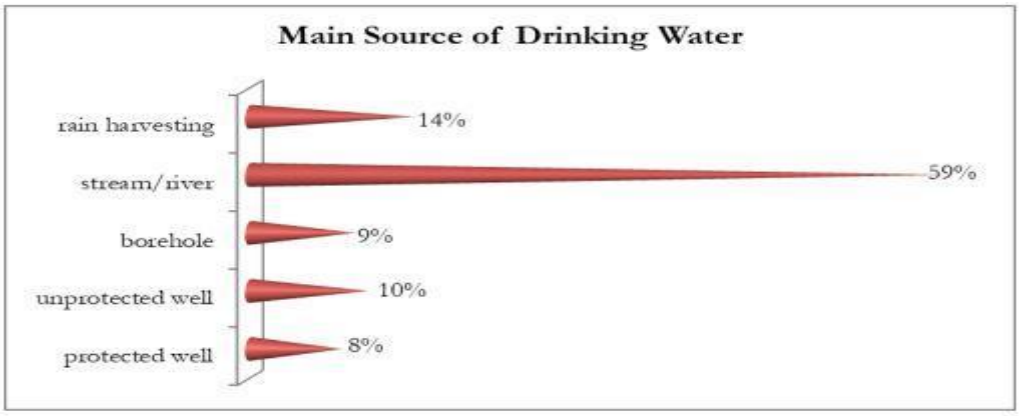


Figure 4.1: Sources of Water

Source: Household Survey 2017.

Households in Makueni and Kitui the adjoining area (Mbooni East and Kitui) are dependent on two main categories of water sources as follows;

4.4.1 SURFACE WATER SOURCES

The primary surface sources of water in the project area (Thwake, Muoni, Kaiti, Kalawa, Kiangini, Mbanya, Thange, and Uani rivers, among others) flow west – east general direction and have sources from Mbooni Hills in the North. In contrast, other tributaries originate from Kikima and Kiu hills to the East. The rivers and their tributaries influence surface water sources and groundwater recharge capacity. Most rivers are semi-permanent (seasonal) and drain into the Athi River system, while most tributaries are seasonal.

Specific sources included Kambi ya Mawe, Kikumini dams, and Kaiti River as the notable surface water sources for the Wote Sub-county. Sources in Kalawa Sub-County include Kyamakuthi, Mkuku, Yumbuni, and Kiatirieni earth dams as well as access to the seasonal Kalawa stream, Thwake River, and Athi River, with the latter being the only permanent source. Kathonzweni benefits from about nine earth dams provided by various groups, including the Red Cross (Ituka and Kwa Musele dams), CDF initiatives, World Vision, the Catholic Church, and the Ministry of Water. Kikuu and Athi Rivers are also accessible whenever surface or sub-surface flow occurs. Finally, notable sources in Nguu include the Nthunguni and Mwingati rock catchment dams and the seasonal Muoni and Kikuu rivers.
During dry seasons, local consumers use small sand holes between 0.5m and 2m, often by water vendors, to extract water from the riverbeds. More than 50% of water consumers in the urban centers and the area, in general, depend on surface and sub-surface water sources.
Many households have installed rainwater harvesting systems (direct from roofs) and communal rock catchment systems. Where rock catchments have been provided, storage tanks and water kiosks have also been installed under the management of the same communities. A good example is found at Mathangathi village in Mavindini.

4.4.2 GROUNDWATER

Groundwater is perhaps the most reliable water source in Makueni and Kitui Counties, though unsustainable depths, poor yields, and associated costs limit exploitation. For example, Wote Water and Sewerage Company extracts water for public supply from a borehole constructed in 1947, while many other private and institutional boreholes exist in various parts of Makueni. Wote Sub-County has the highest groundwater yield and the most boreholes in the area in terms of number and presence, with over 25 boreholes compared to an average of less than five in other Wards. There are more boreholes in the lower zones,

4.4.3 WATER QUALITY

The project tests the water quality on a quarterly basis. According to EMCA regulations (2006, water quality monitoring for sources of domestic water should be maintained at least twice every calendar year and such monitoring records shall be in the prescribed form. Physical-chemical and biological test results presented during the audit for the period October 2020 - March 2022 for some selected parameters are shown in Table 4.1. Spot sampling and laboratory testing was also conducted during the audit and results are also presented in Table 4.1. The following variances were observed between the contractor's and this audit results.

· Colour – the variance could be attributed to the rains which occurred a few days before the date of the site survey, during which the primary information herein was gathered.

· Nitrate concentration - this was observed both upstream and downstream of the Athi River, while in Thwake River, no nitrate was detected. This may indicate that nitrate is contributed by Athi River.

Table 4.1 Water physical-chemical analysis for selected parameters (Domestic use)

Source: ESA Report 2022.

	Oct 20		Mar 21		July 21		Oct 21		Feb 22		
	Athi River										
Parameter*	**Up**	**Down**	**Up**	**Down**	**Up**	**Down**	**Up**	**Down**	**Up**	**Down**	**Guide****
pH	8.12	8.60	8.97	8.97	8.21	8.34	8.70	8.75	8.89	8.75	6.5-8.5
Colour	<10	20	20	30	<10	<10	20	20	20	20	<15
Conductivity***	470	470	630	640	500	520	630	640	760	780	<1500
Chloride	42.7	43	63.2	72	43.5	46.9	62.1	63.3	82.8	87.9	<250
Fluoride	0.96	1.08	1.16	1.16	0.97	1.21	1.86	1.32	1.98	1.51	<1.5
Nitrate	9.66	9.96	9.54	9.72	12	11.8	9.75	10.4	12.3	10.2	
Nitrite	0.11	0.1	0.2	0.18	0.12	0.017	0.081	0.1	0.28	0.21	<3
COD	28	24	38	52	19	15	26	21	43	34	<30
BOD	<1.0	<1.0	10	30	<1.0	30	10	10	20	20	<30
TDS	294	298	398	404	316	326	398	403	481	491	<1200
TSS	52	49	72	78	21	14	36	34	66	79	<30
Oil and Grease	<0.01	<0.01	0.012	<0.01	0.012	<0.01	<0.01	<0.01	0.016	<0.01	Nil

4.5 BIODIVERSITY

4.5.1 VEGETATION

Floral surveys undertaken between in the month of March 2022 revealed the following: The project area depicts a homogenous mix of plant species adapted to dry conditions and low rainfall experienced

throughout the year. The area has a dry wooded vegetation dominated Acacia-Combretum sp. and dry land grass species. Floral species sampled ranged from small Samplings, small trees, and medium trees to large trees. Floral diversity in the project area was largely associated with human encroachment up to the riparian habitats in activities seeking resources such as fuel wood, charcoal, grass and other plants used in livestock grazing. Further in the settled areas there were some few alien invasive plants, mainly bushes such as Lantana camara bushes and others of wild thorny berriesAmong the significant notable plant species in the dam area include (ESA Report, 2022):

i) Grasses – *Chloris gayana, Common star* grass and *Themeda thriandra*,
ii) Poisonous weeds – *Solanum incanum* and *Datura stramonium*,
iii) Acacia species – *Acacia tortilis, Acacia melifera* and *Acacia Karki*
iv) Shrubs – *Banalities aegypttica* and *Lantana Kamara*,
v) Horticultural crops like pawpaw, mangoes, maize, oranges, and bananas, among others,
vi) Indigenous trees like *Croton megalocarpus* and Exotic trees

4.5.2 ANIMAL SPECIES

4.5.2.1: Mammals

Historically the area had a wide variety of wild animals. These include the Elephants, African Buffalo, Grey Duiker, Black backed jackal, lesser kudu, spotted hyena, olive baboon. The only large mammal sighted at the project area were the Common Hippopotamus (Hippopotamus amphibius) which were in the river waters and at the main dam area; and upstream area of the Athi river. Most Sightings made were of small mammals which included hares, Dik dik (Madoqua kirkii), Hinde's rock rat (Aethomys hindei), the white backed mongoose and the Striped Grass Mouse (Lemniscomys striatus). The local people also reported occasional sighting of the Bat-eared Fox (Otocyon megalotis); Velvet monkeys (Chlorocebus pygerythrus), White tailed mongoose (Ichneumia albicauda) and the Bush baby (Galago senegalensis), around wet riverine areas with trees. Bats pellets-like droppings around tall leafy trees, and also protective quills of the African Crested Porcupine (Hystrix cristata) quills were sighted in the upstream area during the survey. These species of small mammals have all been found in low numbers in the area. With exception of the hippos within the waters of the dam area majority of these species have a larger ecosystem range outside the dam area. The areas to be affected are not considered to be critical or of special importance for these species but conservation of faunal species present in the area remain important. There have been cases of human wildlife conflicts involving the hippos and crocodiles, the baboons and velvet monkeys are a nuisance as they are notorious crop raiders. Hyrax and squirrels can be observed all over the area.

4.5.2.2 Birds

There are many bird species in the area and especially the riverine sections. Some of the birds spotted during the survey included the following: Fish Eagles (Haliaeetus vocifer), Eastern Chanting-Goshawk, Melierax sp. Eastern Nicator (Nicator gularis), African Dusky Flycatcher (Andropadus latirostris), Yellow-whiskered Greenbul (Andropadus latirostris), Others included birds (Plocepasser mahali, Ploceus subaureus and Ploceus vitellinus; Woodpecker; striped Kingfisher (Halcyon sp. Secretary bird (Sagittarius serpentarius), Common Hoopoe (Upupa epops) Helmeted Guineafowl (Numida meleagris) which was seen in an area with bush and tall grass; Speckled Pigeon Columba guinea, the Barbet (Trachyphonus darnaudii), Verreaux's Eagle-Owl (Bubo lacteus), the Barn owl, (Tyto alba), Red-backed Scrub-Robin (Cercotrichas leucophrys), White-faced Whistling-Duck Dendrocygna viduata, the Hammerkop (Scopus umbretta) which was found along the river flood plain; The White necked crows (Corvus albicollis) were also spotted near a local shopping Centre in the dam area zone. Three bird species of conservation significance reported in the area, including hornbills (which were reported to

have been present in the wet riverine forest patches in the past but have over the years disappeared); heron which is almost endangered. The endangered Hindes babler (Turdoides hindei) was also reported to have been seen in the more wetter and densier riverine patches, but has in recent years disappeared. The respective populations of large birds' species occurred in low numbers. Birds in the area, as well as those which are migratory transiting through the area, were most likely affected by noise and dust from construction site and trucks bring materials.

4.5.2.3 Fish

The fish in the area are mainly found are Barbus sp., Ray-finned fish (Momyrus) sp., and the common eel angelic anguila, African Catfish (Clarias sp.); Common Carp Cyprinus carpie;
Further noted that the on-going Project is expected to attract additional aquatic animal species to location (hippos, crocodiles, snakes, etc.). and Tilapia (Tilapia sp. Local fishermen reported that their respective populations have greatly reduced over the years especially due to high water pollution levels in the Athi River.

4.5.2.4 Invertebrates

There were many different types of invertebrates especially arthropod categories of insects such as butterflies, Honey bees (Apis melifella); Grasshopper, Locust (brown locust), crickets ants, wasps, dragon fly, firefly, termites, and diseases vectors such as mosquitoes and various crop pests around mostly found on tree leaves; crustaceans which were represented by crabs found around the river bank, arachnids mostly on the riverine trees, and myriapods which included the millipedes and Centipedes of moist soils around trees and along the river bank. Molluscs were also present as slags were seen under moist tree leaves; Mollucs shells were also collected in the riverine zone.

4.5.2.5 Amphibians

These include frogs and toads .The aridity of the area, climate change and ecosystem disturbances could be affecting populations of amphibians.

4.6 GEOLOGY AND SOILS

4.6.1 GEOLOGY

Achaean gneisses of the Basement system characterize the geology of Makueni and the neighboring areas. These are the oldest rocks in the area, comprising *quartz-felspathic gneisses* and *biotite gneisses* beneath the recent soils. The project area overlays a basement system, which is characterized by low groundwater yields in the low-lying areas. The base rock is observed only to recharge fast when it is adjacent to a riverbed that directly infiltrates water. This explains the great depths attained to strike reliable aquifers. It is also notable that boreholes drilled on Basement rocks running in parallel trends within short distances hardly interfere with each other due to the unique morphological strata in the area that limit the lateral flow of underground water. This is the kind of base rock running across the Athi River at the point proposed for the dam embankment.

4.6.2 SOILS

Deep sandy alluvium, red sandy soils, and patches of black cotton soils and murram at the project site generally cover most areas around the Makueni and Kitui Counties. Typical soils are sandy (eroded from the base sedimentary rock) and contain little organic matter, resulting in low fertility. However, valleys and river flood plains have notable productive soils due to the accumulation of silt and minerals, although a lack of adequate rainfall limits them. Though most areas have been cleared of vegetation for

agricultural purposes, soil conservation initiatives have been integrated into land use practices by constructing terraces on almost all cultivated land. There is, however, still notable siltation (soil loss into river beds) in most rivers in the area. Soil fertility is high in most areas, but productivity is hampered by poor rainfall.

4.7 CLIMATIC CONDITIONS

4.7.1 RAINFALL

The hills to the north and central parts influence the climate in Makueni County. These higher zones are cool and wet and receive 800mm – 1,200mm rainfall yearly, whereas the low-lying areas are hot and dry, receiving 200mm – 900mm rainfall yearly. The project area receives scarce rain throughout the year, with an average of 500mm per annum spread over two seasons, contributing to the area's severe scarcity of surface water sources. Rainfall is also unevenly distributed over time and space with long periods of dry weather. Long rains occur in March/April, while short ones occur in November/December. Low rainfall is attributed to the trends in winds from the ocean towards the central highlands and high temperatures. Due to the rainfall fluctuations and long dry spells, the generation of silt from the catchments (especially from the Thwake River basin) is relatively high. High flash floods bring heavy loads of silt (sand) towards the dam's location (tonnes of sand were observed in the area).

4.7.2 TEMPERATURES

Makueni and Kitui Counties, in general, experience homogenous climatic conditions characterized by high temperatures during the day measuring up to 32^{o}C and low temperatures at night at an average of about 25^{o}C. During the dry season between May and October, extreme heat is experienced in the low-lying zones, while the high-altitude zones experience relatively cool temperatures. The high temperatures experienced in the low-lying areas cause high evapotranspiration and moisture losses from soils and plants.

4.8 SOCIAL AND ECONOMIC BASELINE CONDITIONS

This section reports the status of the socio-economic conditions. It provides information on the relationship of the project area to the socio-economic aspects, which will assist in determining how the project will affect the social component of the environment. The impact areas for the socio-economic assessment are within the dam site area and the neighbourhood.

4.8.1 ADMINISTRATIVE SETUP AND LOCATION- THE DAM SITE

Thwake Multipurpose Dam will be located 188 km south of Nairobi in the Eastern Province. The dam wall will be sited 1km immediately downstream from the confluence of the Athi and Thwake rivers. The dam wall will be across the Athi River at the Mavindini location of Mavindini in Makueni County and the Kanyangi location in Kitui County. The dam barrier will cut across the Athi River, thereby joining Kilisa hill, part of the Yatta plateau, in the Syomunyu sub-location (Kanyangi location) and Kathukuni hill in Kathukuni village, Katithi sub-location of Mavindini location (Mavindini Ward).
Thwake Dam water is earmarked to cover a total land area of 2,900 hectares across the three counties of Makueni, Mbooni East, and Kitui. The administrative regions that will be fully or partially covered with the envisaged dam water are analyzed in Table 4.2 below:

Table 4.2: Administrative areas covered by Thwake Dam Water Mass

County	Division	Location	Sub-location and size	Villages
Makueni	Mavindini	Mavindini	Katithi (-)	Kathukuni
				Nguumo
				Kiatine
				Miksi
			Mavindini (93.7km^2)#	Thwake
				Ndulumoni
	Kalawa	Kathulumbi	Syotuvali (38.6km^2)	Athi
				Ngomano
				Unyeeo
				Ndindi
				Mutukya
			Kathulumbi (31.4km^2)	Mililuni
		Katangini	Kathongo (20.3km^2)	Ndulumoni
Kitui	Kanyangi	Kanyangi	Kanyangi (150.2km^2)	Kitungulu B
				Syomakanda
				Mukameni (Partly)
				Kilisa
				Kitungulu "B"
				Kinyaau
		Nzambia	Nzambia	Kinyaau
Total 3	3	4	6	

Source: Assistant Chiefs and Village Elders offices

4.8.2 INFRASTRUCTURE IN THE PROJECT AREA

The project site and its surface area can be accessed through the road network using public vehicles, motorbikes, bicycles, and on foot while transporting goods, which involves using all these means plus donkeys and ox-drawn carts. The main roads serving the dam location and its surface area are the Nairobi-Machakos-Kathonzweni and the Nairobi-Mombasa road, where one has to divert at Makindu junction and proceed to Kathonzweni Market. Both roads are entirely tarmacked. Another road accessing the project site is the Machakos - Kitui road through Masii-Tawa road or using the Kwa Vonza - Yatta plateau road to Syomunyu Kanyangi Markets (on the banks of Athi River) in Yatta.

Specifically, the project site can be accessed from Kathonzweni market through Mavindini via Mathemba market or through Kyemuole market junction via Muusini market where roads are well murramed and maintained. From Wote market, the project site can be accessed through Mavindini via Kikumini and Ngosini markets in Makueni or Kathulumbi market via Kalawa town in Mbooni East. In most cases, bicycles and public service vehicles are used for transport. The most common transport

mode is PSV vehicles, motorbikes and bicycles. A small percentage of the community menbers have their own vehiscles, many of the being business.
Communication is mainly by use of mobile phones across the project area, which is fully covered Safaricon and Airtel mobiles networks.

4.8.3 SOURCES OF ENERGY

Kathonzweni and Kalawa markets are the nearest points to the project site, which is served with electricity. Most parts of Makueni County are served with electricity as the fundamental source of energy supplemented with firewood, charcoal, and oil fuels (diesel, kerosene, and petrol). Firewood and charcoal are the most used energy sources for cooking in Kalawa, Mavindini, and Kanyangi areas. Solar and gas energy are rarely used in the project area. The figure below shows the types of energy for cooking.

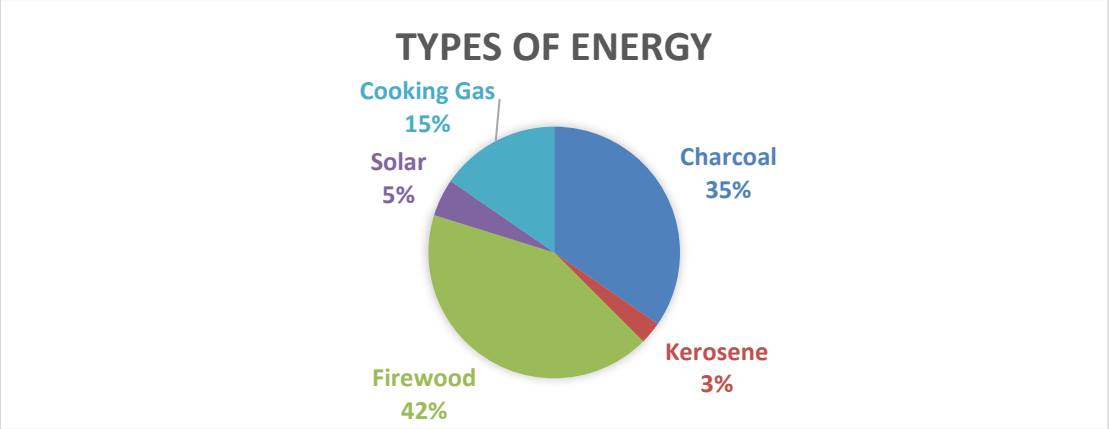


Figure 4.2: Types of Energy Sources (Community Meetings Discussions)

4.8.4 Institutions and Development Agencies in the Project Area

There are various institutions and development agencies (local and outside) within Mavindini, Katithi, Kathulumbi, Syotuvali, and Syomunyu sub-locations, most of which will benefit from and/or participate in the development of the proposed Thwake Multi-purpose Dam project. These institutions and their roles are tabulated in Table 4.3.:

Table 4.3: Institutions and Development Agencies within the Project Area

Type of Institution	Names of Institutions
Markets	Mavindini, Katithi, Miziki, Kathulumbi, Syotuvali, Syomunyu and Kanyangi
Churches	Seventh Day Adventist, Catholic church, Africa Inland Church, and Redeemed Gospel Church.
Schools	**Secondary schools:** Mavindini, Katithi, Mutembuku, Kitoto, Kathulumbi, St. Stephen- Kanyonga, Kanyangi and Syomunyu, **Primary Schools:** Ilumani, Miangeni, Mavindini Kanyonga, Mumbeeni, Miksi, Mathangathini, Kitumbai, Katithi, Kathulumbi, Unyeeyo, Kamutonye, Kitoto, Syongungi, Mutembuku, Muaani, Kathamba Ngii, Kakuli and Mukelenzu

Development agencies	Kenya Rural Enterprise Program, Kenya Women Finance Trust, ACT – Now (branch of German Agro Action), Arid Land Resource Management Project (ALRMP II), ICRISAT, Inades Formation, Makueni Ginneries, World Vision, World Food Programme, UCCS and Red Cross

In addition, numerous CBOs exist (as well as local merry-go-rounds ("chamas")) and local community societies in the project area. Recently, Worldvision has assisted farmers in the project area by funding terrace digging in proponent farms.

4.8.5 SERVICE AREAS

Thwake Multi-purpose dam, once fully completed, is earmarked to produce hydropower and water for domestic and irrigation use. The service area to be served with water for either irrigation or domestic is not already determined but would include fully or partially the areas presented in Table 4.4.

Table 4.4: The Project Service Areas

County	Ward	Area (Km^2)	Percent of total County area (%)
Kibwezi	Mtito Andei	931.2	69.7
	Kibwezi	817.7	
	Machinery	127.1	
	Makindu	880.2	
Makueni	Quote	400.6	75.4
	Kathonzweni	183.4	
	Kithuki	148.7	
	Kitise	291.5	
	Mavindini	257.1	
Mbooni	Kalawa	330	34.7
Nzaui	Nguu	350.3	24.8
Total 4	11	4,717.8	51.2

Source: County Offices Makueni and Kibwezi, 2012

The table above indicates that Thwake Dam will serve approximately an area of 4,717.8 Km^2, which essentially accounts for 51.2% of the total size of the region. This implies that the proposed project will significantly impact over 50% of the administrative units. The project's service area covers parts of three counties: Kibwezi, Mbooni, and Makueni.

4.8.6 LAND OWNERSHIP AND SETTLEMENT PATTERNS

The project area was part of the initiative and support of the Makueni settlement scheme, which started in 1948 to settle retired Akamba soldiers. The other category of people settled in this area included the landless citizens from areas with high population zones that experienced land degradation around Machakos County. The average sizes of land parcels owned by individual households ranged between 0.8 to 16.0 hectares.

All land in the project area, except Katumbua Hill – trust land, is individually and privately owned. Land in Mavindini and Kalawa Wards has been registered, title deeds have been issued, and land in Kanyangi, Kitui has yet to be surveyed and registered. However, discussions indicated that the highest number of landowners hold title deeds of the first generation.At the same time, their offspring do not possess the title deed but own shares from the first-generation title deeds. According to the baseline study, land adjudication and registration is in two forms:

(i) Land surveyed, registered, and title deeds issued as is the case in the Mavindini and Kalawa areas

(ii) The land was not surveyed nor registered and thus not titled, as is the case with Syomunyu in Yatta Ward.

The land to be acquired for the proposed project was complicated by other aspects, including pending dispute cases arising from the "come we shelter" policy among the local tribe and unclear demarcations and "squatters." Regarding land in the area, two main categories of "those affected" were identified.

i) Category A: Residents losing all their land to the main dam or buffer area.

ii) Category B: Residents losing parts of their land to the main dam or buffer area.

To accommodate the project design changes, the Government of Kenya acquired additional 59 acres of land whose owners neighbor the project on the Makueni side. The land owners were compensated and moved out of the land voluntarily. The project is in the process of processing title deeds for those whose land was partially acquired.

4.8.7 LAND USE

Land in the neighbouring areas is used for residential buildings, business/market centres, crop cultivation (growing maize, beans, peas, cotton, and green, among others), grazing, and extracting construction materials (quarrying) – see as illustrated in figure 4.3 below.

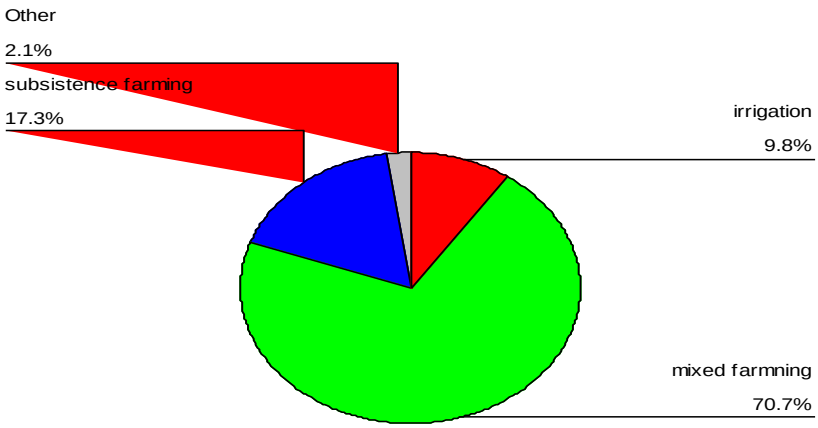


Figure 4.3: Land Use and Patterns and Activities

Previously. The acquired land was used for dwelling, subsistence farming and livestock grazing. The land is now under project construction use and belongs to the Government of Kenya.

The survey (Baseline 2018) indicates that land in the project area is mainly used for residential buildings, commercial buildings, market centers, crop cultivation, grazing and extracting construction materials (quarrying). Growing of food crops is the dominant type of land use in the project as 32% of the respondents said that they practice it. Grazing and cash crop farming are the other major land uses in the area as they accounted for 28% and 22% of responses respectively. Food crops grown in the area include maize, beans green grams, cowpeas, pigeon peas, sorghum and finger millet. Maize is the main food crop and is intercropped with beans while cow peas are the main legumes grown in the area. Other crops grown include vegetables and fruits especially mangoes and pawpaw.

4.8.8 AGRICULTURAL ACTIVITIES AROUND THE PROJECT AREA

Agriculture in the project area including the project acquired land is determined by bimodal rainfall, with short rains falling between October and December and long rains falling between March and May. The project lies in an agro-pastoral zone APLZ I & APLZ I, comprising the lower extremely arid zone. It is classified under ecological zones LM4/5, characterized by frequent dry spells and inadequate proper green vegetation.

The project area falls within the marginal Agro-Pastoral Livelihoods zones where short rains account for about 85% of the annual harvest. Due to the arid conditions, the region experiences recurrent shocks in the form of poor long rains, low prices of livestock (as low as between 15.8% and 34.4%), and higher prices of food commodities, mostly Maize and beans. The area faces a high magnitude of cyclical food deficiency, depending on rainfall, forcing most of the population to rely on food aid. For example, a historical profile exercise in the area revealed that between 1955 and 1999, there were six significant famines, including *"Yua ya Ndeke-1955, Yua ya Atta – 1964/65, Yua ya Longos1974/75, Nikw'a Ngwete – 1980/81, Yua ya Ndukambikwatye – 1984 and Yua ya Ngatata –1993/94".* Some of these famines have been so severe that residents have been forced to return to the ancestral land they migrated from.

Subsistence farming is dominant in the area, with most farmers growing food crops, namely maize, sorghum, beans, and green grains. Maize is the main food crop intercropped with beans, while cowpeas are the main legumes grown in the area. Other crops grown include beans, cow peas, sorghum, millet, cassava, sweet potatoes, pigeon peas, and black-green grams. Sorghum production is not popular, but it has experienced increasing growth in total acreage. Some farmers have started growing fruits, including mangoes, paw paws, citrus, and cotton for commercial purposes. However, cotton production in the area is gradually decreasing. There is minimal use of inputs, including certified seeds and fertilizer, mainly by those doing irrigation. However, there is an average increase in pesticides to control diseases and pests. The farm management level is low, possibly responsible for low crop yields per acre. The main crops grown and production levels in Mavindini are presented in Table 4.5 below.

Table 4.5: Statistics for Food and Cash Crops for Mavindini Division

Name of crop	Hectare	Potential Yield Per Hectare
Maize	800	5 bags
Sorghum	300	4 bags
Beans	280	3 bags
Pigeon peas	400	5 bags

Cow peas	500	4 bags
Cassava	40	5 bags
Millets	20	4 bags
Green grams	500	4 bags
Cotton	600	850 Kgs

Source: Agricultural Extension offices – Kathonzweni

Crop farming faces significant pests and diseases, including Aphids, Mites, Scale and bollworms, weevils, pods, caterpillars, Powdery Mildew, and Wilt. With the arid climatic conditions and crop diseases, the project area largely depends on the import and relief of agricultural products.

4.8.9 LIVESTOCK

The mean population of households rearing livestock in the project areas is 88%, as the project area is generally suitable for livestock keeping. The principal livestock kept include cattle, sheep, goats, donkeys, poultry, rabbits, and bees. The livestock kept are mainly indigenous breeds that withstand harsh environmental conditions. Animals in the area provide the following benefits: cash income from the sale or hire of animals or their products; a source of power for cropping, transport, and manure for soil fertility maintenance; a source of food, transport, fuel, access to social support networks, cultural wellbeing and a variety of other functions.

Oxen are used for plowing, donkeys are used for fetching water, and those who own none chiefly borrow them after working for the wealthy and middle class to fetch their water and plow their land. Due to inadequate grass, cattle are illegally moved into restricted grazing areas like forests and KARI Farms. Table 4.6 presents livestock statistics in the Mavindini location in the project area.

Table 4.6: Livestock Statistics for Mavindini Division

Livestock Type	Breeds	Population	Average Per Household
Cattle (beef and dairy)	Zebu and Crosses	4,000	4
	Friesian, Jersey, Ayrshire and Crosses	23	1
Meat goats	Local and Galla	7,000	8
Sheep	Local and Doper	400	3
Donkeys	Local	150	1
Rabbits	Crosses	200	2
Poultry	Local	7,500	10
Bee keeping	Log type: lags troth	900:26	3

Source: Livestock Extension and veterinary offices – Kathonzweni.

The principal livestock products include beef, chevon/mutton, offal, eggs, milk, hides and skins, manure, and crude honey. Livestock rearing is, however, complicated by abnormal movements of family members to towns in search of employment opportunities. The area also has common livestock diseases, including CBPP, Black Quarter, Trypanosomiasis, Anaplasmosis, worms, Fowl Pox, and Coccidiosis.

4.8.10 POVERTY AND INCOME LEVELS

The KNBS Comprehensive Poverty Report 2020) used data from the Kenya Integrated Household Budget Survey (KIHBS) of 2015/16. The report findings confirmed that using a monetary measure alone does not capture the high incidence of Multidimensional poverty and that it is possible to be Multidimensional poor without being monetary poor. The analysis shows that relying only on monetary measures can send inaccurate signals to policymakers regarding the optimal design of social policies and monitoring their effectiveness.

The Monetary poverty rate for Makueni County is 34.5%, slightly lower than the national rate of 35.7%, with approximately 341,197 people in Makueni County being monetarily poor. Makueni County has a multidimensional poverty rate of 59.7%, 24 percentage points higher than the monetary poverty rate of 34.5%, with 589,618 people being multi-dimensionally poor. When disaggregated by age groups, 56.4% of children in Makueni County are multidimensional poor. This is four percentage points higher than the national average of 52.5%. Among the youth, 54% are multidimensional poor compared to a national average of 48.1%, while for the elderly population, 61% are multidimensional poor compared to a national average of 55.7%.

The core drivers of multidimensional poverty for youth aged 18-34 years are education (53.1%), housing (52.4%), nutrition (49.9%), water (47.6%), and economic activity (38.4%). Among adults aged 35-59 years, the core drivers of multidimensional poverty are economic activity (79.5%), education (76%), housing (64.6%), and water (55.6%). Among the elderly aged 60+ years, the core drivers of multidimensional poverty are housing (62.2%), nutrition (62.1%), education (56.6%), and water (53%) (Makeni County Integrated Development Plan 2023-2027).

4.8.11 EDUCATION

Education is considered an essential tool in Makueni County in alleviating poverty and is also key in determining the quality of the available labor force, which is helpful in all other sectors of the local economy. In Makueni and Mbooni East project areas, literacy levels are medium, with an average of 75.3% (79.6% for men and 70.9% for females) (ESIA, 2012)

Literacy levels in the project area are high at 85%. However, literacy levels for women are lower (77.7%) than for men (92.3%). The project site has many schools, as shown in Table 4.7.

Table 4.7: Educational Institutional Presence around the Project Area

Location	ECD Centers and Primary Schools	Secondary Schools	Polytechnics
Mavindini	Ilumani, Miangeni,Mavindini Kanyonga, Mumbeeni, Miksi, Mathangathini, Kitumbai and Katithi	Mavindini, Katithi, and St. Stephen- Kanyonga	Mavindini
Kathulumbi	Kathulumbi, Unyeeyo, Kamutonye, Kitoto, Syongungi, Mutembuku, Muaani, Kathamba Ngii, Kakuli and Mukelenzu	Kathulumbi, Kitoto and Mutembuku	Mutembuku

Kanyangi	Kinyau, Kilisa, Mukameni, Nzambia, Syomakanda, Kanyangi	Nzambia, Kanyangi, Syomunyu, Kalulini	Kanyangi Itulani

According to data collected during the community level meetings, using structured questionnaires, of those interviewed, 31.6% had primary education, 21.6% had secondary education, and 51.6% had a college education. This implies that most of the population had attained a college level of education. The primary and secondary education level population will provide adequate unskilled labor during construction and dam operation.

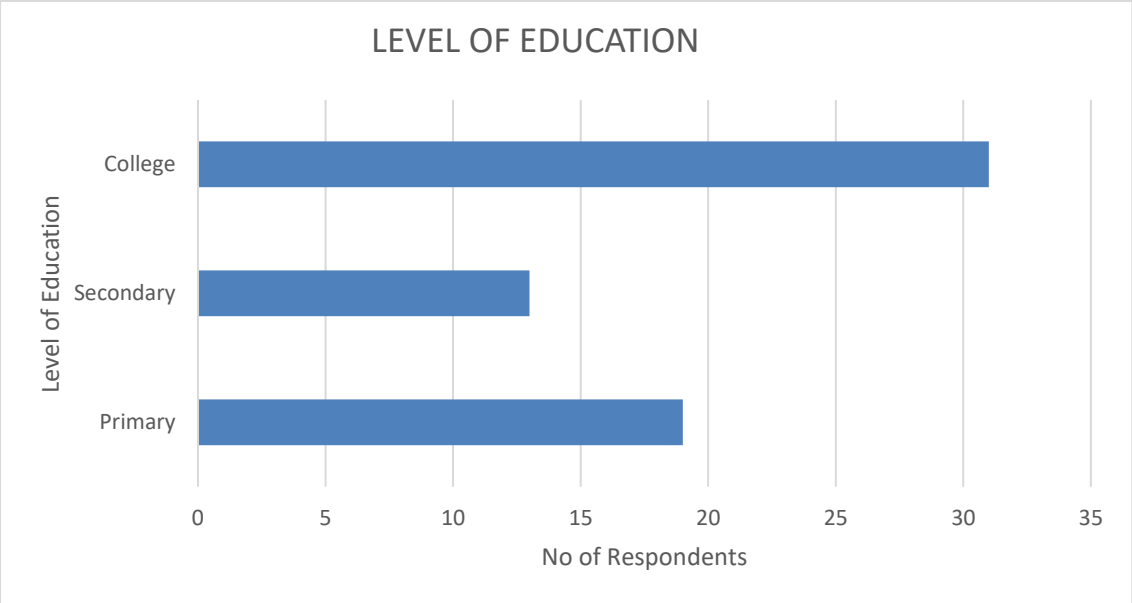


Figure 4.4: Level of Education (Responses from Community Meetings)

4.8.12 LABOUR FORCE AND ECONOMIC OCCUPATION

The project areas have a total labor force (those aged 15 – 64 years) of 117,601 persons. This provides a pool of workers for the construction of Thwake Dam. The agricultural sector is the leading industry employed, occupying 78% of the population, compared to rural self-employment (8%), wage employment (10%), and self-employment (4%).

The household survey in the project area indicated that 40% of the population is self-employed, while 33% are unemployed. Those in self-employment mainly own small businesses in the respective markets within the target areas and are mostly the younger generation.

4.8.13 HEALTH

Health information was collected using a structured questionnaire at the community-level meetings at Kanyangi, Katithi in Mavindini, and Kathulumbi. The common health issues that were reported by the community include malaria, upper respiratory illnesses food and water-borne illnesses such typhoid, cholera and other stomach illnesses, HIV and AIDS and other STI. The project site clinic is operational and cases of diseases reported by the project workers are treated at the clinic.

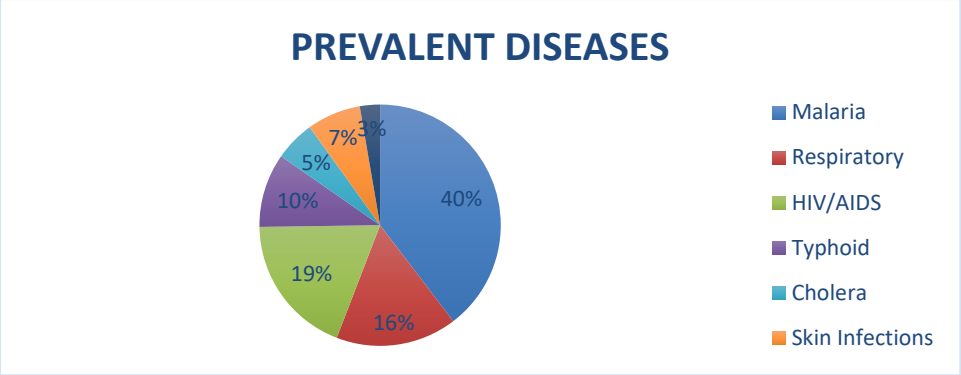


Figure 4.5:Disease Prevalence (Source: Responses from Community Meetings)

4.8.14 SANITATION

Household survey results indicate that households in the project area mainly use pit latrine with wall (69%) as the main means of human waste disposal. Ventilated improved pit latrine (2%) is the least used followed by open pit latrine with no wall (4%). The results also indicate that the households at least have a form of latrine (Baseline Study, 2018).

4.9 CROSS-CUTTING ISSUES

4.9.1 GENDER

In the 2019 census, Makueni County had a total population of 987,653, with 497,942 females and 489,691. More women than men are in the project areas, accounting for 54% of the total population. This is because most men migrate to the big towns for employment and other income opportunities. Gender disparities are also found between the rural and urban populations, where 54.9% of all urban populations were women, while they accounted for 54.5% of the rural population.
Ownership and access to productive resources mainly benefit the man. This is seen, for example, when all land and beef cattle are owned and controlled by men while the rest of the less valuable livestock, including chicken, are owned and managed by both men and women, but both genders manage all. A daily activity profile drawn for the area reveals that women undertake eighteen activities compared to men's fourteen. In addition, women undertake almost all water-related activities, including fetching water, washing utensils, washing the house and clothes, cooking, and bathing children.

Gender Mainstreaming:
Women and men will benefit equally from the employment opportunities created and safe access to drinking water. Women often run shops and bars in the area. During the construction period, there are income-generating activities for women, such as food catering/restaurants for workers on the construction sites, more bars, and selling local products to construction camp workers. These activities will mainly benefit women, who are often the sole supporters of their families. It is recommended that the contractor give equal employment opportunities to women and men within the project skills requirements and maximize the procurement of local products and services.
The resultant safe drinking water reduced distance to water will profoundly benefit women and create more time for them to engage in other productive activities. As women are culturally regarded as "responsible" for household chores, they must travel long distances in search of water. This could be changed by the provision of water to the rural area.

4.9.2 CULTURAL ISSUES

All the project service areas are mainly occupied by the Akamba community, which forms approximately 99% of the total population. However, there is still a substantive percentage of people from other communities, especially in the major towns of Wote, Kanyangi, Kalawa, Makindu, Kibwezi, and Mtito Andei. The Akamba consists of various clans, including *Atwii, Aombe, Akitondo, Atangwa, Akikui and Atwii.* These have elaborate cultural practices, including strong kinship linkages with organizations spanning from localized merry–go–rounds to strong clan relations and burial societies, as well as social interactions mainly during religious ceremonies. They have strong beliefs in traditions, including witchcraft, the state, and their relationship with their departed ancestors. More members from non-Kamba communities are expected to immigrate into the project area during and after the completion of the proposed dam to exploit the emerging opportunities in fishing, farming, and transport.

4.9.3 HIV/ AIDS AND OTHER COMMUNICABLE DISEASES

Makueni and Kitui counties are located in rural areas, and most of the inhabitants are non-residents. Therefore, social interactions and related implications are expected to be relatively low. The influence of significant towns, including Machakos and Nairobi, in terms of HIV/AIDS (and other social diseases) could be substantial. Makueni County has a population of 949,298, representing 49% males and 51% females. HIV prevalence in Makueni is (5.1%) lower than the national prevalence of 5.9% (Kenya HIV Estimates 2015).The main groups dealing with HIV/AIDS management in Makueni are Community-Based Organizations (CBOs), Self Help Groups, Women Groups and numerous other community initiatives. The National Council on HIV and AIDS also plays a leading role here.

4.9.4 CLIMATE CHANGE CONCERN

The construction and operation of the Thwake multipurpose dam should be seen within the context of global climate change, which might significantly affect the project's physical environment. Climate change could affect project operation through, for example, higher temperatures and, therefore, higher water demands, more intense rainfall and thus more intense floods, or reduced rainfall and lower water availability. However, the project itself will significantly increase the security of water supply to farmers and improve flood control, thereby militating against the potential impacts of climate change.

4.9.4 DISASTER RISK

The Kenyan Seismic Code, issued in 1973 by the Ministry of Works, uses the Modified Mercalli Intensity (MMI) scale to map the seismic hazard of the country. As the Figure below shows, the map divides the country in four seismic zones: Zone V, VI, VII and VIII-IX, where the Roman numbers are in accordance with the MMI scale. The adopted return period of design earthquakes even though not stated is inferred to be not more than 100 years.

The project is located along the Athi River on the border of Kitui – Makueni which lie in Zone V. Reference to A Catalogue of Felt Earthquakes in Kenya (1892-1969), for the seismic fortification intensity division diagram, the Project is set according to the intensity V, with the Seismic hazard rated as very low. The geological tectonic conditions within the project site and its environs would be of good stability.

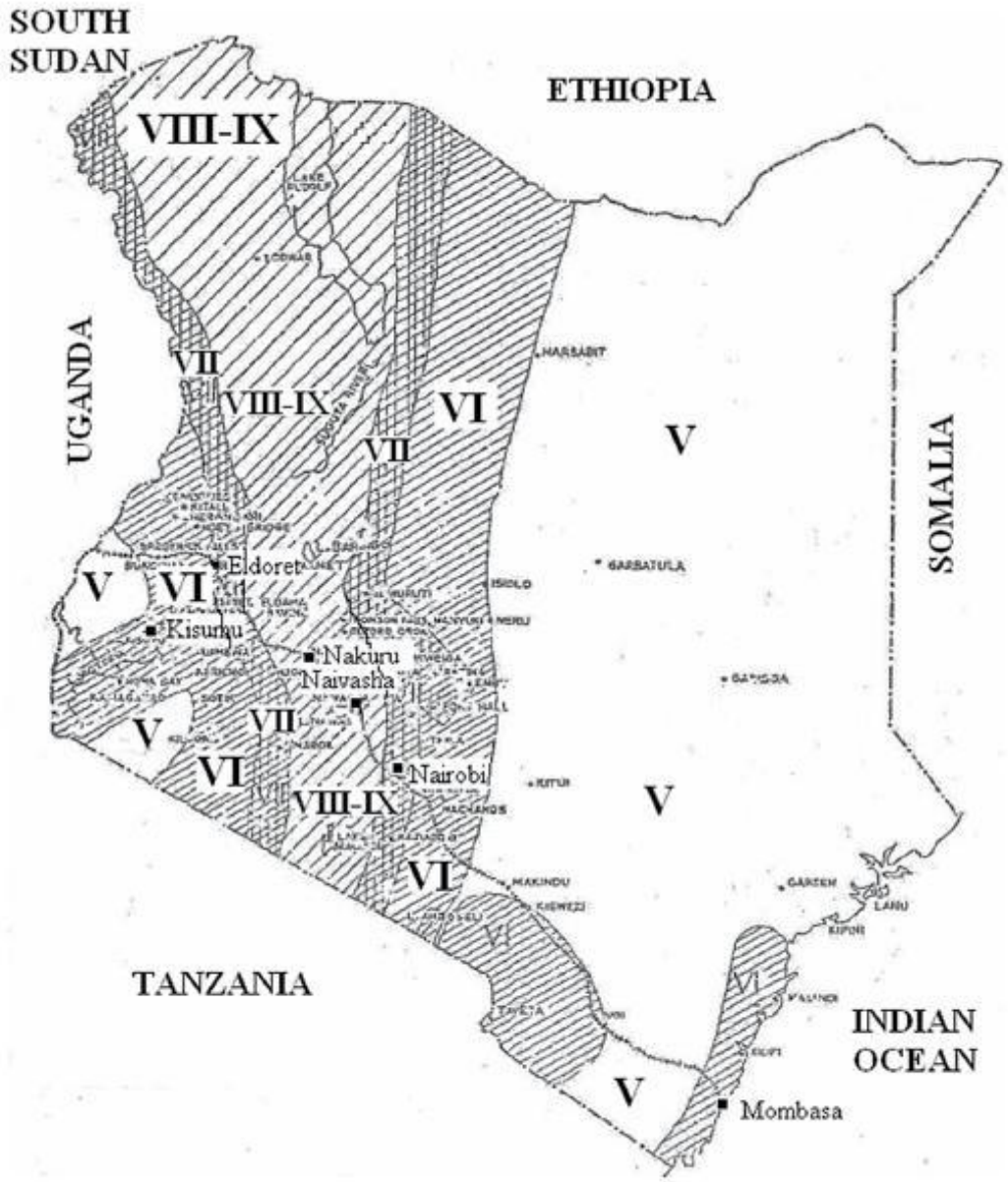
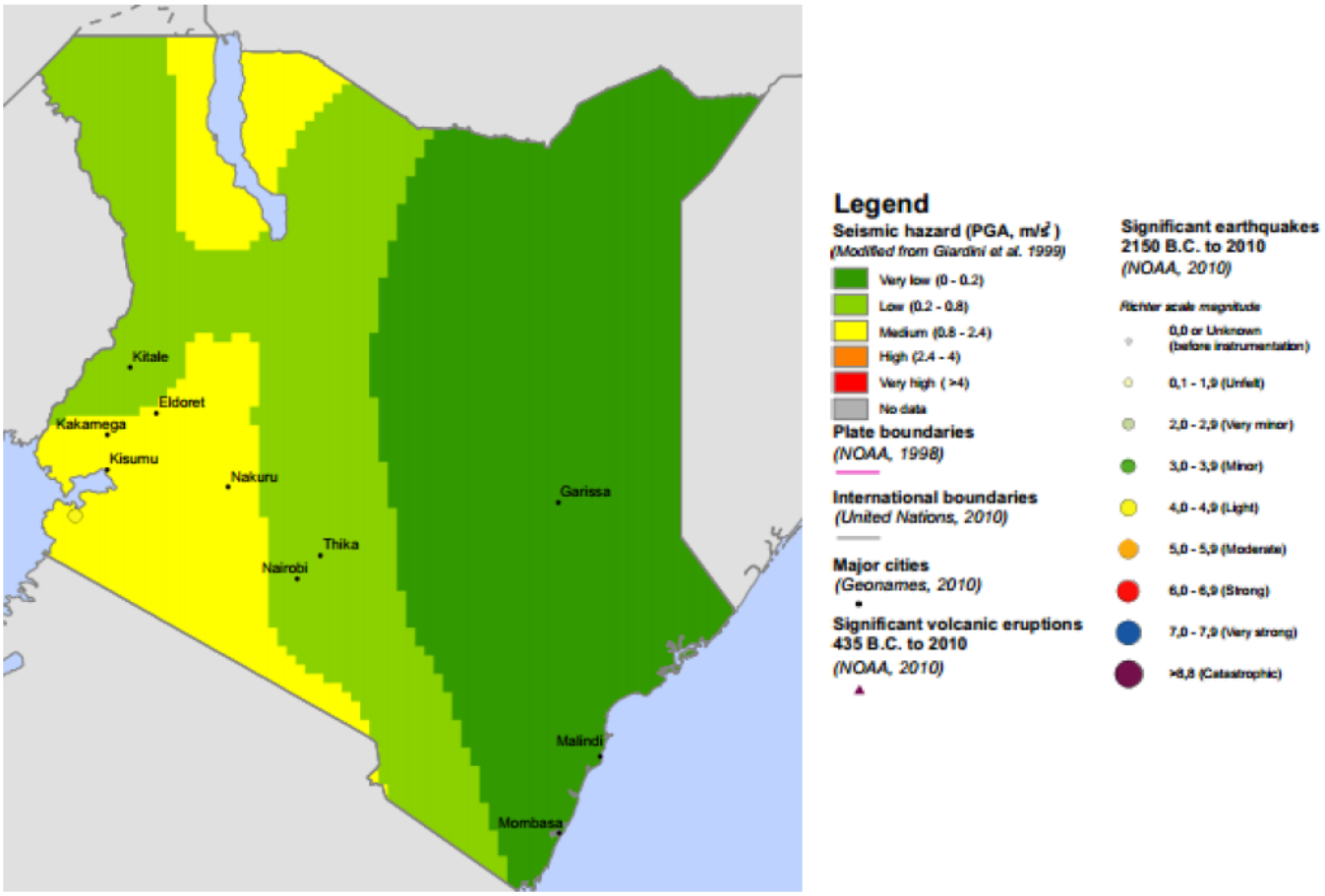


Figure 4.6: Seismic Zoning of Kenya

Mercalli Intensity	Magnitude	Witness Observations
I	1 to 2	Felt by very few people; barely noticeable.
II	2 to 3	Felt by a few people, especially on upper floors.
III	3 to 4	Noticeable indoors, especially on upper floors, but may not be recognized as an earthquake.
IV	4	Felt by many indoors and few outdoors. May feel like heavy truck passing by.
V	4 to 5	Felt by almost everyone, some people awakened. Small objects moved. Trees and poles may shake.
VI	5 to 6	Felt by everyone. Difficult to stand. Some heavy furniture moves, some plaster falls. Chimneys may be slightly damaged.
VII	6	Slight to moderate damage in well built, ordinary structures. Considerable damage to poorly built structures.
VIII	6 to 7	Little damage in specially built structures. Considerable damage to ordinary buildings, severe damage to poorly built structures.
IX	7	Considerable damage to specially built structures, buildings shifted off foundations. Ground cracked noticeably. Landslides.
X	7 to 8	Most masonry and frame structures and their foundations destroyed. Ground badly cracked. Landslides.
XI	8	Total damage. Few, if any, structures standing. Bridges destroyed. Wide cracks in ground. Waves seen on ground.



Source: WHO 2010

Figure 4.7: Seismic Distribution Map

CHAPTER FIVE: STAKEHOLDER'S ENGAGEMENT

5.1 Introduction

Under the Environmental Management and Coordination Act (1999), consultation & public participation (CPP) is recognized as an essential input in ensuring sound environmental management for proposed development activities. The primary purpose of CPP is to sensitize stakeholders, gather views, concerns, and values, incorporate public comments in decision-making, get ideas on project design, and capture local knowledge. During such talks, the proponent, through the consultants, solicits views, opinions, concerns, comments, and suggestions regarding the proposed project's environmental impacts from the interested and affected parties in the proposed development areas.

Stakeholder engagement is vital to developing an environmentally and socially sustainable project. OS10 emphasizes the importance of open engagement with stakeholders and providing opportunities for stakeholder's views to be considered in the project design and during implementation. Stakeholder engagement was also guided by the AfDB Integrated Safeguards System (ISS) OS1 and OS10 (Stakeholder Engagement and Information Disclosure). Stakeholder participation is one of the policy objectives under the Environmental and Social Operational Safeguard 1 to provide the opportunity for stakeholder engagement and consultation in assessing and managing the environmental and social risks and impacts. OS10 advocates for stakeholder participation and information disclosure to the public.

The participation of various stakeholders dramatically contributes to the success of any proposed project. This involves gathering environmental and social information from stakeholders, i.e., baseline data, potential impacts, and mitigation measures, to ensure a comprehensive report is produced. This process also contributes to the general acceptability of the proposed project, especially by the locals. To ensure that the interests of the various stakeholders are addressed, a consultative-participatory approach was adopted to create awareness and sensitize the community on the new project changes adopted in phase 1 of dam construction.

5.2 The Process and Methodology

The public consultation process involved public barazas meetings, structured questionnaires, and focus group discussions. Meetings were held at the community and county levels. The consultation aimed at sensitizing the members on the new design and scope changes of Thwake dam, to collect the views, opinions, and concerns of the local community and county stakeholders, identify potential adverse social and environmental impacts, and obtain recommendations from the community.

5.2.1 Public Meetings

1. Community meetings - The meetings were held from 11th - 13th February 2025 at 3 locations in the project areas: at Kyusyani Catholic church in Mavindini Ward, Kanyangi Chiefs Camp in Kanyangi Ward, and Africa Brotherhood Church (ABC) in Kathulumbi, Kalawa Ward. WhatsApp message notices were communicated to the Area Chiefs to mobilize representatives of fthe communities living in the neighbourhood of the project to attend and participate in the public meetings. The meeting were mobilized through the Seniour community Liason Officer and the area Chiefs. A total of 64 community members (21 females and 43 males) attended the meetings. The meetings locations were selected as they are central and allow for more participants. The three locations neighbour the dam on the sides of Kitui and Makueni, and the participants represent real experiences of the environmental and social

impacts (positive and negative) of the dam construction. The local administration, religious leaders, and community members have a considerable interest in and influence on dam construction activities.

2. County level meetings - The meetings were held between 03/04/25 and 04/04/25 at Makueni and Kitui Counties. The meetings were attended by various National Government Agencies, NEMA and representatives from county government and interested parties representatives. The meeting was mobilized through the community Liaison Officer and notices to the meetings participants were issued by the Ministry of Water, Sanitation and Irrigation through the PIT. Detailed minutes of the meetings, attendance and issues raised are outlined in Appendix 3.

Table 5.1: Community Meetings Schedule

Date of Meeting	Meeting Venue	Main Type of stakeholders present	Male	Female	Total
11th Feb. 2025	Kathulumbi-Kalawa, at ABC Church.	Administration Officer Religious Leader Community Members	14	2	16
12th Feb. 2025	Kanyangi, at Chief's Camp	Community Members	14	10	24
13th Feb. 2025	Mavindini, at Kyusyani Catholic Church	Area Chief Community Members	15	9	24

Table 5.2: County Stakeholders Meetings Schedule - Makueni County

Date of Meeting	Meeting Venue	Main Type of stakeholders present	Male	Female	Total
3/4/25	Mavindini Chiefs Camp.	Member of County Assembly, Faith Based Organization, Community Based Organization, Chief & Assistant Chiefs, State Department for Housing and Urban Development, Ward Coordinator, Persons Living with Disability (PLWD), Member of County Assembly, Village Administrators, Opinion Leaders, Non-Governmental Organization, Youth, Community Health Promoters, GMC-WWO, National Environmental Management Authority (NEMA)	14	9	23

Table 5.3: County Stakeholders Meetings Schedule - Kitui County

Date of Meeting	Meeting Venue	Main Type of stakeholders present	Male	Female	Total
03/04/25	Kanyangi AIC Church	Faith-Based Organization, Ministry of Interior, Youth, Business Community Village Administrator, Kitui Water and Sanitation Company, Community-Based Organizations, CSO Office, Opinion Leaders	17	6	23

5.3 Summary of outcomes of CPP

Public consultation results indicated that the local communities were optimistic about the ongoing

dam project due to the expected positive socio-economic impacts and benefits. The following is a summary of the benefits:

5.3.1 Stakeholders Views on Positive Benefits

- Employment and skills transfer are seen as a predominant benefit to the community during the construction phase, with complementary activities like business activities due to the supply of construction materials. The local employees will gain new skills and knowledge.
- Boost local business opportunities due to increased incomes from business initiatives, e.g., the sale of agricultural products brick making leading to improved regional economy.
- The provision of water for irrigation will improve livelihoods and food security.
- Access to reliable, clean, and safe water supply will reduce waterborne disease incidences like cholera.
- Local tourism will be boosted as visitors come to see the dam,
- Better infrastructure, e.g., roads, increased water points, and electricity connections.
- Improved standards of living/ social status, e.g., better housing conditions for those compensated.
- Improved local climate due to water availability to grow trees at household levels and rehabilitation of areas cleared off vegetation for the project.

5.3.2 Summary of negative concerns and issues

The following are the negative issues raised, but the negative impacts will be reduced or eliminated with proper mitigation measures. Table 5.4 outlines a summary of the issues raised.

Table 5.4: Summary of Public Participation Negative Issues and Concerns

No	Issue/Concern Raised	Response provided
1.	Land displacement – Will the new dam changes lead to more land acquisition?	No. Land for the new design changes, especially for saddle dams, has been acquired from the initial land. The other sections land was already acquired as part of the additional 58 acres. There are no plans for new land acquisitions
2.	Human-Wildlife conflicts –There has been an increase in the number of water animals in the Athi area, i.e., the hippos and the crocodiles. The animals threaten the health & safety of communities and destroy their crops, thus affecting food security. What is the project doing to curb the menace? The community recommended the following:	Two KWS Wardens have been deployed to the site to monitor the movement of the hippos and safeguard workers and the community in the project area. The hippos are in their habitat area, and the project leadership will continue to engage KWS to create more awareness and avoid human-wildlife conflicts. A KWS office is being proposed to be set up in the project area to focus more on the hippos and crocodiles.

	1. Establish the area's Kenya Wildlife Service (KWS) offices to help with emergency and rescue services. 2. Electric fences along the farms	The project has not planned to install an electric fence to prevent the hippos from reaching community farms. However, engagement with KWS continues to pursue a long-term solution, including relocation where possible.
3.	Cracked houses – Many houses near the dam site have been reported to have broken due to excessive vibration emanating from blasting operations at the dam site. Is there any plan to compensate?	Yes. Many complaints from the neighboring communities have been reported to the project. All houses reported cracked will be assessed, and complaints will be resolved based on the assessment report before the closure of the project.
4.	There will be a possible increase in malaria cases; how will this be addressed? The community recommended the supply of mosquito nets by the county government.	There will be consultations with the county governments to create more awareness of malaria prevention and equipment in the nearby hospitals to prevent and handle the likely increase in malaria cases.
5.	Closed Roads- Some access roads have been closed, forcing the residents to walk long distances, particularly from Kitui to Makueni.	The roads at the dam site are closed for security and safety reasons, as crossing through an active construction site is unsafe. Water points and community access roads have been planned to be built in Feb or March 2025
6.	Buffer Zone- Is the buffer zone enough to accommodate the new dam changes?	The design provided an adequate buffer zone for the dam. Surveyors and engineers who designed the dam, leading to the variation of the dam, did not provide an increased buffer zone; hence, flow back will be accommodated with the existing buffer zone. However, the two proposed saddle dams will ensure enough and safe storage of the additional water as a result of the change in dam height
7.	Flooding – There was flooding in my farm/residence during the recent rains. What is the project going to do to ensure no more flooding?	Dam water flow back to flooded community land is new information and will be shared with the Engineers and surveyors to investigate and advise if the buffer zone needs to be expanded. Where extra land will be required to accommodate the expanded buffer zone will be compensated accordingly.
8.	Water use and management conflicts – Water conflicts might occur during dam	Farmers will be encouraged to join the Water Users Association (WRUA) or Irrigation

	operation. How will this be handled?	Water Users Association (IWRUAs), which are mandated to help resolve water conflicts at the lowest level of water management.

5.4 Inclusion of Stakeholder Consultation Views in the Project Design

One of the objectives of the stakeholder consultations was to collect the views and concerns of the local community and incorporate them into the design. The issues raised by the community have been addressed during the construction of the project and emerging issues included in the ESMP for implementation of mitigation measures.

5.5 Grievance Redress Mechanism

The community was sensitized that a grievance redress mechanism exists to solve disputes as soon as possible in the interest of all parties concerned. The site established a Community Grievances Committee attended by the Chiefs of Kanyangi, Kathulumbi, and Mavindini locations. Other members include PIT (Gender and Social Development Expert, Environment, Health and Safety Expert), Senior Community Liaison Officer, EHS teams from the contractor and consultant. The committee's chairman is Mr. Ngoma, the chief of the Mavindini location. The committee meets once a month to consider grievances reported and resolutions reached. If grievances require higher leadership's attention (Contractors Project Manager, Senior Resident Engineer or Program Coordinator), they are escalated as necessary. Community members are encouraged to report their grievances to the Chief of their location or project leadership directly.

5.6 Provisions for the Future and Continuous Consultation during Implementation

The community meetings will be addressed through the Stakeholders Engagement Plan (SEP) which has been prepared and will be disclosed.

5.7 Conclusion of CPP

The proponent intends to implement the new design and scope changes in phase 1 of the Thwake Multipurpose Dam project. The negative issues the communities raise will be addressed in the best practicable ways. Because of the above findings, including the perceived benefits, all stakeholders, including the communities living in the neighborhood, have a high acceptance of the dam project. In conclusion, the community supports the project changes and does not anticipate any significant threat to the environment and livelihoods now and in the future.

CHAPTER SIX: METHODOLOGY OF IMPACTS IDENTIFICATION AND PREDICTION

6.1 Introduction

This chapter presents the methodology for predicting and evaluating the significance of anticipated positive and negative impacts of the proposed dam development, considering the design and scope variations. The process aims to identify and document all foreseeable beneficial or adverse impacts the project might exert on the bio-physical environment and local communities by employing a systematic approach. The impacts are then weighted, and a significance matrix is used to rate the impacts based on the types of effects, the magnitude of the impact, the probability of occurrence of the impact, the extent of the effect, and the overall significance (importance). Therefore, this will ensure that all relevant impacts are recognized early on and risks are evaluated and rated to gauge their significance levels, thus enabling informed decision-making and appropriate management measures to be implemented throughout the project lifecycle.

6.2 Description and Identification of Environmental social-economic Impacts

An impact in this context refers to any change likely to cause instability in the environmental or socioeconomic setting. Environmental and social impacts are the consequences of proposed project activities on ecological resources or receptors of particular value or sensitivity, such as disturbance due to noise and health effects due to poor air quality. Receptors can comprise but are not limited to, people or human-made systems, such as residents, communities, social infrastructure, cultural aspects, livelihoods, and components of the biophysical environment, such as aquifers, flora, and paleontology.

Impacts on the environment can lead to changes in existing conditions; the impacts can be direct, indirect, or cumulative. Direct effects refer to changes in environmental components that result from immediate cause-effect consequences of interactions between the environment and project activities. Indirect impacts result from cause-effect implications of interactions between the environment and direct effects. Cumulative impacts refer to the accumulation of environmental changes caused by human activities. Cumulative impacts add to the already existing effects associated with the proposed development and have been differentiated into the construction and operational phases of the project.

The impacts can be either negative or positive. They may also occur immediately or may be delayed in their timing. Another description is whether the impacts are permanent or temporary in their persistence. The impacts are also described using the phase in which they occur, i.e., planning, operation, or construction.

6.3 Determination of Environmental and Social Impacts and Rating

Identifying and assessing environmental and social impacts is a multi-faceted process using a combination of quantitative and qualitative descriptions and evaluations. The approach involves using a magnitude-sensitivity matrix, professional judgment, and reasoned argument to determine the significance of environmental impacts associated with the proposed project. Once a potential impact has been determined, it is necessary to identify which project activity will cause the impact, the probability of occurrence of the effects, and its magnitude and extent (spatial and temporal). This information is essential for evaluating the impact's significance and defining mitigation and monitoring strategies.

The significance of the potential environmental and social impacts is determined by context and intensity of action. Context refers to geographical, local, national, or global context. The severity of

the effects defines intensity, e.g. the magnitude of deviation from background conditions, the size of the area affected, the duration of the effect (short, medium, or long term, intermittent or continuous), violation of legal compliance, and the overall likelihood of occurrence, as described in the following section. The potential project impacts identified are described and rated according to the definitions below.

a) Extent

The extent of each aspect, receptor, and impact will be defined. The geographical coverage (spatial scope) description takes account of the following factors:

- The physical size/distribution of the aspect, receptor, and proposed impact; and
- The nature of the baseline - bio, physical, and social environment within the area of effect.

For example, some impacts are likely confined to a smaller geographical area than others, which may be experienced at some distance. The significance of effects also varies spatially. Many will be significant only within the site's immediate vicinity or the surrounding community, while others may be significant at a local (project) or regional (county) level.
The extent of the impact will be rated on the following scale:

Localized (At a localized scale and a few hectares in extent	***1***
Study Area (the proposed site and its immediate environs	***2***
Regional (County Level)	***3***
National	***4***
International (Beyond Kenya)	***5***

b) Duration

Duration refers to the length of time that the aspect may cause a positive or negative change in the bio-physical and social environment. The environmental assessment will distinguish between different periods by assigning a rating to duration based on the following scale:

Very short (0-1 Years)	***1***
Short-term (1-5 Years)	***2***
Medium-term (5-15 Years)	***3***
Long time (>15 Years)	***4***
Permanent	***5***

c) Magnitude

The magnitude of an environmental aspect is determined by the degree of change to the baseline environment and includes consideration of the following factors:

- The reversibility of the impact;
- The sensitivity of the receptor to the stressor;
- The impact duration, its permanency, and whether it increases or decreases with time;
- Whether the aspect is controversial or would set a precedent and
- The threat to environmental and health standards

The importance of each effect is rated on the following scale, as shown in Table 7.1.

Table 6.1: Magnitude Levels of Scale

Value	Description	Scale Description
1	No impact	This means that to the best knowledge of the experts, the activity/action will not have any known impact on the environment. Such an impact will not in any way affect the normal functioning of either the human or the natural systems and does not, therefore, warrant any mitigation.
2	Minimal impact	Any activity with little impact on the environment calls for preventive measures, which are usually inexpensive and manageable. Such actions have minimum effects on the natural or human environment.
3	Moderate impact	A moderate impact will have a localized effect on the environment. If the product is harmful and cumulative, action in the form of mitigation measures needs to be put in place to ensure that it doesn't become permanent and irreversible.
4	High impact	An impact is high if it affects a relatively large area (spatial) or several biological resources (severity), and the effect is likely to be felt for a relatively long period (temporal), e.g., more than one year. If the product is harmful, such an impact must be considered promptly, and proper mitigation measures must be taken to prevent further direct, indirect, or cumulative adverse effects.
5	Very high impacts	Such an activity rates highly in all aspects of the scale, i.e., temporal, spatial, and severity. If negative, it is expected to affect a vast population, plants and animals, biodiversity in general, and a large area of the geophysical environment, usually having transboundary consequences. Urgent and specialized mitigation measures are needed. The experts believe that any project with very high negative impacts MUST be suspended until sufficient effective mitigation measures are implemented.
6	Not known	Some activities for which impacts are unknown, e.g., some chemicals are suspected of producing carcinogenic effects, but this has not yet been confirmed.

d) Probability/Likelihood of impact

The probability of the impact occurring refers to the likelihood of the occurrence of a particular event or outcome (impact). Possibility is indicated on the following scale:

Highly Improbable (<20% chance of occurring)	***1***
Improbable (20-40% chance of occurring)	***2***
Probable (40-70% chance of occurring)	***3***
Highly Probable (>70-90% chance of occurring)	***4***
Definite (100% chance of occurring)	***5***

6.4 Level of Significance Determination of Identified Impacts

The purpose of impact evaluation is to assign relative significance to predicted impacts associated with the project and to determine how impacts are to be avoided, mitigated or managed. The information presented above for identifying and describing the aspects and effects is summarized in a tabular form, and a significance rating is assigned. Considering all the factors described above, significance is determined with or without mitigation. This study defines a "significant impact": "An impact which, either in isolation or in combination with others, could, in the specialist's opinion, have a material influence on the decision-making process, including the specification of mitigating measures. Once an impact is identified, the rating process is followed.

The environmental significance rating attempts to evaluate the importance of a particular impact, the consequence and likelihood of which has already been assessed. The result is a combination of extent, duration, and magnitude, i.e., the values for these three criteria are added. The potential risk (or impact significance) combines the consequence and probability, as indicated in the equation below.

Risk (Significance) = Consequence (Extent + Duration + Magnitude) x Probability

The description and assessment of the aspects and impacts undertaken are presented in a consolidated table (**Table 6.2**), with the significance of the effect assigned using the process and matrix detailed below. The sum of the first three criteria (extent, duration, and magnitude) provides a collective score for the CONSEQUENCE of each impact.
The last criterion determines the PROBABILITY/LIKELIHOOD of the impact occurring. The product of CONSEQUENCE and PROBABILITY leads to the assessment of the SIGNIFICANCE of the impact, whether it will be of low, medium, or high significance, as shown in the matrix table 7.3.

Table 6.2: Risk/Significance Assessment Matrix

		CONSEQUENCE (Extent + Duration + Magnitude)																			
PROBABILITY	1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
	2	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40
	3	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60
	4	4	8	12	16	20	24	28	32	36	40	44	48	52	56	60	64	68	72	76	80
	5	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100

Mitigation measures will be proposed to avoid, minimize, or eliminate the negative impacts. To assess and evaluate the mitigation thresholds, the rating table below is being used to classify the impacts as low, medium, and high:

Table 6.3: Negative Impacts and Mitigation Ratings Table

Low		<30	This impact would not have a direct influence on the decision to develop.

Medium		30-60	This impact could influence the decision to develop unless it is effectively mitigated.
High		>60	This impact must influence the decision process to develop

6.5 ENVIRONMENTAL AND SOCIAL IMPACTS ASSESSMENT AND MITIGATION MEASURES

This chapter describes the project's anticipated environmental and socio-economic impacts and proposed mitigation measures. Potential positive and negative environmental and social effects associated with the proposed dam height increment, spillway, saddle dams, and employers' camp construction are considered at all stages of the project cycle (construction, operation, and decommissioning). The potential significant impacts were identified based on the nature of the receiving environment and depending on the activities causing the effect. The approach to assigning (weighting) significance to the identified environmental and social risks relied upon a magnitude-sensitivity matrix, expert judgments, and reasoned argument. The level of importance of the anticipated project impacts is made regarding the significance assessment matrix and rating table in (Tables 7.2 and 7.3). The impacts are broadly classified as positive or negative and low, medium, and high significance.

6.5.1 PRE CONSTRUCTION PHASE IMPACTS

6.5.1 Pending legacy issues from land acquisition

Although the project has acquired all the 59 required additional acres, some parcels were partially acquired and the land demarcation and issuance of new title deeds to the affected PAPs needs to be completed.

Mitigation

- Finalize the demarcation of land and issuance of title deeds to the affected persons and land owners.

6.5.2 CONSTRUCTION PHASE - POSITIVE ENVIRONMENTAL & SOCIAL IMPACTS

Employment/Business opportunities

Skilled and unskilled men and women, like artisans, plumbers, masons, and carpenters, will get temporary job opportunities to provide manual labor for pit excavation, masonry, carpentry, and other work. Other professional skilled labor like engineers and consultants will also benefit.

Enhancement of Employment/Business opportunities

i) The Project has prioritized the employment of skilled and unskilled labor from the respective project area.
ii) The project procures goods and services such as construction materials, such as cement, sand, aggregates, reinforcing steel, metal, etc., from within the nearby trading centers.
iii) The Project has developed a fair and transparent employment and procurement policy and processes to avoid potential nepotism or favoritism.
iv) Training & Skills development - Local workers involved in construction gain skills and experience, enhancing their employability and potentially leading to long-term economic benefits.
v) Local Economic Stimulus - Construction materials will be sourced within local markets, thus supporting local businesses such as hardware shops in the project area.
vi) Gender Empowerment – Both men and women are given equal work opportunities during the pre-construction, construction, and decommissioning phases.
vii) Revenue - Increased revenue generation for the national government, the project will contribute to the national kitty through various taxes. The contractor, suppliers, and proponents will pay

Value Added Tax (V.A.T) when purchasing materials for the project. Construction workers will also pay income tax from their earnings while working on the project.

6.5.3 CONSTRUCTION PHASE - NEGATIVE ENVIRONMENTAL AND SOCIAL IMPACTS

The project poses the following negative environmental and social impacts during construction.

6.5.3.1 Increased extraction of raw materials

The construction materials required include stones, cement, ballast, hardcore, murram, etc. The requirement and use of local building materials during construction can have various implications for sustainability, cost-effectiveness, and community development. Some materials may be abundant, and others must be sourced from outside the area. For example, stones are sourced for the area and crushed at the site; sand is extracted from the seasonal rivers.

Table 6.4: Increased Raw Materials Extraction Impacts Rating

Criteria		Rating
Consequences	Severity/Magnitude	2
	Spatial Scope/Geographical Extent	2
	Duration of Impact	5
Likelihood	Frequency/ Duration of Activity	2
	Frequency of Impact	4
Impact Significance Rating (Consequence X Likelihood)	Medium Risk	54

Mitigation:

1. Buy only the needed building materials and recycle them for other uses
2. Ensure accurate budgeting and estimating of construction material requirements to ensure no excess is acquired.
3. Ensure that damage or loss of materials is minimal through proper storage.
4. Use at least 5%-10% recycled, refurbished, or salvaged materials to reduce the use of raw materials.
5. Consider the environmental performance of suppliers of raw materials in the selection process. The Contractors will source construction materials such as sand and hardcore from registered and approved quarry and sand mining firms whose projects have undergone satisfactory environmental impact assessment/audit and received NEMA approval.

6.5.3.2 Local Air Quality Pollution

Air pollution can degrade the site's and neighborhood's environmental quality and could impact public health. Dust will be emitted during excavation and related earthworks. Airborne particulate matter pollution is likely to occur during blasting operations. Dust emissions into the air while transporting construction materials and exhaust fumes from transport vehicles can impact sensitive receptors (residents, road users, and sensitive receptors) within the immediate vicinity and the project area of influence. Concrete mixing will also add minimal dust particles in the air. Thwake dams' environs tend to be windy most of the time. Thus, there is ease in blowing dust particles into the local environment.

Table 6.5: Impacts on Local Air Pollution Impacts Rating

Criteria	Rating

Consequences	Severity/Magnitude	4
	Spatial Scope/Geographical Extent	1
	Duration of Impact	2
Likelihood	Frequency/ Duration of Activity	3
	Frequency of Impact	3
Impact Significance Rating (Consequence X Likelihood)	Medium Risk	42

Mitigation Measures:

- Spray water during periodic access road wetting to reduce nuisance dust levels.
- Construction vehicles' speed restriction is 30 km/h or less on the sites and the access roads.
- Use appropriate Personal Protective Equipment (PPE) such as dust masks, particularly for construction workers.
- All construction materials will be transported in designated covered trucks and should use only predetermined tracks,
- Minimise drop heights when loading stockpiles or transferring materials
- Compact, apply water when necessary, or apply (non-toxic) soil stabilizers on all unpaved access roads, parking areas, and staging areas at construction sites;
- Minimizing the number of motorized vehicles in use and the number of trips through proper planning
- Equipment and vehicles shall be properly turned and maintained according to manufacturers' specifications
- Use standard fuel and lubricants.
- Avoid unnecessary car idling and switch off the engines of vehicles and machinery while not in use.
- Undertake monitoring close to dusty activities, noting that this may be daily visual inspections or passive/active monitoring.
- Impose speed limits on haul routes and in construction compounds to reduce dust generation.

6.5.3.3 Noise and Vibration Impacts

Noise and vibration can be a source of disturbance at sensitive receptors. Construction of the dam height, spillway, and saddle dams will likely result in noise emissions due to the machines used during excavation and construction vehicles delivering materials to the site. Noise-generating activities will include mixing, casting, and material movement. Workers with prolonged exposure to noisy environments may develop hearing problems. Blasting operations at the construction site are the primary source of noise and ground vibrations. There will be blasting operations. Thus, high noise levels and vibrations are inevitable. Sensitive noise and vibration receptors include buildings (residential houses, places of worship, and educational institutions), workers, and road users near the dam area.

Table 6.6: Noise and Vibration Impacts Rating

Criteria		**Rating**
Consequences	Severity/Magnitude	4

	Spatial Scope/Geographical Extent	2
	Duration of Impact	2
Likelihood	Frequency/ Duration of Activity	2
	Frequency of Impact	4
Impact Significance Rating (Consequence X Likelihood)	Medium Risk	48

Mitigation Measures

- Maintain construction vehicles as per the manufacturer's requirements
- Impose a speed limit of 30km/h on all vehicles transporting construction equipment and materials.
- Notify the community on blasting schedules
- Conduct regular noise level and vibration surveys
- Audiometric examinations of workers exposed to noise above 85 dB
- Minimizing the number of motorized vehicles in use and the number of trips through planning.
- Workers who may unavoidably have to work with noise-generating equipment, e.g., earthmoving equipment should be provided with ear plugs and advised to put them on.
- Siting noisy equipment as far away as possible from Noise Sensitive Receptors (NSRs), and use barriers (e.g., acoustic sheds or partitions) to reduce the level of construction noise at receptors wherever practicable
- Where practicable noisy equipment will be orientated to face away from the nearest NSRs
- For machines with fitted enclosures, doors and door seals will be checked to ensure they are in good working order; also, that the doors close properly against the seals.
- Throttle settings will be reduced, and equipment and plant turned off, when not being used.

6.5.3.4 Impacts on Soil Resources

During construction, soil disturbance caused by excavation will have significant impacts. Loose soil will accumulate and may pose adverse environmental effects. If left unattended, the soil may be swept away, leading to soil loss and flooding in the recipient area. Soil compaction from vehicles transporting construction materials causes changes in drainage paths and reduces infiltration, thus increasing runoff speed and more erosion. Hazardous materials and wastes released during construction, including oils and paint spills, may find their way into soils, causing soil contamination.

Table 6.7: Impacts on Soil Resources Impacts Rating

Criteria		**Rating**
Consequences	Severity/Magnitude	2
	Spatial Scope/Geographical Extent	2
	Duration of Impact	4
Likelihood	Frequency/ Duration of Activity	2
	Frequency of Impact	3

Impact Significance Rating (Consequence X Likelihood)	Medium Risk	45

Mitigation Measures:

- To prevent excavated soil erosion and transport to other areas, excavated materials should be reused to landscape the construction site. The soil should be compacted to avoid soil erosion. The soil removed from the pits should be reused to fill the voids and packed correctly to prevent erosion during the rainy season.
- Proper solid and waste disposal through a waste management plan should be enhanced.
- The Contractor(s) should present procedures for and ensure the implementation of measures to protect soils from any accidental or structural contamination.
- Vehicles should preferably be parked on paved platforms.
- Fuel storage should not leak, and should be periodically monitored, and repaired or replaced when necessary.
- Maintain fuel and clean vehicles and equipment at workshops/sites with adequate leakage prevention (e.g.) impermeable surface, settlers, and oil separator).
- Storing all hazardous, sanitary, and cleaning wastes in facilities approved by NEMA.
- Strict enforcement and monitoring of standard procedures for storing and handling hazardous wastes and raw material (e.g., fuel or chemicals).
- Any contaminated soil should be scooped up and disposed of appropriately through licensed hazardous waste handlers

6.5.3.5 Impacts on Water Resources

Hazardous materials leaks from construction vehicles, such as diesel and oils, may eventually infiltrate the ground and find their way into the rivers nearby, thus causing surface and groundwater pollution. Further, there is a likelihood of increased water use during construction. The impact is low.

Table 6.8: Impacts of Water Resources Impacts Rating

Criteria		**Rating**
Consequences	Severity/Magnitude	2
	Spatial Scope/Geographical Extent	2
	Duration of Impact	1
	Frequency/ Duration of Activity	2
	Frequency of Impact	3
Impact Significance Rating (Consequence X Likelihood)	Low Risk	25

Mitigation/Management measures

- Disturbed areas will be rehabilitated as soon as possible to prevent erosion and pollution of surface water.

- Construction vehicles and equipment will be serviced regularly
- The contractor should ensure water wastage is avoided at all costs.
- Fuel storage should not leak, and should be periodically monitored, and repaired or replaced when necessary.
- Maintain fuel and clean vehicles and equipment at workshops/sites with adequate leakage prevention (e.g., impermeable surface, settlers and oil separator).
- Regular tests of the neighbouring water resources/points/river

7.5.3.6 Impact on River Flows

The dam construction significantly impacts river flows during construction, leading to changes in flow patterns, water levels, and sediment transport. These altered flow regimes can disrupt the life cycles of fish and other aquatic organisms that depend on natural river flows for spawning, migration, and habitat. Construction activities, such as excavation and material transport, can temporarily alter river flows, causing water levels and sediment load fluctuations. Construction activities increase river sediment loads, affecting water quality and downstream ecosystems. All these are temporary changes.

Mitigation Measures

- Sediment management – implement dam sediment control report
- Construct sediment load control ponds to trap suspended solid in storm water flows
- Monitor river conditions and dam adjust construction accordingly

Table 6.9: Impacts on River Flow Impacts Rating

Criteria		**Rating**
Consequences	Severity/Magnitude	3
	Spatial Scope/Geographical Extent	1
	Duration of Impact	4
	Frequency/ Duration of Activity	1
	Frequency of Impact	3
Impact Significance Rating (Consequence X Likelihood)	Medium Risk	36

6.5.3.7 Increased solid and liquid waste generation

Solid wastes will be generated at the construction sites. Such wastes will consist of plastic and parts of PVC pipes, metal cuttings, rejected materials, excavated materials, packaging materials, empty cartons, wasted mortar, ballast, sand, and cement. Such solid waste materials can injure the environment through blockage of drainage systems, choking water bodies, and negatively impacting human and animal health.

Some waste materials contain hazardous substances, such as cement and adhesives. In contrast, some waste materials, including metal cuttings and plastic containers, are not biodegradable and can have long-term and cumulative environmental effects. Liquid will be generated when mixing cement and mortar. The fluids may find their way into the soils and water bodies nearby if not well controlled within the site.

Table 6.10: Increased Solid Wastes Impacts Rating

Criteria		Rating
Consequences	Severity/Magnitude	3
	Spatial Scope/Geographical Extent	2
	Duration of Impact	2
	Frequency/ Duration of Activity	2
	Frequency of Impact	4
Impact Significance Rating (Consequence X Likelihood)	Medium Risk	42

Mitigation Measures

i. Review and implement the waste management Plan (WMP) system, e.g., source reduction, recycling construction materials, etc including ensuring the Contractor maintain records of types, quantities, origin, (temporary) storage, transport and elimination/reuse of solid waste, and make these available to the works supervisor upon his request, as proof of proper waste management practices.

ii. Extend the contract of the existing NEMA-licensed waste handler to dispose of any hazardous materials.

iii. Recover damaged or waste construction materials, e.g., doors, plumbing & lighting fixtures, and glass, recovered for refurbishing and re-use.

iv. Purchase building materials with minimal or no packaging to avoid generating excessive packaging materials.

6.5.3.8 Habitat Loss

Dam construction can lead to the inundation of riverine habitats, resulting in habitat loss and fragmentation, leading to reduced connectivity, thus blocking fish migration routes and limiting the connectivity of river ecosystems.

Mitigation Measures:

- Replant native vegetation in affected areas (where possible)
- Restore degraded riparian areas along the rivers (Athi and Thwake)
- Maintain buffer zones with indigenous plant to erosion and support wildlife
- Promote community managed conservations zones through WRUAs) and provide training and alternatives livelihoods to reduce pressure on natural resources

Table 6.11: Impacts on Habitat Loss Rating

Criteria		Rating
Consequences	Severity/Magnitude	2
	Spatial Scope/Geographical Extent	1
	Duration of Impact	5
	Frequency/ Duration of Activity	1
	Frequency of Impact	3
Impact Significance Rating (Consequence X Likelihood)	Medium Risk	32

6.5.3.9 Impacts on Ecology and Biodiversity

Construction of the saddle dams may imply the removal of existing vegetation and/or the possibility of submerging others. Certain plant species will likely go extinct while others will be introduced.

Thwake – Athi River confluence point has a minor unique riverine ecosystem with species including crocodiles, flying snakes, rare birds, and a host of micro-organisms that may be affected. There is also potential disruption of habitats downstream of the saddle dams due to construction activities (discharge of excessive particulate matter, cement, and other construction materials.

Table 6.12: Impacts on Ecology and Biodiversity Rating

Criteria		**Rating**
Consequences	Severity/Magnitude	2
	Spatial Scope/Geographical Extent	1
	Duration of Impact	5
	Frequency/ Duration of Activity	1
	Frequency of Impact	3
Impact Significance Rating (Consequence X Likelihood)	Medium Risk	32

Mitigation Measures:

- Site restoration after the end of construction activities
- conducting comprehensive assessment to identify potential impacts on biodiversity and ecosystem
- Establishing a monitoring and reporting mechanism by the program including biodiversity and ecosystem in the annual E$S audit

6.5.3.10 Traffic Flow and Transport Impacts

Temporary traffic diversions and road closures may be required to undertake construction activities. Given the rural environment and very few vehicles operating in the area, the potential impact is very low and insignificant.

Table 6.13: Traffic and Transport Impacts Rating

Criteria		**Rating**
Consequences	Severity/Magnitude	2
	Spatial Scope/Geographical Extent	1
	Duration of Impact	1
Likelihood	Frequency/ Duration of Activity	2
	Frequency of Impact	3
Impact Significance Rating (Consequence X Likelihood)	Low	20

Mitigation Measures:

- Impose speed limits of less than 30 km/h on project vehicles when driving within the construction area.
- Choosing suitable traffic routes/diversions to reduce the neighborhood's impact.

6.5.3.11 Gender-Based Violence –Sexual Exploitation, Abuse, and Harassment (GBV-SEAH)

The impact includes all forms of gender-based violence, exploitation, and harassment during the construction period. GBV and, more so, sexual exploitation and abuse (SEA) of communities and sexual harassment (SH) can potentially occur, with women being more vulnerable, especially when seeking employment during this phase of the project.

Table 6.14: Gender-Based Violence –Sexual Exploitation, Abuse, and Harassment (GBV-SEAH) Impacts Rating

Criteria		**Rating**
Consequences	Severity/Magnitude	1
	Spatial Scope/Geographical Extent	1
	Duration of Impact	1
	Frequency/ Duration of Activity	2
	Frequency of Impact	2
Impact Significance Rating (Consequence X Likelihood)	Low Risk	12

Mitigation Measures:

- Conduct comprehensive training sessions for all construction workers, supervisors, and contractors on recognizing, preventing, and responding to GBV and SEA.
- Ensure all employees understand and sign clear codes of conduct and policies that prohibit GBV and SEA, including harassment, exploitation, and discrimination.
- Engage with local communities to raise awareness about GBV and SEA, respectful behavior, and gender equality, as well as available support services.
- Ensure continued implementation of the clear human resources policy against sexual harassment that is aligned with national law
- Ensuring appointed human resources personnel to manage reports of sexual harassment according to policy
- Review of specific project components that are known to heighten GBV risk at the community level, e.g., compensation schemes; employment schemes for women; etc.
- The contractor will ensure adequate referral mechanisms are in place if a case of GBV at the community level

6.5.3.12 Child Labour, Exploitation and Abuse

There is the potential of children being engaged in the project construction activities and also the risk of child abuse by the project workers. The law prohibits the employment of persons below 18 years for gainful employment. The contractor will adhere to the Children Act to ensure no children are employed on the site.

Table 6.15: Child Labour Impacts Rating

Criteria		**Rating**
Consequences	Severity/Magnitude	1
	Spatial Scope/Geographical Extent	1
	Duration of Impact	1

	Frequency/ Duration of Activity	2
	Frequency of Impact	2
Impact Significance Rating (Consequence X Likelihood)	Low	12

Mitigation Measures

1. Ensure the contractor signs a code of conduct that covers child protection, ensuring no children are employed at the construction site under national labor laws.
2. Ensure that any child sexual relations offences among contractors' workers are promptly reported to the police.
3. Employ workers 18 years and above and have a valid national ID at the time of hire.

6.5.3.13 Labour conditions

The project has employed a large number of skilled and unskilled personnel. Impacts may occur from poor health and safety conditions at work, which may increase the risk of injuries, informal employment, which may lead to violation of workers' rights, lack of contractor oversight, and hence physical and mental abuse. Poor labor and working conditions can become potential triggers for social problems such as drug and alcohol abuse and GBV. Large infrastructure projects, such as this one, may lead to an influx of workers and job seekers, which may negatively affect the social acceptability of the project as surrounding communities miss out on employment opportunities.

Mitigation measures

i. Review and implement the Labour Management Plan.
ii. Include minimum criteria for employment to be implemented by the contractor and subcontractors
iii. Contractor to implement the Human Resources Policy, which will outline worker rights to be included in all contracts including restrictions on working hours in line with applicable ILO standards, compensation including consideration of overtime, holidays etc. contractor will require its subcontractors to put in place policies in line with national legislation and applicable international legislation and contractor Code of Conduct and Policies.
iv. Regular monitoring of contractor and subcontractors' staff to ensure compliance with the labour laws
v. Document and create awareness of the employment rights of the workers on-site
vi. Adherence to minimum wage and prompt payment of salaries/dues as agreed on
vii. Review and implement the workers Grievance Redress Mechanism for efficiency
viii. Ensure all workers including sub-contractor have contracts or written documents on their terms of engagement
ix. Contractor to ensure timely submission of all statutory deductions
x. Contractor will ensure that adequate clean water, adequate food and access to medical care is provided to all workers on the worksite and at accommodation.
xi. Contractor will establish contractual clauses (signed code of conduct) to be embedded in the contracts of the workers and sub-contractors that require adherence to Kenyan law and international standards to be upheld related to worker rights.
xii. Contractor will ensure that its Code of Conduct is followed to regulate the performance and behaviour of all workers, including provision for disciplinary action for anti-social behaviour and non-compliance with health and safety regulations such as lack of use of PPE.
xiii. Pre-employment medical assessments will be put in place as a workforce risk management tool to screen individuals for risk factors that may limit their ability to perform a job safely and

effectively. Expected benefits of conducting pre-employment medical assessments include a safer working environment, reduction in workplace injuries, minimized downtime, matching the capacity of the employee with the role, and overall recruitment cost and risk reduction.

6.5.3.14 Workplace Occupational Safety and Health Impacts

Occupational health and safety impacts during construction are of paramount concern, as construction sites involve various hazards that can pose risks to workers. These hazards include accidental falls, struck-by hazards, caught-between hazards, electrical hazards, ergonomic hazards, chemical and biological hazards, and noise and vibration. Construction activities such as bush clearing, materials delivery, excavations, concrete mixing, and construction traffic will generate a lot of dust, especially during the dry seasons, which may affect the workers' respiratory system. Construction workers may be exposed to infections if not provided with clean drinking water, proper food hygiene, sanitation, and water disposal facilities. These conditions can compromise the workers' health, especially if such foodstuffs are prepared in unhygienic conditions. Addressing these impacts is crucial to ensure the well-being of construction workers and prevent accidents and injuries.

Table 6.16: Occupational Safety & Health Impacts Rating

Criteria		**Rating**
Consequences	Severity/Magnitude	3
	Spatial Scope/Geographical Extent	1
	Duration of Impact	2
Likelihood	Frequency/ Duration of Activity	3
	Frequency of Impact	3
Impact Significance Rating (Consequence X Likelihood)	Low Risk	36

Mitigation Measures:

- Update and Implement the Environmental, Health and Safety (EHS) plan being that of contractual agreement by the contractor/ sub-contractors in order to outline procedures for avoiding health and safety incidents and for emergency medical treatment.
- Provide comprehensive safety training for all workers, emphasizing hazard awareness, safe work practices, and emergency procedures.
- Ensure that a first aid kit is always provided within the site, fully equipped at all times, and managed by qualified persons.
- Regular inspections and audits should be conducted to identify and address potential hazards on the construction site.
- Update and adopt emergency response plans to address potential accidents or incidents promptly.
- Maintain licensed food handlers to ensure food safety at the site
- Maintain quarterly domestic water quality tests on-site by accredited Laboratory
- Ensure appropriate use of PPE, such as hard hats, safety glasses, gloves, and respiratory protection.
- Update and implement procedure for the recording and analysis of incidents and lessons learned such that additional actions can be implemented to avoid or minimize occupational

health and safety risks.

- Contractor takes Work Injury Benefits Act (*WIBA*) insurance for all workers
- Provision and wearing of recommended quality Personal Protective Equipment (PPE) by workers on site at all times. Active replacement of worn out of PPE.
- Contractor to designate a lead Safety Environment and Health Officer to enforce the safety and health management on site and to monitor implementation for the duration of the construction work
- Contractor to ensure all machines and equipment on site serviced as required and are in proper working condition.
- Proper signage at strategic places for information and warning e.g., excavation sites to warn on fall risks.
- The contractor will keep an incident occurrence book, register the site with DOSHS and insure vehicles, workers and third parties.
- All accidents to be reported to the Bank and national authorities in the stipulated times including fatalities in less than 24 hours.

6.5.3.15 Community Health, Safety, and Security Impacts

The general public will also be exposed to safety hazards from construction activities involving vehicles, open trenches, dust, noise, etc. Available employment opportunities bring a temporary influx of migrant workers hosted by the local communities. This may stimulate business in the project area and also propagate the spread of Sexually Transmitted Diseases (STDs), including HIV/AIDS. There could also be cases of unwanted pregnancies as the migrant workers interact and get into relationships with the local communities.

There is also risk of damage to community property e.g through traffic accidents, blasting works etc.

In the public participation, the community also raised concerns on the delay in providing access routes including to the river which has affected their lives/livelihoods.

Table 6.17: Community Health, Safety, and Security Impacts

Criteria		**Rating**
Consequences	Severity/Magnitude	2
	Spatial Scope/Geographical Extent	1
	Duration of Impact	2
Likelihood	Frequency/ Duration of Activity	2
	Frequency of Impact	3
Impact Significance Rating (Consequence X Likelihood)	Low Risk	25

Mitigation Measures:

- Hazard Prevention and Risk Assessment- Regularly assess potential hazards and risks to community health and safety, including those related to infrastructure development, traffic, and environmental factors; prioritize hazard prevention and control procedures, such as implementing strict protocols for interaction with local communities.
- Blasting operations – implement and monitor compliance to blasting procedures ensuring blasting is done by licensed and competent Blasters. Relevant permits for blasting should be

maintained. Recording of blasting excessive noise and vibrations will continue to be monitored and confirm compliance to NEMA limits.

- Emergency Preparedness – review and update comprehensive plans outlining procedures for responding to potential incidents, such as accidents, disasters, or public health emergencies.
- Safety Culture and Training - Foster a culture where safety is a top priority for all employees and community members; implement comprehensive safety training programs for all employees, contractors, and community members, covering relevant hazards, safety procedures, and emergency response protocols.
- Regulatory Compliance and Legal Frameworks - Adhere to all relevant regulations and legal frameworks related to community health and safety, including environmental impact assessments (EIAs), traffic safety regulations, hazardous materials handling procedures, regular inspections, and regulation enforcement including:
    - Implement appropriate traffic plans as/ when needed e.g. speed limits when on community access, Use flag men/women to give directions to traffic, Use reflective signature to direct traffic to designated areas. Sensitize drivers to observe speed limits including on college grounds
    - Minimum requirement of Third-Party Insurance for all vehicles in use by the contractor.
    - Provide primary health care and first aid at construction camp site to for emergencies.
    - Ensure workers (and community if possible) receive education and sensitization around transmission and symptoms of communicable diseases of concern, HIV/AIDS Awareness and STDs.
    - Coordinate with local health and emergency service providers for accident case
    - Provide signage in active construction sites to warn public/college visitors/students to keep off and risk of any incidents
    - Provision of protective condoms in worker's sanitation facilities.
    - Have a functional Grievance Mechanism to address community grievances related to the construction works.
- Community Engagement and Participation - Engage the local communities to understand their concerns and perspectives regarding project activities and potential impacts, give clear and accessible information to the community, and encourage the use of the established Grievance Mechanisms.
- Compensation for damaged community property/assets where liability is ascertained and based on independent assessment.
- Ensure remaining community access routes including to the river are established
-

6.5.4 OPERATION PHASE - NEGATIVE ENVIRONMENTAL AND SOCIAL IMPACTS

6.5.4.1 Increased Water Resource Use

After dam completion, the local communities will increase the use of water and land resources due to water availability for farming, livestock, and domestic use. Mitigation measures include basin-wide integrated planning to avoid overuse, misuse, and conflicting uses of water and land resources, as well as land use planning efforts, which include watershed areas above the dam.

Table 6.18: Increased Water Use Impacts Rating

Criteria		Rating
Consequences	Severity/Magnitude	3
	Spatial Scope/Geographical Extent	1
	Duration of Impact	4
Likelihood	Frequency/ Duration of Activity	2
	Frequency of Impact	4
Impact Significance Rating (Consequence X Likelihood)	Medium	48

Mitigation Measures:

- A more detailed ESIA to be prepared for the water supply component of the project.
- Encourage beneficiaries to monitor, detect water leaks, and repair broken pipes
- Community water use demand management education
- Install automatic water-conserving taps where possible
- Install water meters in residential houses and farms to monitor the water usage

6.5.4.2 Water Quality Impacts

Water stored in a dam or reservoir must undergo physical, chemical, and biological transformations. Two physical processes drive most water quality changes in dams: trapping sediments and nutrients and thermal stratification in reservoirs. These phenomena are induced by climatic conditions (heat exchanges, aeration, etc.), chemical exchanges from geological formations, aquatic chemical reactions and material degradations, and biological reactions associated with decaying organic materials (biomass and humic matter decomposition). Massive potential for sand generation in the catchment and high vegetation cover also leads to potential humic content of the soils. The altered water quality will impact the downstream ecological systems. The dam can degrade downstream ecosystems by altering thermal regimes or causing hypoxic stress.

The reservoir is capable of trapping significant sediments and bed load, transforming or destroying downstream ecosystems like flood plains and deltas. Limited water mixing, aeration, and light penetration reduce available oxygen, resulting in anoxic conditions at the lower layers of the water. Anaerobic conditions in the lower layers of the water generate carbon dioxide, methane, and hydrogen sulfide and create low pH scenarios. Due to the lowered pH, geologically held iron, manganese, and other heavy metals will likely be released into the water, effectively changing the water quality. Implications on water quality would be felt by the water consumers in the immediate location of the dam as well as social and ecological defendants of Athi River downstream in terms of habitat pollution, people's health, and cost of water treatment at various stages.

Table 6.19: Water Quality Impacts Rating

Criteria		Rating
Consequences	Severity/Magnitude	5
	Spatial Scope/Geographical Extent (Study Area)	2
	Duration of Impact	1
Likelihood	Frequency/ Duration of Activity	4

	Frequency of Impact	4
Impact Significance Rating (Consequence X Likelihood)	High	64

Mitigation Measures:

a) Strategic pollution control and prevention upstream of the dam (Athi and Thwake Rivers)
b) Wastewater treatment in the upstream before discharge
c) Collaboration among stakeholders, e.g., government, private, and NGOs in pollution control.
d) Implement the relevant laws, policies, and safeguards.

6.5.4.3 River Hydrology and Morphology Changes

Changes in the downstream morphology of the riverbed and banks are possible impacts since dam controls will regulate the water flows. Depending on the dam design, the flow regime of the Athi River could change for a considerable distance downstream. Currently, the flow in Athi River fluctuates between rainfall periods, with peak flows during high rainfall intensity periods and extremely low flows during dry weather when tributaries bring in little or no water. With the dam's construction, downstream flows will most likely be regulated to a relatively constant flow rate over longer durations. The implications downstream will be;

(i) Reduced average high water levels downstream

(ii) Constant distribution of silt deposition (land fertility for downstream farmers) will be confined on a narrower flood plain since flood flows will be reduced,

(iii) On the other hand, current sub-aquatic ecosystems will be compromised in the higher floodplain zones of the river basin, thus slightly changing the basin characteristics (this change in trend has not been quantified at this stage).

Table 6.20: River Hydrology and Morphology Changes Impacts Rating

Criteria		**Rating**
Consequences	Severity/Magnitude	3
	Spatial Scope/Geographical Extent (Study Area)	2
	Duration of Impact	5
Likelihood	Frequency/ Duration of Activity	4
	Frequency of Impact	3
Impact Significance Rating (Consequence X Likelihood)	High	70

Mitigation Measures

(i) Ensure compliance with the water resources regulations at all times. At least 30% of the base flow (Environmental Flows) should always flow in the stream to sustain ecological and social requirements downstream

(ii) With effects on the level of flood heights downstream, it may be necessary to review the riparian land and extent of the sub-aquatic ecosystem downstream,

(iii) River gauging stations around the dam and downstream may require to be reactivated to monitor the effects of the dam on the river basin over time.

6.5.4.4 Local Air Quality Pollution

Dust emissions from earthen roads from transport vehicles accessing the dam can impact sensitive receptors (residents, road users, and sensitive receptors) within the immediate vicinity. Low carbon

emissions are expected from vehicular movements, but the duration is temporary, thus causing no significant impact on the environment.

Table 6.21: Increased Local Air Quality Impacts Rating

Criteria		Rating
Consequences	Severity/Magnitude	1
	Spatial Scope/Geographical Extent	1
	Duration of Impact	1
	Frequency/ Duration of Activity	2
	Frequency of Impact	3
Impact Significance Rating (Consequence X Likelihood)	Low Risk	15

6.5.4.5 Noise Pollution and Vibration

Noise emissions and associated impacts during vehicle repairs and maintenance are expected to be very low since they will be experienced only during repairs and maintenance in the dam area or at the employer's camp. There will be no ground vibrations during the dam operation.

Table 6.22: Increased Noise and Vibration Impacts Rating

Criteria		Rating
Consequences	Severity/Magnitude	1
	Spatial Scope/Geographical Extent	1
	Duration of Impact	1
	Frequency/ Duration of Activity	2
	Frequency of Impact	3
Impact Significance Rating (Consequence X Likelihood)	Low Risk	15

6.5.4.6 Workplace Occupational Safety and Health Issues

There may be occupational health and safety during operation and maintenance of works by the attendants, including injuries, accidents. Health issues may also result fron unhygienic conditions, poor waste disposal mechanisms.

Table 6.23: Occupational Safety & Health Impacts Rating

Criteria		Rating
Consequences	Severity/Magnitude	3
	Spatial Scope/Geographical Extent	1
	Duration of Impact	2
Likelihood	Frequency/ Duration of Activity	2
	Frequency of Impact	3
Impact Significance Rating (Consequence X Likelihood)	Low Risk	30

Mitigation:

- Provide comprehensive safety training for all workers, emphasizing hazard awareness, safe work practices, and emergency procedures.

- Ensure workers insurance is in place
- Ensure that a first aid kit is always provided within the site, fully equipped at all times, and managed by qualified persons.
- Regular inspections and audits should be conducted to identify and address potential hazards on the construction site.
- Update and adopt emergency response plans to address potential accidents or incidents promptly.
- Ensure proper solid and liquids disposal.
- Practice proper hygiene

6.5.3.7 Ecology and Biodiversity

During the operation stages of the dam and upon inundation of the dam area, the following is anticipated;

i) Riparian aquatic vegetation could develop on the new water/land transition zones with new species introduced and flourishing of the existing species (grasses, reeds, cyperus spp., etc.),
ii) A completely new ecosystem will also be established around the inundated area. Planktons, periphytons, and aquatic macrophytes will get established with implications on current aquatic life,
iii) This also links to water quality, ranging from improved aeration to pollutant removal and fish breeding.
iv) Decaying aquatic organic matter may also affect water quality negatively by imparting undesirable odor, color, and turbidity),
v) Indigenous fish (mainly tilapia, mudfish, eel, etc.) and aquatic animals such as frogs, birds, and other microorganisms will potentially thrive. At the same time, larger species, including crocodiles and hippos, will migrate from different areas to the project area and perhaps to specific dam locations.

Table 6.24: Ecology and Biodiversity Impacts Rating

Criteria		**Rating**
Consequences	Severity/Magnitude	3
	Spatial Scope/Geographical Extent	1
	Duration of Impact	4
Likelihood	Frequency/ Duration of Activity	2
	Frequency of Impact	4
Impact Significance Rating (Consequence X Likelihood)	Medium Risk	48

Mitigation Measures

- The role of the Kenya Wildlife Services would be crucial in monitoring the new habitats and characteristics of the wildlife migrating into the dam area.
- Establish community interests and values in the evolving ecological setting and enhance economic benefits.

6.5.4.8 Visual and landscape impacts

Visual impacts are anticipated during project operations since land surfaces will be visibly

changed due to the presence of the dam and employer's houses. Some areas near the dam will be backfilled and vegetation replanted.

Table 6.25: Visual and Landscape Impacts Rating

Criteria		Rating
Consequences	Severity/Magnitude	2
	Spatial Scope/Geographical Extent (Study Area)	1
	Duration of Impact	4
Likelihood	Frequency/ Duration of Activity	2
	Frequency of Impact	2
Impact Significance Rating (Consequence X Likelihood)	Medium Risk	42

6.5.4.9 *Human-Wildlife Conflicts*

The project will promote more water animals, such as hippos and crocodiles. The presence of water could also attract other species of wildlife from as far as Tsavo and Kitui National Parks, especially grazers with potential human/wildlife conflict risks.

Table 6.26: Human-Wildlife Impacts Rating

Criteria		Rating
Consequences	Severity/Magnitude	3
	Spatial Scope/Geographical Extent (Study Area)	2
	Duration of Impact	4
Likelihood	Frequency/ Duration of Activity	3
	Frequency of Impact	4
Impact Significance Rating (Consequence X Likelihood)	High Risk	63

Mitigation:

- Community education on how to co-exist with the animals
- KWS to open an office in the area to monitor the animals eg hippos in the river and to respond to emergencies

6.5.4.10 Waterborne Diseases

Vectors are part of the biodiversity but have negative implications for the residents. These include mosquitoes (associated with stagnant water), snails (carriers of bilharzia), and micro-organisms carrying other disease-causing germs (typhoid, cholera, dysentery, skin infections, eye infections, etc.).

Table 6.27: Water-Borne Diseases Impacts Rating

Criteria		Rating
Consequences	Severity/Magnitude	2
	Spatial Scope/Geographical Extent (Study Area)	2
	Duration of Impact	4

Likelihood	Frequency/ Duration of Activity	2
	Frequency of Impact	3
Impact Significance Rating (Consequence X Likelihood)	Medium Risk	40

Mitigation:

- Regularly provide mosquito nets to the residents living near the dam and its environs.
- Improved community health services

6.5.4.11 Community Occupational Safety and Health Issues

During operation, the community members may be exposed to various health and safety risks, such as falls and drowning in the dam. Though unlikely, there may be a risk of flooding or dam break.

Dam break and sudden release of the impounded water may occur under certain remote condition. This will require an emergency preparedness and response. A Consultant has been engaged to conduct sensitization of the community and stakeholders down stream of the dam about the emergency preparedness and planning measures of the dam in case of a dam break. The National Disaster Management Unit and National Government Administration have been involved and their roles defined in the dam break emergency preparedness and planning.

The Consultant is also updating the dam EPP to include the measures to be taken in case of a dam break.

Table 6.28: Community/ Public Safety & Health Impacts Rating

Criteria		**Rating**
Consequences	Severity/Magnitude	1
	Spatial Scope/Geographical Extent	1
	Duration of Impact	1
Likelihood	Frequency/ Duration of Activity	2
	Frequency of Impact	1
Impact Significance Rating (Consequence X Likelihood)	Low	9

Mitigation

- Fencing the dam area to restrict community access to the dam.
- Deploying security
- Update the emergency response and preparedness plan
- Ensure the existence an Operation and Maintenance (O&M) Manual which can be reviewed to assess the need for updates when needed and which cover among others Critical event inspections. There should be inspections or monitoring during or immediately following the occurrence of critical events, such as severe rain.
- After the successful implementation and operationalization of the project, observations, surveillance, inspections, routine monitoring and continuing evaluation in line with the O&M manual are required to assure the satisfactory performance of the water reservoir and safety of the community. Periodic inspection as part of the ongoing O&M program is essential to disclose conditions that might Cause disruption or failure of operation and to determine the adequacy of

the dam to serve the purpose for which it was designed

- Undertake annual environmental audits and submit findings to NEMA. The report findings will guide on whether the system is holding as expected or if remedial action of needed
- Continuously implement the emergency preparedness plan developed under the initial dam scope

6.5.4.12 Cumulative Impacts

Cumulative impacts that result from the incremental effect of the project when added to impacts from other relevant past, present, and reasonably foreseeable developments, as well as unplanned but predictable activities enabled by the project that may occur later or at a different location. Cumulative impacts can result from individually minor but collectively significant activities occurring over time. Cumulative impacts can occur either when different implications from one development interact to exacerbate effects on sensitive receptors or when the result of an action is augmented or exacerbated by influences from other existing or future neighboring developments, thus creating a more significant impact on a receptor.

There is no known plan of additional dams on Thwake River in the foreseeable future. Potential cumulative impacts may be associated with the dam development because of planned phases 2 and 3 of construction work and operation ie water supply and irrigation which may put extra pressure on the water resources in the river and especially availability of water for downstream users. Other possible impacts are from activities such as irrigation as more and more farmers engage in irrigation farming. Building a dam on a wild river affects the flow of the river, it reduces the flow on up as well as on the downstream, which could affects the wildlife or communities downstream. The flow manipulations also result in physical, chemical, and biological changes to the ecosystems of upstream backwaters, the reservoir body and surroundings, and downstream. This may be compounded by the addition of saddle dams resulting in larger areas of impact.

Table 6.29: Cumulative Impacts Rating

Criteria		**Rating**
Consequences	Severity/Magnitude	3
	Spatial Scope/Geographical Extent	1
	Duration of Impact	3
Likelihood	Frequency/ Duration of Activity	3
	Frequency of Impact	3
Impact Significance Rating (Consequence X Likelihood)	Impact	42

Mitigation Measures:

- Developing measures to avoid, minimize, or remedy impacts
- Develop action-specific measures, establish policies, and consult with stakeholders.
- Maintaining environmental flow as designed for this dam

6.5.5 OPERATION PHASE - POSITIVE ENVIRONMENTAL AND SOCIAL IMPACTS

The following are the potential positive impacts anticipated during the operation phase of the dam.

6.5.5.1 Floods Control and Drought Mitigation

The dam will effectively regulate Athi River levels and control flooding downstream by temporarily storing the flood volume and releasing it later, ensuring a sustainable water supply to various users.

6.5.5.2 Improved Environmental Conservation and Protection

With improved water availability, the residents will have opportunities to establish tree nurseries and plant more fruit and exotic trees on their farms, thus promoting environment conservation and local climate. The impact here is significant.

6.5.5.3 Climate Change Vulnerability, Adaptability, and Resilience

Climate change (CC) is a reality phenomenon that can destroy infrastructural projects. CC causes extreme and unpredictable weather conditions characterized by unreliable, erratic, or extremely high rainfall, leading to droughts and floods. Improved environmental conservation through improved tree growing in the area will create more carbon sinks, thus reversing the impacts of climate change. Additionally, local farmers will practice climate-smart agriculture, thus enhancing climate change adaptation & resilience and reducing the local community's vulnerability to climate change impacts like prolonged droughts and famine.

6.5.5.4 Improved household food security and livelihood

The farmers in Makueni and Kitui counties can grow high-value horticultural and food crops for subsistence and commercial use. This will also improve nutritional values at the household level due to the variety of crops grown. There will be enhanced household incomes from selling farm produce and dairy products, thus boosting the economy. This is a highly significant impact.

6.5.5.5 Increased Land Values in the Project Area

Providing irrigation infrastructure is an additional value for properties, especially land and commercial plots in the target project area. Properties and land are expected to be appreciated because of improved access to irrigation farming. The project will attract more regional investment, leading to accelerated business growth.

6.5.5.6 Improved hygiene practices and Public Health

Access to reliable, safe water supply for domestic use will promote better hygiene practices, improve personal and community health, and reduce water-borne diseases such as cholera and typhoid, contributing to public health. Water is key to proper cleanliness, hygiene, disease prevention, and public health. Water should always be available.

6.5.5.7 Education

Contribution to Competency-Based Curriculum (CBC) - The current education curriculum is practical-oriented, with agriculture as one of the critical subjects. The pupils from local schools will have an added advantage and ability to translate theory into practice since they will be exposed to irrigated agriculture technologies, both on the farms and in kitchen gardens in their homes. School farms can be used as demonstration sites or learning centers.

6.5.5.8 Social Equity

Equitable access to water facilities promotes social inclusion and reduces disparities, fostering a sense of community well-being.

6.5.5.9 Enhanced Community Resilience

Access to water will help the community withstand climate shocks such as prolonged droughts, thus contributing to community resilience in the face of the unpredictable changing climate. Additionally, the project will ease the current water deficit in Machakos (Konza City), Makueni, Kitui counties and the environs, consequently promoting the national economic growth.

6.5.6 DECOMMISSIONING PHASE - NEGATIVE ENVIRONMENTAL AND SOCIAL IMPACTS

The lifeline of the dam is 100 years. Some project camp components may be decommissioned when the construction phase is over. A detailed decommissioning plan will be developed and implemented in compliance the Bank's ISS requirements and National legislation. Under these circumstances, the contractor will demolish the built structures, remove the salvage materials, and restore the area affected to its original state. Decommissioning impacts include but are not limited to:

6.5.6.1 Solid Wastes Generation

The resultant waste should be sorted into re-recyclables and non-recyclables before disposal at the designated sites as per NEMA regulations.

Table 6.30: Solid Wastes Generation Impacts Rating

Criteria		**Rating**
Consequences	Severity/Magnitude	2
	Spatial Scope/Geographical Extent	1
	Duration of Impact	1
	Frequency/ Duration of Activity	1
	Frequency of Impact	3
Impact Significance Rating (Consequence X Likelihood)	Medium	45

Mitigation:

- Develop a waste management plan.
- Use a NEMA-licensed waste handler to dispose-off the wastes

6.5.6.2 Noise & vibration impacts

The anticipated noise levels are minimal due to the dismantling cutting of metals, wood, iron sheets, etc., and waste transport.

Table 6.31: Noise and Vibration Impacts Rating

Criteria		**Rating**
Consequences	Severity/Magnitude	2
	Spatial Scope/Geographical Extent	2
	Duration of Impact	2
	Frequency/ Duration of Activity	2
	Frequency of Impact	1
Impact Significance Rating (Consequence X Likelihood)	Low	18

Mitigation:

- Use of the right tools for demolition.
- Safety and health inductions

6.5.6.3 Workplace Occupational Safety and Health Risks

During the demolition of project structures, the workers may be exposed to risks of minor injuries and accidents from falls or hand tools.

Table 6.32: Workplace Occupational Safety & Health Impacts Rating

Criteria		Rating
Consequences	Severity/Magnitude	3
	Spatial Scope/Geographical Extent	2
	Duration of Impact	2
	Frequency/ Duration of Activity	2
	Frequency of Impact	2
Impact Significance Rating (Consequence X Likelihood)	Medium	45

Mitigation Measures:

- Provide safety awareness training for workers involved in demolitions.
- Implement the Emergency Response Plan
- Provide all required PPEs

6.5.7 DECOMMISSIONING PHASE - POSITIVE IMPACTS

6.5.7.1 Employment Opportunities

Despite the winding up of the project, temporary jobs will be available for casual workers hired to bring down the project infrastructure to a close. Some existing infrastructure at the campsite, such as the dispensary, will be handed over to the county governments.

CHAPTER SEVEN: ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)

7.1 Introduction

This chapter presents the environmental management principles, responsibility, and the Environmental and Social Management and Monitoring Plan (ESMP) that will need to be implemented by the proponent/contractor to prevent or reduce significant adverse impacts to acceptable levels. Environmental monitoring is an essential component of project implementation. An ESMP is a tool that provides a mechanism for managing and monitoring the ecological results of a project during its execution and operation to reduce their adverse effects and to introduce standards of good practice to be adopted for all project works. The ESMP facilitates and ensures the follow-up of implementing the proposed mitigation measures. Preparing the ESMP is one of the objectives of the EIA report and is a requirement for environmental management under the EMCA 2003.

The Environmental and Social Management Plan (ESMP) is a summary developed by the proponent that identifies the material measures and actions to assess, manage, and monitor the risks and impacts of the project in a manner and time frame acceptable to the Bank. One of the AfDB objectives of OP 1, Environmental and Social Assessment Safeguards, is to ensure the effective management of environmental and social risks in projects during and after implementation. The ESMP acts as a management tool, recording the Bank's agreement on when and/or how specific issues will be addressed. The ESMP allows the Borrower to allocate resources based on agreed measures and actions as the project's planning and development progresses. The ESMP forms the core for environmental management and project monitoring during the construction, operational, and decommissioning phases. The ESMP should be used as a checklist on-site. Due to the project's magnitude, compliance with the ESMP must be monitored periodically, and reports must be prepared and provided at monthly site meetings during the construction phase and quarterly during the operations and maintenance period.

7.2 Management Plan Principles

This project aims to enhance social and economic benefits for people living within beneficiary areas and the region. The project, however, should also observe environmental conservation requirements per the established laws and regulations. To realize this goal, acceptability by a majority of the beneficiaries and minimal effects on the physical environment will be required to be integrated into the project through constant consultations, evaluations, and reviews of the design aspects throughout the project coverage.

It is recommended that guiding principles specific to this project and the regulations governing water resources management be developed to integrate environmental management considerations in the construction maintenance of the facility components and public amenities. Among the factors that need to be considered in this particular project implementation will include:

(i) Ensure soil erosion control, prevention of siltation, and discharge of pollutants into the water sources upstream of the dam (mainly the seasonal rivers and streams).
(ii) Enhancing integration of environmental, social, and economic functions in the project implementation.
(iii) Compensations or appropriate acquisition process of any land and/or property affected by any of the projects is per the laid down guidelines,
(iv) The contractors and other players in the project activities be prevailed upon to implement the EMSP through sustained supervision and continuous consultations,

(v) Mainstream climate change (mitigation and adaptation) management in the project implementation.

7.3 Specific Management Issues

7.3.1 Management Responsibilities

The responsibility for implementation of the ESMP lies with the Ministry of Water, Sanitation and Irrigation. The Ministry of Water, Sanitation, and Irrigation, through the PIT, will oversee, guide, and coordinate the implementation of the environmental management aspects, including dam conservation, soil erosion control, re-vegetation whenever appropriate, water conservation and equity in distribution, and enhanced sanitation and hygiene measures throughout the project area. The PIT is resourced with qualified and experienced experts in EHS and Gender and Social matters to monitor, provide liaisons, report implementation, and propose improvements to environmental and social management aspects during construction and post-tracking audits.

The contractor will be responsible for implementation and compliance with the ESMP at the site and related activities. At the same time, the supervising consultant will oversee and ensure the contractor complies with the requirements of this ESIA and ESMP.

The contractor and Supervising Consultant is required to hire qualified E&S personnel to support the implementation of the ESMP, and roles include:

i) Enhance the integration of environmental, social, and economic functions in the project's implementation.
ii) Consider preventive measures towards possible social and economic disruptions arising from the project implementation per the guidelines.
iii) The contractors and other players in the project activities prevailed upon to implement the EMP through sustained supervision and continuous consultations.

The County governments will issue required licenses and enforce compliance with the conditions outlined in the permits and other County Government laws.

7.3.2 Environmental and Social Management Guidelines

Under due consideration of the ESMP and as part of the ESIA, the contractor have submitted and will be required to review and update the management plans listed below , to address risks brought about by the additional scope meetings

- ✓ Contractor’s Environmental and Social Management Plan
- ✓ Occupational Health and Safety plan
- ✓ Pollution Prevention and Control Plan
- ✓ Environmental Management Plan (Waste Management Plan, Pollution Prevention and Control Plan
- ✓ Blasting Operation Plan, Control of Excessive Vibrations of Noise, and Dust
- ✓ Traffic Management Plan
- ✓ Human resources management with a focus on prioritizing local communities

- ✓ Social and Gender Management Plan
- ✓ Public health and safety management plan
- ✓ The provisions for the workers and community grievances redress mechanism
- ✓ Sexual Harassment, Abuse, and Exploitation Management Plan
- ✓ Emergency Response and preparedness

Upon completion and commissioning of the dam, it will be necessary to establish appropriate operational guidelines on environmental conservation and social linkages. This will enable management to identify critical environmental and social issues and institute proper actions to minimize associated conflicts. The policies should cover ecological management programs, standard operation procedures, compliance monitoring schedules, and environmental audit schedules as required by law. Social harmony of the dam and its associated components will be achieved through collaborations with the stakeholders or community management committees.

7.3.3 Environmental Education and Awareness Raising

Water consumers and beneficiaries must understand the fundamental principles of environment, water use, sanitation, and hygiene. In this regard, therefore, the following steps will be considered;

(i) Create liaisons on all matters related to the environment, utilization of water, health, safety, sanitation, and hygiene issues of the water resource development,

(ii) Encourage contribution of improvement ideas from the beneficiaries on specific issues related to the dam management, water distribution systems, water availability, sharing, etc., say through questionnaires or direct interactions,

(iii) Establish initiatives to instill a sense of ownership of the dams and related components to all beneficiaries.

7.3.4 Emergency Response and Preparedness

An Emergency Response and Preparedness plan has been developed and implemented in Phase 1 construction. The plan has been reviewed during construction to ensure it remains updated and relevant to the project activities. Possible emergencies during the construction have been identified and listed, e.g., medical emergencies, fires, and accidents.

a) First Aid

The contractor provides first aid arrangements at the site. First aid kits are inspected monthly to ensure they are adequately stocked. Trained first aiders are deployed and assigned responsibilities for the first aid stations. All personnel are trained and communicated to know the locations and procedures to follow in an emergency.

b) Site Clinic

A site clinic, level 2, is located at the site. Doctors, clinical officers, and nurses have been employed to offer medical services, including handling emergencies at the site.
An Ambulance is available at the site to respond to emergency medical cases.

c) Fire Safety

Fire extinguishers have been installed at various locations on the site, and workers have been trained to use them in case of fire. Fire Marshals have been appointed and trained to support fire safety.

d) Reporting of Emergencies

All emergencies are reported to the supervisor or Safety Engineer immediately after a worker notices an emergency. Emergency phone numbers for fire, police, and ambulance will be posted and communicated to all the employees.

7.3.5 Dam Break Emergency Preparedness and Planning

The Proponent engaged a consultant to study the Dam Break analysis and emergency preparedness plan. The report identified areas, communities, and facilities downstream of the dam that will be affected if the dam breaks (though remote) and suddenly vast volumes of stored water are released.

The report identified and made recommendations to ensure the safety of persons and facilities downstream of the dam. The recommendations identified include:

1) Awareness and sensitization of the communities and stakeholders living downstream of the dam. A consultant has been engaged to develop manuals, print communication materials, and sensitize communities and stakeholders on the risks of the dam and emergency preparedness in case of a dam break.
2) Identification and engagement of emergency responders who include community leaders, local Administration, NGOs, and Kenya Red Cross, among others
3) The capacity-building of the institutions and local administrations is planned to understand their roles in managing dam break emergencies.

7.3.6 Monitoring and Reporting

Monitoring and reporting provide the basis for tracking the project's performance and verifying compliance with the ESMP and the requirements of the OSs. Monitoring and reporting also help identify actions or measures that may be needed to remedy or improve a project's environmental and social performance. The extent and mode of monitoring and reporting reflect the nature of the project and the significance of its environmental and social risks and impacts.

7.3.7 ENVIRONMENTAL AND SOCIAL AWARENESS, CAPACITY BUILDING AND TRAINING

Effective implementation of this ESMP and the AfDB's OS instruments require commitment and leadership of the project management team (Ministry, Supervising Consultant, and the contractor) in EHS issues. This commitment will be demonstrated by visible actions and by ensuring EHS is integral to project management. Capacity building in E&S is critical in enabling the project team to enhance knowledge and understanding in the implementation of the ESMP, ensure compliance with the National legislation and OS requirements, and achieve continuous improvement in EHS performance.

Project Capacity Building and Training:

Capacity building is a continuous activity, and the project team is encouraged to take every opportunity to learn to improve E&S performance continuously. The topics listed in Table 7.1 below are key to ensure compliance.

Table 7.1: Capacity Building and Training Topics

Training/Awareness	Objective	Target Group	Frequency

Project Environmental and Social Impact Assessment (ESIA)	- Understand and apply National legislation and Af DB's OS Instruments - Demonstrated knowledge of environmental and social impacts, relevance, and project activities that generate the impacts	Contractors' management team, SMEC supervision team, PIT, EHS team	Once a year
Project ESMP	- Understand environmental and social impacts and mitigation measures applied.	Contractors' management team, SMEC supervision team, PIT, EHS team	Twice a year
E&S Leadership and commitment	- To learn the value of E&S in project success and enable project leaders to demonstrate visible leadership	PM, SRE, PC, Senior Engineers	Once a year
Occupational Health & Safety Plan	- Impart knowledge of safety and health risks and exposure to the workers - To implement and continuously monitor the effectiveness of risk control measures to prevent injuries/ill health	Contractors' management team, SMEC supervision team, PIT, EHS team	Twice a year
Waste Management and pollution control plans	- To identify project activities that generate waste and apply waste management principles	Contractor, SMEC, PIT and EHS Team	Twice a year
Community Health & safety plan	- To understand and mitigate project impacts on the community - To monitor and report incidents affecting the community, investigate and implement corrective actions	Contractor, SMEC, PIT and EHS Team	Once a year

Stakeholders Engagement Plan	- To maintain positive engagement and communication with stakeholders - To inform the stakeholders of environmental and social impacts and mitigation measures in place - To obtain feedback from the stakeholders	Contractor, SMEC, PIT and EHS Team, Community leaders	Quarterly
Emergency Preparedness and Response	- To develop, implement, and maintain updated project Emergency Preparedness and Response	Contractor, SMEC, PIT and EHS Team	Twice a year
Traffic control and safe driving	- To minimize traffic accident risk exposure - To avoid equipment downtime due to accidents	Drivers, Traffic Marshals, EHS Team	Quarterly
Statutory Training and compliance (First Aid, Fire Safety, and OSH Committee)	- To comply with the requirements of the OSH legislation	First Aiders, Fire Marshals, and OSH Committee members	Once a year

7.4 ENVIRONMENT AND SOCIAL MANAGEMENT PLAN (ESMP)

The ESMP is shown in Table 7.2 below.

Table 7.2: Environment and Social Management Plan (ESMP)

Anticipated Negative Impacts	Recommended Mitigation Measures	Responsibility	Performance Indicator	Where to Monitor	Time Frame	Cost (Ksh)
A. NEGATIVE ENVIRONMENTAL IMPACTS DURING PRE CONSTRUCTION						
Pending legacy issues from land acquisition	• Finalize the demarcation of land and issuance of title deeds to the affected persons and land owners.	PIT/Ministry working with National Land Commission	Demarcated land and consolidated project land title Issued title deeds to PAPs whose land was partially acquired	**Project Site** **PAPs Land/areas**	Prior to commencement of additional Works	**25,913,105***
A. NEGATIVE ENVIRONMENTAL IMPACTS DURING CONSTRUCTION						

1. Increased extraction of raw materials **Objective: Minimize wastes**	1. Buy only needed building materials and avoid wastage. 2. Ensure accurate budgeting and estimation of actual construction material requirements to ensure no excess is ordered 3. Ensure that damage or loss of materials is minimal through proper storage. 4. Use at least 5%-10% recycled, refurbished, or salvaged materials to reduce the use of raw materials. 5. Donate recyclable/reusable or residual materials to local community groups, institutions, and local residents or homeowners. 6. Use of durable, long-lasting materials that will not need to be replaced as often, thereby reducing the amount of construction waste generated over time 7. Consider environmental performance of suppliers of raw material in the selection process. The Contractors will source construction materials such as sand and hard core from registered and approved quarry and sand mining firms whose projects have undergone satisfactory environmental impact assessment/audit and received NEMA approval	Contractor[2] Supervising Consultant/PIT	% of generated waste Vs extracted materials Reduction in land disturbance area for raw materials extraction Compliance with the ESIA and permit conditions for sources	Construction site	Monthly	500,000
2. Local Air Quality Pollution **Objective: To minimize dust and exhaust emissions**						

[2] Has an implementation responsibility all through construction phase

2.1 Dust emission	1. Restrict construction vehicles' speed to 30 km/h or less. 2. Use of personal protective equipment (PPE), e.g. masks 3. Road wetting on graded access routes when necessary to reduce dust generation by construction vehicles 4. Transport all construction materials in designated trucks, which will be covered. 5. Use appropriate Personal Protective Equipment (PPE) such as dust masks, particularly for construction workers. 6. Undertake monitoring close to dusty activities, noting that this may be daily visual inspections, or passive/active monitoring	Contractor Supervising Consultant/PIT	Number of community complaints PPE purchase and use Number of respiratory complications reported. Compliance to Air Quality Regulations Serviced vehicles on site Number of air quality surveys undertaken Period of servicing of vehicles and machinery type of fuel and lubricant used	Construction site and adjacent areas	Daily/Monthly	300,000
2.2 Exhaust Fumes	1. Maintain and service construction vehicles at designated garages 2. Ensure/minimize no vehicle idling at the site, 3. Conduct regular air quality surveys for dust and emission analysis 4. Equipment and vehicles shall be properly turned and maintained according to manufacturers' specifications 5. Use standard fuel and lubricants. 6. Impose speed limits on haul routes and in construction compound to reduce dust generation	Contractor Supervising Consultant/PIT				
3. Impacts on Soil Resources **Objective: Protection from soil erosion and pollution by oil spills/diesel**						

3.1 Soil erosion	1. Avoid stockpiles of excavated material. 2. Soils excavated should be used for backfilling where possible	Contractor Supervising Consultant/PIT	Suspended solid particulate matter downstream	Soil erosion prevention/control plan	Quarterly	Cost build in the construction BOQ
3.2 Soil contamination from oil spills and other construction wastes	1. Control accidental oil spills by proper vehicle maintenance 2. Waste water containing pollutants like cement, concrete, chemicals, and fuels shall be discharged into a conservancy tank 3. Obtain NEMA Effluent Discharge Licence 4. Vehicles should preferably be parked on paved platforms. 5. Fuel storages should not leak, and should be periodically monitored, and repaired or replaced when necessary. 6. Maintain fuel and clean vehicles and equipment at workshops/sites with adequate leakage prevention (e.g.) impermeable surface, settlers, and oil separator). 7. Storing all hazardous, sanitary and cleaning wastes in facilities approved by NEMA. 8. Strict enforcement and monitoring standard procedures for storing and handling hazardous wastes and raw material (e.g., fuel or chemicals). 9. Any contaminated soil should be scooped up and disposed of appropriately through licensed hazardous waste handlers		Deviations of water quality analysis parameters Licensed hazardous waste handler licencse and volumes of waste collected and disposed Hazmat for storage of hazardous waste Location of vehicle maintenance Spill containment plan and its application	River water – upstream and downstream	Quarterly	100,000

4. Impacts on Water Resources **Objective: Minimize water consumption, promote more efficient & safe water use, and control pollution of groundwater**						
4.1 Increased water use/ demand	1. Implement water demand management measures, e.g., recycling water during construction. 2. Ensure taps are not running when not in use 3. Install a discharge meter at water outlets to determine and monitor total water usage for beneficiaries 4. Obtain a Water Abstraction license from WRA 5. Fuel storages should not leak, and should be periodically monitored, and repaired or replaced when necessary. 6. Maintain fuel and clean vehicles and equipment at workshops/sites with adequate leakage prevention (e.g., impermeable surface, settlers and oil separator). 7. Regular tests of the neighbouring water resources/points/river	Contractor Supervising Consultant/PIT	Rate of water consumption Water tests for nearby sources and the results Water abstraction permit acquired Proper storage of fuel and servicing of vehicles in the right spaces	Construction and Camp sites	Monthly	50,000
5. Increased wastes generation **Objective: Minimize waste generation and ensure efficient waste management**						

Increased wastes generation	1. Implement an integrated solid waste management (ISWM) system, e.g., source reduction, recycling construction materials etc. 2. Contract a NEMA-licensed waste handler to dispose of general and hazardous materials and construction wastes. 3. Recover damaged or waste construction materials, e.g., doors, plumbing & lighting fixtures, and glass, recovered for refurbishing for re-use. 4. Purchase building materials that have minimal or no packaging to avoid the generation of excessive packaging wastes	Contractor Supervising Consultant/PIT	Tonnes of waste disposed NEMA-licensed waste handler to dispose of general and hazardous material	Dam and campsites	Throughout construction period	250,000 (Waste handler)
6. Impacts on Ecology and Biodiversity **Objective: To conserve the ecosystems and Biodiversity**						
Destruction of important animal habitats at the dam construction site and quarries	• Rehabilitate and, where possible, restore the damaged areas to their original state • Induction programs for workers must include requirements to protect the natural environment.	Contractor Supervising Consultant/PIT	Acreage rehabilitated Inductions of workers	Project Area	Construction and Operation stage	3,000,000
7. Noise and Vibration Impacts						

Increased Noise and Vibration	1. Use approved blasting materials and methods to avoid excessive noise and vibrations. 2. Create community awareness of the increased noise and vibrations from the site. 3. Obtain licenses for the emission of excessive noise and vibration (Kitui, Makueni) 4. Maintain construction equipment and machinery as per the manufacturer's requirements. 5. Impose a speed limit of 30km/h on all vehicles transporting construction equipment and materials. 6. Undertakes regular noise and vibration measurements and monitors dam site and quarries quarterly. 7. Workers who may unavoidably have to work with noise generating equipment, e.g., earthmoving equipment should be provided with ear plugs and advised to put them on 8. Siting noisy equipment as far away as possible from Noise Sensitive Receptors (NSRs), and use of barriers (e.g., acoustic sheds or partitions) to reduce the level of construction noise at receptors wherever practicable 9. Where practicable noisy equipment will be orientated to face away from the nearest NSRs 10. For machines with fitted enclosures, doors and door seals will be checked to	Contractor Supervising Consultant/PIT	No. off non-compliant Noise and Vibration records Blasting plan and adherence including baseline survey Baseline and afterwards tests for workers PPE issuance and use Periodic maintenance of vehicles and machines Types of blasting materials and methods	Project and surrounding community areas	Blasting Times During noisy activities	300,000

	ensure they are in good working order; also, that the doors close properly against the seals 11. Throttle settings will be reduced, and equipment and plant turned off, when not being used 12. Maintain construction vehicles as per the manufacturer's requirements 13. Notify the community on blasting schedules 14. Conduct regular noise level and vibration surveys 15. Audiometric examinations of workers exposed to noise above 85 dB 16. Minimizing the number of motorized vehicles in use and the number of trips through planning.					
17. **Habitat Loss –** minimize/restore habitat loss	1. Replant native vegetation in affected areas 2. Restore degraded riparian areas along the rivers (Athi and Thwake) 3. Maintain buffer zones with indigenous plant to erosion and support wildlife 4. Promote community managed conservations zones (WRUAs) 5. Provide training and alternatives livelihoods to reduce pressure on natural resources	Contractor, Supervising Consultant/PIT	Acreage of planted native vegetation No. of community members trained	Project and surrounding areas	Monthly	500,000

18. Impact on River Flows	1. Sediment management – implement dam sediment control report 2. Construct sediment load control ponds to trap suspended solid in storm water flows 3. Monitor river conditions and dam adjust construction accordingly	Contractor Supervising Consultant/PIT	No. deviations of suspended solid from standard Number of sediment load control ponds (under BoQ)	Project Rivers section – upstream and down stream	Monthly	200,000
8. Traffic Impacts						
Increased Traffic accidents	1. Impose speed limits of 40 km/h within project sites and when driving within the settlement area and 80 km/h on public roads. 2. Choosing suitable traffic routes/diversions reduces the neighborhood's impact. 3. Enforce traffic rules within and outside the project sites 4. Ensuring hired drivers are qualified and refresher trainings undertaken	Contractor/ Supervising Consultant/PIT	No. of road traffic accidents No. of enforcement actions executed	Dam site and neighbourhood	Monthly	No cost
B. NEGATIVE SOCIAL IMPACTS DURING CONSTRUCTION						

1. Occupational safety and health - increased workplace accidents	1. Establish occupational and safety management policy and plan 2. Ensure compliance with OSHA, 2007 and related Regulations 3. Ensure compliance with the AfDB Group's OS 2 – Labour and working condition requirements 4. Provision and use of adequate PPE for all workers 5. Provide comprehensive safety training for all workers, emphasizing hazard awareness, safe work practices, and emergency procedures. 6. Regular inspections and audits should be conducted to identify and address potential hazards on the construction site. 7. Develop and communicate emergency response plans to address potential accidents or incidents promptly. 8. A stocked first aid box that is readily available and accessible should be provided within the project site. 9. Provision for workers training in first aid, with certificates issued by a recognized body. 10. Training workers on general rules of hygiene, health and safety (HHS) 11. Update and Implement the Environmental, Health and Safety (EHS) plan being that of contractual agreement by the contractor/ sub-contractors in order to outline	Contractor Supervising Consultant/PIT	Zero accidents No. of improvement actions implemented No. of training hours No. of Inspections and audits done Fulltime EHS officer on site First aid kits and trained first aiders on each site Number of inspections, audits and risk assessments undertaken Valid WIBA for all workers Reporting time for major accidents Operational site clinic and ambulance	Dam site	Monthly	2,200,000

	procedures for avoiding health and safety incidents and for emergency medical treatment. 12. Provide comprehensive safety training for all workers, emphasizing hazard awareness, safe work practices, and emergency procedures. 13. Ensure that a first aid kit is always provided within the site, fully equipped at all times, and managed by qualified persons. 14. Regular inspections and audits should be conducted to identify and address potential hazards on the construction site. *15.* Update and adopt emergency response plans to address potential accidents or incidents promptly. 16. Maintain licensed food handlers to ensure food safety at the site 17. Maintain quarterly domestic water quality tests on-site by accredited Laboratory 18. Ensure appropriate use of PPE, such as hard hats, safety glasses, gloves, and respiratory protection. 19. Update and implement procedure for the recording and analysis of incidents and lessons learned such that additional actions can be implemented to avoid or minimize occupational health and safety risks. 20. Contractor takes Work Injury Benefits Act (*WIBA*) insurance for all workers					

	21. Provision and wearing of recommended quality Personal Protective Equipment (PPE) by workers on site at all times. Active replacement of worn out of PPE. 22. Contractor to designate a lead Safety Environment and Health Officer to enforce the safety and health management on site and to monitor implementation for the duration of the construction work 23. Contractor to ensure all machines and equipment on site serviced as required and are in proper working condition. 24. Proper signage at strategic places for information and warning e.g., excavation sites to warn on fall risks. 25. The contractor will keep an incident occurrence book, register the site with DOSHS and insure vehicles, workers and third parties. 26. All accidents to be reported to the Bank and national authorities in the stipulated times including fatalities in less than 24 hours. 27. Ensure a qualified EHS officer 28. Operational site clinic and ambulance					

2. Labour Issues - Poor management of labor matters and resolution of labor disputes	1. Payment of workers' salary and dues on time 2. Regular communication and engagement of workers 3. Implement employee suggestion and feedback program 4. Implement employee's grievances redress mechanism 5. Workers issued with contracts and code of conducts 6. Adherence to minimum wage and prompt payment of salaries/dues as agreed on 7. Contractor will ensure that adequate clean water and access to medical care is provided to all workers on the worksite 8. Pre-employment medical assessments will be put in place as a workforce risk management tool	Contractor Supervising consultant/PIT	Payment of wages on time Timely submission of statutory deductions Amicable resolution of employees' grievances Workers contracts Pre-employment medical assessments Minimum wage adherence	Dam site	Monthly	No cost (covered in contractor works and technical input costs)

3. Emergency Response and Preparedness - Uncoordinated responses to emergencies (medical, environmental, employee strikes, Dam break, ….)	• Identify and categorize all emergencies likely to result from the Dam operations. • Update and implement an emergency response plan:- define responsibilities and train all employees to understand what to do in an emergency. • Sensitize community and stakeholders/emergency responders of the Dam break EPP • Maintain the site clinic in good and well-equipped/stocked • Map and sensitize communities and stakeholders that may be affected by the emergency • Identify and train emergency responders to understand their roles • Valid workers insurance	Contractor/ Supervising Consultant/PIT	No. of employees trained in ERP Equipped ERP facilities No. of community members/stakeholders trained Valid WIBA	Dam site and community	Monthly	1,000,000
4. Limited access to water points (human, livestock) – access routes blocked/diverted by the project	1. Sink and equip boreholes for the community near the site to have alternative access to water points (where applicable). 2. Construct and maintain alternative routes to rivers to allow the community access to water for livestock.	Contractor Supervising Consultant/PIT	No. of community meetings Community routes to the river	Project Area	Monthly	500,000 For boreholes if needed to be treated as day works and costs agreed on with PIT

5. Gender-Based Violence – Sexual Exploitation, Abuse, and Harassment (GBV/SEAH)	• Conduct comprehensive training sessions for all construction workers, supervisors, and contractors on recognizing, preventing, and responding to gender inequities, GBV, and SEA. • Establish clear codes of conduct and policies that prohibit GBV and SEA, including harassment, exploitation, and discrimination. • Engage with local communities to raise awareness about GBV and SEA, respectful behavior and gender equality, and available support services. • Ensure continued implementation of the clear human resources policy against sexual harassment that is aligned with national law • Ensuring appointed human resources personnel to manage reports of sexual harassment according to policy • Review of specific project components that are known to heighten GBV risk at the community level, e.g., compensation schemes; employment schemes for women; etc. • The contractor will ensure adequate referral mechanisms are in place if a case of GBV at the community level	Contractor Supervising Consultant	No. of cases reported Workers code of conduct Training of workers Established mechanisms for handling and referral of cases Qualified human resource to handle	Project Area	Monthly	50,000

6. Child Labour, Exploitation and Abuse	1. Ensure the contractor signs a code of conduct that covers child protection, ensuring no children are employed on site following national labour laws. 2. Ensure that any child sexual relations offenses among contractors' workers are promptly reported to the police. 3. Employ workers 18 years and above with a valid national ID at the time of hire. 4. The management of the relationship between employees and the communities in the project area, with the emphasis on the protection of minors and other vulnerable members	Contractor Supervising consultant/PIT	No. of cases reported Age of all employees	Project Area	Monthly	50,000

7. Community Safety and Health Impacts	1. Develop and implement community safety and health prevention program 2. Sensitization of community on the project activities 3. Engage Community Liaison Officer to lead community safety and health sensitization program 4. Monitor environmental impacts in the community areas. 5. Hazard Prevention and Risk Assessment- Regularly assess potential hazards and risks to community health and safety, including those related to infrastructure development, traffic, and environmental factors; prioritize hazard prevention and control procedures, such as implementing strict protocols for interaction with local communities. 6. Emergency Preparedness – review and update comprehensive plans outlining procedures for responding to potential incidents, such as accidents, disasters, or public health emergencies. 7. Safety Culture and Training - Foster a culture where safety is a top priority for all employees and community members; implement comprehensive safety training programs for all employees, contractors, and community members, covering relevant hazards, safety procedures, and emergency response protocols. 8. Regulatory Compliance and Legal Frameworks - Adhere to all relevant	Contractor Supervising Consultant /PIT	No. of community awareness sessions Functional GRM Operational site clinic and ambulance Minimum requirement of Third-Party Insurance for all vehicles Community sensitization forums	Project Community areas	Quarterly	500,000

	regulations and legal frameworks related to community health and safety, including environmental impact assessments (EIAs), traffic safety regulations, hazardous materials handling procedures, regular inspections, and regulation enforcement including: o Implement appropriate traffic plans as/ when needed e.g. speed limits when on community access, Use flag men/women to give directions to traffic, Use reflective signature to direct traffic to designated areas. Sensitize drivers to observe speed limits including on college grounds o Minimum requirement of Third-Party Insurance for all vehicles in use by the contractor. o Provide primary health care and first aid at construction camp site to for emergencies. o Ensure workers (and community if possible) receive education and sensitization around transmission and symptoms of					

	communicable diseases of concern, HIV/AIDS Awareness and STDs. o Coordinate with local health and emergency service providers for accident case o Provide signage in active construction sites to warn public/college visitors/students to keep off and risk of any incidents o Provision of protective condoms in worker's sanitation facilities. o Have a functional Grievance Mechanism to address community grievances related to the construction works.					
8. Stakeholder Engagement and communication	1. Implement activities as defined in the SEP 2. Establish and maintain GRM (employees and community) 3. Monitor implementation, review and feedback on stakeholder engagement	Contractor Supervising consultant /PIT	%. of SEP actions completed % of reported grievances resolved and closed	Project and neighboring areas	Monthly	7,000,000
9. Cultural Sites/Heritage	1. Management of ''Chance Finds'' - Comply with defined national, AFDB cultural heritage regulations	Contractor/ Supervising Consultant, Project Proponent	No. of cultural sites discovered	Project Area	Continuous - Throughout construction period	No cost

2. ENVIRONMENTAL AND SOCIAL IMPACTS DURING OPERATION PHASE

A. Negative Impacts	Recommended Mitigation Measures	Responsibility	Performance Indicator	Where to Monitor	Time Frame	Cost (Ksh)

ENVIRONMENTAL IMPACTS DURING OPERATION PHASE						
1. Increased Water Use	1. Encourage beneficiaries to monitor, detect water leaks, and repair broken pipes 2. Instal water meters 3. Install automatic water-conserving taps where possible	Proponent	Ratio of supplied/metered (billed)	Household-level	Continuous	400,000
2. Water Quality Degradation	1. Strategic pollution control and prevention upstream of the dam (Athi and Thwake Rivers) 2. Wastewater treatment before discharge 3. Collaboration among stakeholders	Proponent NEMA, WRA (monitoring) ,	Deviations of water parameters	Dam and River water	Quarterly	200,000
3. Hydrology and Morphology changes	1. Ensure compliance with the water resources regulations at all times. At least 30% of the base flow should always flow in the stream to sustain ecological and social requirements downstream. 2. With effects on the level of flood heights downstream, a review of the riparian land and the extent of the sub-aquatic ecosystem downstream is necessary. 3. Install river gauging stations around the dam and downstream to monitor the effects of the dam on the river basin over time.	Proponent WRA (monitoring)	% of compliance to River Flows standards	Downstream the dam	Quarterly	500,000
4. Local Air Quality	1. Conduct air quality monitoring within the site and community areas 2. Water the haulage roads to suppress dust generation 3. Control speed and operation of vehicles to 30 km/h or less to reduce dust and exhaust emissions. This is a very low-impact	Proponent	Compliance reports to Air quality standards No. of complaints recorded	Dam site and community	Monthly	1,200,000

4. Noise and Vibration Impacts	1. Monitor and record noise and vibration emitted from the site 2. Impose a speed limit of 30km/h on all vehicles visiting the dam site 3. Apply method to minimize/control noise and vibrations to comply with the NEMA regulations 4. Sensitize the community on the health effects of noise and vibration	Proponent	No. of complaints recorded No. of health effects recorded	Dam site and community areas	Monthly	1,000,000
5. Ecology and Biodiversity	1. Habitats conservation 2. Collaboration among stakeholders, including County governments and conservation agencies.	Proponent	Inventory of Species Habitats Mapping	Project Area	Periodic	800,000
3. **Emergency Response and preparedness:** uncoordinated responses to emergencies (medical, environmental, employee strikes, Dam break)	1. Identify and categorize all emergencies that are likely to result from the Dam operations 2. Prepare and implement emergency response plan:- define responsibilities and train all employees to understand what to do in case of an emergency 3. Map and sensitize communities and stakeholders that may be affected by the emergency 4. Identify and train emergency responders to understand their roles	Proponent	Documented ERP plan No. of sensitizations done	Project site and community	As per plan	300,000
SOCIAL IMPACTS DURING OPERATION PHASE						
Human-Wildlife Conflicts	● Physical barriers e.g.electric fences, non-deterrents such as plant unpalatable crops (e.g., chili, lemongrass) to deter wildlife ● Awareness creation and education of local communities on how to co-exist with the animals ● Establish buffer zones between human	Proponent	No. of cases reported	Project Area	Continuous	450,000

	settlements and wildlife habitats. ● Set up KWS station and post Wardens to handle human-wildlife conflicts					
Dam Water Back flow back – water submerging land and homestead	● Assess and confirm dam water flow back does not reach and submerge community lands and homesteads ● Where lands/homesteads will be submerged by the dam back flood waters to be compensated and recollected ● Sensitize the community on dam water backflow levels	Proponent	Reports of confirmation	Project	Monthly	1,000,000
Increased Malaria	● Use of treated mosquito nets to prevent bites ● Improved access to community health services.	Proponent	No. of cases treated – Hospital Records	Project Area	Continous	100,000
Community Safety and Health	● Regular inspections and audits should be conducted to identify and address potential hazards at the dam site. ● Develop and communicate emergency response plans to address potential accidents or incidents promptly.	Proponent	No. of injuries reported	Project Area	Continous	500,000
ENVIRONMENTAL AND SOCIAL IMPACTS DURING THE DECOMMISSIONING PHASE						
Wastes generation	● Develop a waste management plan. ● Use a NEMA-licensed waste handler.	Contractor/Proponent	No stock pile of wastes	Camp site area	Monthly	500,000
Noise and Vibration	● Use of the right equipment and tools during demolition ● Ensure compliance with the Noise and	Contractor/Proponent	Reports of compliance	Camp site area	Monthly	350,000

	Excessive vibrations regulations ● Monitor noise and vibrations emitted from the site activities.					
Community Safety and Health	● Provide safety awareness training for workers involved in demolitions. ● Emergency and Response Plan in place.	Contractor/Proponent	No. of injuries/ accidents	Camp site area	Monthly	200,000
Workers in Occupational Safety and Health - Increased number of accidents and ill health	● Establish occupational and safety management policy and plan ● Ensure compliance with OSHA, 2007 and related Regulations ● Ensure compliance with the AfDB Group's OS 2 – Labour and working condition requirements ● Provision and use of adequate PPE for all workers ● Provide comprehensive safety training for all workers, emphasizing hazard awareness, safe work practices, and emergency procedures. ● Regular inspections and audits should be conducted to identify and address potential hazards on the construction site. ● Develop and communicate emergency response plans to address potential accidents or incidents promptly. ● A stocked first aid box that is readily available and accessible should be provided within the	Contractor/Proponent	Zero accidents Audits No. of improvement actions implemented No. of training hours No. of Inspections and audits done	Dam site and activities outside the protect	Monthly	1,000,000

	project site. ● Provision for workers training in first aid, with certificates issued by a recognized body. ● Training workers on general rules of hygiene, health and safety (HHS) ● An emergency and response Plan is in place.					
					Total	**25,000,000**

*The demarcation of Kes 25,913,105 is awaiting Exchequer from GOK in the year 2024/2025 budget.

CHAPTER EIGHT: CONCLUSION AND RECOMMENDATIONS

8.1 Conclusion

This ESIA covers the new scope of works, including the change of dam height, spillway extension, construction of two saddle dams, and employers' houses. The Project will have direct and indirect benefits. It will also negatively impact the surrounding bio-physical and social environments, including extraction of natural, noise pollution and dust emissions, solid wastes and effluent generation, worker accidents, and injuries during construction. During operation, the negative impacts include possible changes in river flow regimes downstream, increased water use, water management conflicts, increased waste generation from camps, increased malaria cases, and introduction of new plant and animal species. To mitigate the negative impacts, the proponent shall commit to maintaining and integrating the current mitigation measures throughout the project life cycle and implement the Environmental and Social Management and Monitoring Plan (ESMP). The proponent shall also adhere to all relevant national and AfDB environmental, health, and safety standards and policies and regulations governing establishing and operating such huge water infrastructural projects in Kenya.

The project has provided for a budget during pre-construction phase of KES 25,913,105 for the finalization of demarcation of the project land and issuance of title deeds to the PAPs whose land was partially acquired. The construction, operation and rehabilitation phase ESMP costs are Kenya Shillings (KES) 9,500,000, 6,450,000 and 2,050,000 respectively, and stakeholder engagement plan costs of 7,000,000.

Therefore, main ESMP/SEP costs are 25,000,000 and finalisation of land acquisition legacy issues (final land survey and issuance of title deeds to PAPs whose land was partially acquired) costs are 25,913,105.

8.2 Recommendations

It is recommended that the dam design and scope changes, including dam height change, spillways extension, two saddle dams, and employers camps, be implemented to increase water storage and uplift the living standards of the beneficiary communities. The following broad recommendations are proposed to minimize the environmental and social impacts of the proposed construction works and dam operation.

- Review and implement the Standard Operation Procedures currently being implemented: Emergency Response and preparedness, Traffic Management, Labour Management, Waste Management Plans, Occupation Safety and Health Plans, Social and Gender Management Plans, Public health and safety management plan, Workers and community Grievances Redress Mechanism, Sexual Harassment, Abuse, and Exploitation Management Plan

- There is a need to educate the communities on co-existence with wildlife to ensure community and public safety. Adopting economic activities that co-exist with wildlife, such as eco-tourism, should be initiated.

- The community should be organized into a strong unit to control local resources and social and economic benefits from the dam's construction, including sand harvesting and marketing products such as fish, crops, and livestock.

The Project Proponent will strictly adhere to this report's environmental & social management and monitoring plan. Finally, it is recommended that the proponent implements the Phase One design incorporating the variations..

REFERENCES

1. Climate Change Act, 2016
2. Consultancy Services for Identifying Investment Opportunities for Project Affected Persons (Paps) (2018). Contract No: MWI/TMWDP/C010/2016-2017
3. Environmental and Social Impact Assessment Study Report, Proposed Thwake Water and Sanitation Project, 2013.
4. Environmental Coordination and Management Act (Noise and Excessive Vibration Pollution) (Control) Regulations, 2009.
5. Gender Policy, 2011 by Ministry of Gender, Children and Social Development Gender Policy
6. Kenya Gazette supplement Environmental Management and Coordination (Waste Management) Regulations, 2006.
7. Kenya Vision 2030
8. Kenyan Constitution, 2010
9. Kenya National Bureau of Statistics (KNBS) Poverty Report (2022).
10. Makueni County Annual Development Plan, 2024
11. Republic of Kenya (2005); Kenya Gazette Supplement Acts, Environmental Management and Coordination Act (EMCA) No. 8 of 1999, Government Printer, Nairobi.
12. Republic of Kenya (2005); Kenya Gazette Supplement Acts, Environmental (Impact Assessment and Audit) Regulations 2003, Government Printer, Nairobi Republic of Kenya (2005).

APPENDICES

APPENDIX 1: ESIA CHECK LIST - VARIATION OF THE TMWDP PROJECT WORKS

Questions Considered	Yes/No. Briefly Describe	Is this likely to result in a significant effect? Yes/No/? -Why
Brief Project Description: Thwake Multipurpose Dam is an ongoing project. The objective of ESIA is to assess and evaluate the environmental and social impacts and risks arising from implementing the new scope of work. The purpose is to incorporate the design and scope changes involving the construction of an increased dam height by 3m from 77.5 to 80.5m (relative to CAS design but still under 84.0m granted by NEMA) the construction of 2 saddle dams, one enlarged spillway, and an employer's camp house. The study will assess if the variations will cause any significant environmental, socio-economic, and cultural impacts.		
A: Triggers to EMCA		
1. Does the project fall under the second schedule of EMCA Cap. 387	Yes, the project is a high-risk project.	Yes, the dam project covers Makueni and Kitui counties and is of national interest. Project. Construction will result in increased blasting, the volume of construction material, and the acquisition of extra, leading to the displacement of people.
B. Triggers to AFDB Safeguard Policies		
2. Does the project trigger one or more of the AfDB Safeguard policies	Yes, the AfDB ISS Operational Safeguard 1 on Environment and Social Assessment OS 2: Involuntary resettlement, OS 3: Biodiversity, renewable resources and ecosystem services. OS 4: Pollution prevention and control, OS5: Labour conditions, health and Safety and OS 10: Stakeholder Engagement and Information Disclosure. will be triggered.	Yes, Construction will result in increased blasting, the volume of construction material, and the acquisition of extra, leading to the displacement of people. The likely impacts will be addressed based on AfDB Safeguards.
C. GoK Policies and Laws applicable		
3. Does the project fall under/trigger any other GoK Policies and Laws?	Yes, laws and policies triggered include Land tenure, Climate Change, the Employment Act, the Children Protection Act, and the Energy and Petroleum Act.	Yes. The risks of construction and operation use of materials are high if not well mitigated.
D. Project Location		

4. Is the proposed site a protected or reserved site (Provide proximity in km) Biosphere Reserve, National park, Wildlife / Bird Sanctuary, Wetland, Important Bird Areas, Coastal area with corals, Mangrove areas (or Estuaries with mangroves), Natural lakes, Habitat of migratory birds (outside protected areas), Migratory Route of Wild Animals/Birds, Area with threatened/ rare/endangered fauna (outside protected areas), Area with threatened/rare/ endangered flora (outside protected areas), Reserved/Protected Forest, Zoological Park /Botanical Garden	No. The project site is in a rural set-up with a sparse population.	No.
5. Are any areas on or around the location protected under international, national, or local legislation for their ecological, landscape, cultural, or other values that could be affected by the project?	No, there are no protected areas within the project site	No.
6. Are any other areas on or around the location important or sensitive for their ecology, e.g., wetlands, watercourses, coastal zones, mountains, mangroves, forests or woodlands, or migratory routes, which could be affected by the project?	No sensitive area has been identified within or near the site.	No

7. Are there any routes or facilities on or around the location used by the public for access to recreation or other facilities that could be affected by the project?	No. Buffer Zones have been created.	Yes, flooded low lands will hinder movement of people between villages. Markets and likely breeding grounds for mosquitoes. It is likely to result in human-wildlife conflicts
8. Is the project in a location likely to be highly visible to many people?	Yes, the dam area is visible.	No
9. Are there any areas or features of historic or cultural importance on or around the location that could be affected by the project?	No features or areas of historic or cultural importance were identified within the project area.	No
10. Is the project in a previously undeveloped area where greenfield land will be lost?	Yes. The employers' camp will be built on undeveloped land.	No.
11. Are there existing land uses on or around the location, e.g., homes, gardens, private property, industry, commerce, recreation, public open space, community facilities, agriculture, forestry, tourism, mining, or quarrying, which could be affected by the project?	Yes. Rural settlements, but the variation of dam works will not affect any land use.	No,
12. Are there any plans for future land uses on or around the location that could be affected by the project?	No.	No
13. Are any areas on or around the location densely populated or built up which could be affected by the project?	No, the dam is located in rural area, sparsely populated with no built up areas nearby	No,

14. Are any areas on or around the location occupied by sensitive land uses, e.g., hospitals, schools, places of worship, and community facilities that could be affected by the project?	Yes, hospitals, schools, and places of worship are located in the neighboring areas of the dam site. The construction changes will not affect these facilities.	No
15. Are there areas on or around the location subject to pollution or environmental damage, e.g., where existing legal environmental standards are exceeded, which could be affected by the project?	No.	No
16. Is the site already degraded (low groundwater, poor soil quality)?	Yes. The soil is sandy, and sparse vegetation grows.	No
17. Are there steep slopes in the proximity of the investment site?	No. They are gentle slopes.	No
18. Do people live on the proposed site?	Yes. Construction workers.	No
19. Do indigenous peoples live on or near the site?	Yes, the indigenous community (Akamba) lives harmoniously in the neighboring areas	No
20. Is the site vulnerable to natural hazards (in a floodplain, near a volcano, on a seismic fault, or near a coastline?	No. There is no history of such natural hazards.	No
21. Are there land title conflicts?	No.	No.
22. Are there known archaeological, historical, or other cultural property? Are any of these world heritage/ UNESCO designated, etc	No	No

E. Construction Impacts		
23. Will construction, operation, or project decommissioning involve actions that will cause physical changes in the locality (topography, land use, water bodies, etc.)?	Yes. Dam construction is a considerable project impacting the biophysical environment.	No. Mitigation measures will be put in place.
24. Will the construction or operation of the project use natural resources such as land, water, materials, or energy, especially any resources that are non-renewable or in short supply?	Yes.	Yes.
25. Will the project involve using, transporting, transporting, handling, or producing substances or materials that could harm human health or the environment or raise concerns about actual or perceived risks to human health?	Yes, such as explosives for blasting rocks	Yes. But effects will be appropriately mitigated.
26. Will the project produce solid wastes during construction, operation, or decommissioning?	Yes, but the solid waste expected to be produced will be minimal, e.g., stone/brick breakages, cement/concrete spills, and wastes from camp houses...	No
27. Will the project release pollutants or other hazardous, toxic, or poisonous substances into the air?	No	No
28. Will the project cause noise and vibration or release of light, heat energy, or electromagnetic energy?	Yes. Minimal noise during construction	No

29. Will the project lead to risks of contamination of land or water from releases of pollutants onto the ground or into surface waters, groundwater, coastal waters, or the sea?	No.	No
30. Will there be any risks of accidents during the construction or operation, which could affect human health and the environment?	Yes, risks of collapsing excavated areas, falling into open pits, and working at height can affect workers and the general public.	No
31. Will the project result in social changes like demography, traditional lifestyles, and employment?	Yes, improved water availability will result in improved hygiene standards and public health. Construction and operation will increase employment opportunities	No
F. Water Resource Impacts		
32. Could the investment modify groundwater levels by altering flows, paving surfaces, or increasing water extraction?	No.	No
33. Could it affect groundwater quality?	No, no seepage of wastewater will be experienced as per the design	No
34. Could it affect the quality (through sediment, wastewater, storm discharge, or solid waste) of nearby surface waters (lakes, rivers, and streams)?	No.	No
35. Will it affect water quantity in nearby water bodies (lakes, rivers, streams)?	Yes. Flows will be regulated from the dam	No
36. Are there nearby potable water sources that need to be protected?	No	No

G. Drainage Impacts		
37. Will the investment in storm water drainage affect existing drainage patterns?	No	No
38. Will it cause standing water, which could cause public health risks?	Yes	Yes
39. Will erosion result in sediment discharge to nearby water bodies?	No	No
40. Will surface drainage patterns be affected in borrow pits and quarries?	Yes,	Yes
41. Will infiltration patterns be affected?	Yes. For, downstream after the release of water from the dam	No
H. Ecosystem Impacts		
42. Could the investment affect natural habitats or areas of high ecological value?	Yes. It will interfere with the natural characteristics of the ecosystem.	No.
43. Could it affect the natural characteristics of adjacent or nearby sites?	No	No
44. Could it affect wildlife or natural vegetation?	Yes. Water animals like hippos and crocodiles will increase, leading to human-wildlife conflicts.	No. With proper mitigation measures.
I.Socio-Economic Impacts		
45. Will the project changes entail the resettlement of the population?	No. The land has already been acquired, and compensation has been made.	No
46. Will the project affect people's property or livelihoods/income?	No. The new dam changes will not affect property and livelihoods.	No
47. Will the project affect indigenous peoples?	No.	No
48. Will it limit local populations' access to natural resources?	No	

49. Will it have an impact on land use?	No.	No
50. Will it induce further encroachment of nearby areas?	No. The land has already been acquired, and demarcation is done.	No
51. Will it cause any health impacts?	Improved accessibility to water will reduce cases of waterborne diseases such as cholera and typhoid, except malaria cases may increase.	No, with mitigation measures.
52. Will it disturb nearby communities during construction?	Yes, there was minimal disturbance during the delivery of construction materials.	No
53. Could cultural resources be affected?	No	No.
54. Could it affect nearby properties?	No	No.
J. Operation Impacts		
55. Is the project susceptible to earthquakes, subsidence, landslides, erosion, flooding, and extreme or adverse climatic conditions, which could cause the project to present environmental problems?	No. Engineering design has considered all these factors.	No
56. Are there any other factors that should be considered, such as consequential development that could lead to environmental effects or the potential for cumulative impacts with other existing or planned activities in the locality?	Yes, There will be irrigation farming.	No, with proper mitigation measures.
K. Displacement Impacts		
57. Acquisition of private/community land?	No.	No
58. Alienation of any government land, including that owned by the urban local body?	No	No

59. Clearance of encroachment from government/ urban local body land?	No	No
60. Clearance of squatting from Government/Urban local body?	No.	No
61. How many authorized and unauthorized structures will be acquired/cleared?	No structure is affected by changes in the new dam design.	No
62. Number of households to be displaced?	None	No
63. Are the details of village common properties to be alienated, such as pasture land (acres), cremation /burial ground, and others specified?	No.	No
64. Describe existing land uses on and around the project area (e.g., Community facilities, agriculture, tourism, private property).	Agriculture and livestock keeping is practiced in the neighboring areas	No
65. Will the project result in the construction of workers or other people moving into or having access to the area (for an extended period and in large numbers compared to permanent residents)?	Construction workers will be sourced from the local community and homeowners.	No
66. Are financial/in-kind compensation measures expected to be needed?	Yes, for compensation of cracked houses as a result of blasting.	Yes.
L. Loss of assets, crops, fruit, household infrastructure and livelihood		
67. Will the project result in the permanent or temporary loss of crops?	No, the new dam changes will not affect crops.	No
69. Fruit trees/coconut palms? Specify with numbers	No.	No
70. Household assets/infrastructure? Specify with numbers	No.	No
71. Loss of agricultural land? specify with numbers	No	No

M. Public and Occupational health and safety, welfare, employment, and gender		
72. Is the project likely to provide local employment opportunities, including employment opportunities for women?	Yes, local workers will be engaged in the construction work.	Yes.
73. Is the project being planned with sufficient attention to local poverty alleviation objectives?	Yes. The provision of water will open up business opportunities for the community.	Yes. Positive impact.
74. Is the project being designed with sufficient local participation of women in the planning design and implementation process?	Yes. Stakeholder meetings have been held and include both men and women	No
75. Will the project affect/lead to traffic and Pedestrian Safety?	Yes. During the transport of construction materials by trucks and heavy machinery movement	No.
76. Will the project interfere with the usual health and safety of the worker/employee/public ?	Yes. Minor injuries to workers are likely during construction.	No.
77. Will the project introduce new practices and habits?	No. The project has been ongoing.	No
78. Will the project lead to child delinquency (school drop-outs, child abuse, child labor, etc.?	No. The project adheres to the Children Act.	No
79. Will the project lead to gender disparity?	No	No
80. Will the project lead to social evils (drug abuse, excessive alcohol consumption, crime, etc.)?	No.	No
N. Historical, Archaeological, or cultural Heritage sites		

81. Based on available sources, consultation with local Authorities, local knowledge, and/ or observation, could the project be altered?	No. The project started based on Stakeholder consultation and public participation	No.
82. Historical heritage site(s) or require excavation near the same?	No.	No
83. Archaeological heritage site(s) or require excavation near the same?	No.	No
84. Cultural heritage site(s) or require excavation near the same	No.	No
85. Graves or sacred locations or require excavation near the same?	No.	No
O. Result/Outcome of Screening Process		
The changes in the new dam necessitate environmental and Social Impact Assessment.	Yes.	No
Any special conditions:	Construction of the dam with the increased 3m dam height, extended spillway, two saddle dams, and employers camp will be done as per the national rules and regulations and the AfDB environmental and social safeguards.	No.
P: Authorization		
ESIA undertaken by Augustine Makau **Designation:** TMWDP – PIT ENVIRONMENT, SAFETY AND HEALTH EXPERT.	Signature: Date:13 /02/2025	
Approved by: Designation:	Signature: Date:	

Summary of features of the project indicating the need for further funding

The project will require additional funding to implement the new design changes, including an increased 3m dam height, two saddle dams, a spillway of 235m, and an employer's camp. The project will cause minimal, temporary negative environmental and social impacts, including air, soil, and water pollution, waste generation, occupational safety risks, etc. An ESMP has been prepared and will be strictly adhered to mitigate the impacts.

APPENDIX 2: MINUTES OF STAKEHOLDER MEETING AND ATTENDANCE

APPENDIX 2.1:- KATHULUMBI – KALAWA, STAKEHOLDERS MEETING

MINUTES OF PUBLIC PARTICIPATION AND CONSULTATION MEETING HELD ON 11TH FEBRUARY 2025 AT 11.00 AM AT AFRICA BROTHERHOOD CHURCH, UNYEOO IN KATHULUMBI-KALAWA.

ATTENDANCE

1. Augustine Makau TMWDP – PIT ESH EXPERT Chairing
2. Rhoda Kambua Gender and Development Epert
3. Joyce Njigua EIA/EA Consultant - Taking minutes
4. Dominic Kyenza Community Liaison Officer

Community members: See the attendance lists

AGENDA

1. Introductions
2. Opening Remarks and New Project Changes Overview – Augustine Makau
3. Project Impacts and Mitigation Measures
4. Open discussions/Plenary
5. Questionnaire filling
6. Closing Remarks

MIN	MINUTE
MIN. 1/02/2025	**Introduction**
	Mr. Augustine called the meeting to order at 11.10 AM.
MIN. 2/02/2025	**Opening Remarks and Project Overview**
	The meeting started with a word of prayer and later self-introductions. Mr. Augustine informed the participants of the day's agenda and told them that stakeholder public participation and consultation is a constitutional right and, therefore, is done within the law. He explained that the purpose of the meeting was to update the community on the project's progress, changes in the dam designs, and related impacts and mitigation measures. He emphasized that the meeting aimed to collect the communities' environmental and social concerns to update the previous ESIA report for 2013. However, he noted that the project and the community had interacted in other forums. Augustine highlighted that the project was progressing well and that 94% of the work had been completed. He explained that engineers recommended dam changes after completing a detailed design in 2018. He added that the hydrology studies revealed that more water could be impounded and, therefore, the size of the Dam had to be increased. He highlighted the new dam design and scope changes, including: -Change in the height of the Dam from 77.5m to 80.5m to impound 688 million m^3.

<table>
<tr><td></td><td>-Spillway changes: There will be one spillway measuring 235m instead of two as earlier designed.
-Saddle dams: The expert explained that the increased dam height requires more storage space. Therefore, two saddle dams will be constructed, one on the Kitui and the other on the Makueni side.
-Employers Camp houses: The houses will accommodate the experts operating the Dam.
The meeting was informed that 59 acres of land had already been acquired, and 28 affected persons had been compensated. There will be no more land acquisition for new design changes.</td></tr>
<tr><td>MIN. 3/02/2025</td><td>Project likely impacts and mitigation measures
The ESH expert explained that the new dam changes will capture more water for domestic and irrigation purposes. He informed the members that the meeting was convened to collect views on project impacts and urged them members to present the impacts during the open forum discussions.</td></tr>
<tr><td>MIN. 4/02/2025</td><td>Open Forum Discussions/Plenary
The session was open to questions/clarifications/remarks from the meeting participants.
<table>
<tr><th>Question</th><th>Response</th></tr>
<tr><td>1. Mr. Dominic Mutune reported that the boreholes have not been handed over to the community, have broken down, and are facing water scarcity. What is being done to resolve the issue?</td><td>There have been meetings where this has come up and has been noted. The faulty borehole pumps will be repaired as the contractor has been advised to visit the borehole sites, analyze the problems, and conduct repairs.</td></tr>
<tr><td>2. Mr Peter Nzomo asked if the dam height variation from 84m – 80.5m would result in a backflow that would submerge communities nearby.</td><td>No: the engineering design has considered the possible increase in backflow; thus, the community should not have such fears.</td></tr>
<tr><td>3. Shadrack Kingw'aa reported that the land demarcation was done, but title deeds were not issued. We need the title deeds to help owners utilize their land comfortably.</td><td>The demarcation process is set to begin at the end of February 2025. The process will include mapping out the acquired land and processing 304 title deeds to PAPs whose land was partially acquired. (304 title deed) and one unified title.</td></tr>
<tr><td>4. Cracked Houses - Mutinda asked what would be done for all those whose houses had broken due to vibrations from the dam site.</td><td>The PIT EHS explained that an assessment and compensation would be done for all cracked houses once the appraisal and valuation are completed and the report submitted to the Ministry. Through the Consultant, the contractor has been notified of the possible liability.</td></tr>
<tr><td>5. Charles Nzau reported that human-wildlife conflicts, including hippos and crocodiles, have increased in the area. What will be done to stop the hippos from destroying crops?</td><td>Two KWS Wardens are manning the hippos at the project area. The hippos are in their habitat area, and the project leadership will engage KWS to create more awareness and resolve human-wildlife conflicts. A KWS office has also been proposed to be set up in the Project area to focus more on the hippos and crocodiles.</td></tr>
</table></td></tr>
</table>

		The project has not planned to install an electric fence to prevent the hippos from reaching community farms.
	6. Boniface noted that the project might lead to increased water diseases. He suggested upgrading local hospitals, or can the project give the hospital at the site to the community?	After the project is completed, the Dam will be handed over to the county governments. The county governments will address the affected communities' waterborne diseases and malaria issues.
	7. Dominic Masina, can we have more job opportunities for locals?	The project has applied policies that have allowed the contractor to prioritize local employment opportunities. The group agreed to the many locals recruited and working on the project.
MIN. 5/02/2025	**Questionnaires Filling**	
	Madam Joyce and Madam Kambua guided the participants to complete the structured questionnaires. The structured questionnaires were meant to gather more information on environmental and social impacts that may not be captured in the open forum discussions.	
MIN. 6/02/2025	**Closing remarks**	
	Mr Augustine thanked all members for taking the time to attend the meeting. There being no other business, the meeting ended at 1 PM.	

TMWDP – PIT ESH EXPERT: Name: ……Signature:…….... Date:

SOCIOLOGIST: **Name:** Signature:……. Date:

EIA/EA Consultant: **Name: ……**Signature:……. Date:

APPENDIX 2.1.1: KATHULUMBI- KALAWA MEETING ATTENDANCE

REPUBLIC OF KENYA

MINISTRY OF WATER, SANITATION AND IRRIGATION

THWAKE MULTIPURPOSE WATER DEVELOPMENT PROGRAM (TMWDP) PHASE1

PURPOSE: ESIA PUBLIC PARTICIPATION FORUM

DATE: 11TH FEB 2025 VENUE: Kalawa – Kathulumbi

	Name	PHONE	AGE	GENDER M/F	Signature
1	BONIFACE M. MUTIMBI	0710308800	63	M	
2	MUTINDA NYAMAI	0720919158	60	M	
3	JOSEPH K. KITONYO	0727267156	70	M	
4	Elizabeth Malile	0711158734	54	F	
5	PATRICK K. MBITHI	0797121396	76	M	
6	JOSPHAT K. MULE	0721234769	66	M	
7	DOMINIC K. MUSUNE	0711107956	55	M	
8	KIMUYA K. MUNYI	0705 286566	34	M.	

APPENDIX 2.2:- KANYANGI STAKEHOLDERS MEETING

MINUTES OF PUBLIC PARTICIPATION AND CONSULTATION HELD ON 12TH FEBRUARY 2025, AT 10.30 AM, AT KANYANGI CHIEF'S CAMP, ZAMBIA.

ATTENDANCE

1. Augustine Makau TMWDP – PIT ESH EXPERT Chairperson
2. Rhoda Kambua Gender Development and Social Expert
3. Joyce Njigua EIA/EA Consultant - Taking minutes
4. Dominic Kyenza Project Community Liason Officer

Community Members - See attached List

AGENDA

1. Introductions
2. Opening remarks and Project Changes Brief – Augustine Makau
3. Project impacts and mitigation measures
4. Open forum for discussions
5. Questionnaire filling
6. Closing Remarks

MIN	MINUTE
MIN. 1/02/2025	**Introduction**
	The area Chief called the meeting to order at about 10:35 AM and welcomed the community members present and the Thwake Dam team. The meeting started with a word of prayer and later self-introductions.
MIN. 2/02/2025	**Opening Remarks and Project Overview**
	The PIT EHS Expert informed the meeting of the day's agenda and informed the participants that stakeholder public participation and consultation is a constitutional right and, therefore, done within the law. He explained that the purpose of the meeting was to update the community on the project's progress and demonstrate the dam design changes and related impacts and mitigation measures. He emphasized that the main aim was to collect the communities' environmental and social concerns to update the previous ESIA report done in 2013, although noting the project and the community had interacted in the meantime in other forums. The ESH briefed on the project's progress and said that 94% of the work had been done. The expert explained the dam design and scope variations had changed because, after detailed dam designs, including geotechnical investigations, it was realized that more water could be impounded. Therefore, the size of the Dam had to be increased. He informed the meeting that the changes proposed by the engineers include: ● Increase of dam height by 3m from 77.5m to 80.5m to impound an increased amount of water of 688 million m^3, ● The spillway size will increase from 200m to 235m wide. The spillway will be one instead of two, as designed earlier.

<table>
<tr><td></td><td>

Saddle dams: There will be two saddle dams to hold more water. The dams will be constructed, one on Kitui and the other on Makueni.
Employer's Camp houses: The houses will accommodate the staff operating the Dam. The meeting was informed that 59 acres of land had already been acquired, and 28 affected persons had been compensated.

</td></tr>
<tr><td>MIN. 3/02/2025</td><td>Possible Project Impacts and Mitigation Measures</td></tr>
<tr><td></td><td>The ESH expert explained that the new dam changes will capture more water for domestic and irrigation purposes. He informed the members that the meeting was convened to collect views on project impacts. He urged the members to present the likely environmental and social impacts during the open forum discussions and in the questionnaires.</td></tr>
<tr><td>MIN. 4/02/2025</td><td>Open Forum Discussions/Plenary</td></tr>
<tr><td></td><td>The session was open to questions/clarifications/remarks from the meeting participants.
<table>
<tr><th>Questions</th><th>Responses</th></tr>
<tr><td>1. Mr Richard Nyanzi - Will the 3m dam height change affect the residents?</td><td>No. The PIT EHS expert responded that the design changes mean more materials, more time, and more money for the construction of the changes in the design. Competent engineers did the design, so there was no need for fear. He further said the 59 acres of extra land have been acquired.</td></tr>
<tr><td>2. Mr. Mwongela - Will the increased height affect the buffer zone because the water flow back went about 4m from the land outside the Dam during the recent flooding experienced in 2024?</td><td>The EHS Expert explained that flow back had an adequate buffer zone according to the design. The incident reported here will be reported and investigated by the engineers and surveyors to address the problem.</td></tr>
<tr><td>3. Francis Musya said the last flood was about 4m from the project land, plot no. 1025. What will be done to control this in the future?</td><td>The incident will be reported to engineers and surveyors for further investigations and to address the problem.</td></tr>
<tr><td>4. Mr Mwongela reported that the demarcation of land was not done correctly.</td><td>The National Land Commission had completed the phase 1 demarcation. Phase 2 is being planned this month.</td></tr>
<tr><td>5. Mr Francis Mbithi – What happened to water points and access roads?</td><td>The water points have not been created, and access roads have not been planned.</td></tr>
<tr><td>6. Mr. Augustine Mwongela asked, What is being done about the cracked houses due to blasting at the site?</td><td>As the Assessment Report recommends, a survey of all cracked houses will be conducted and later compensated.</td></tr>
<tr><td>7. Mr Muteti Mbaluka - Will a radius of mapping blasting effects of houses exist?</td><td>Mr Augustine said there would be no radius, and all reported cracked house cases</td></tr>
</table>
</td></tr>
</table>

		would be assessed regardless of distance from the site.
	8. Mr Mutemi – Can the rehabilitation of the Murram road from Kanyangi to Nzambia be done as part of CSR?	The community road was not included in the project's Bill of Quantities (BoQ). -2 Access roads: one to Nzambia and the other to Mukameneni, will be concluded by 31st March 2025
	9. Mr. Francis Mbithi – Will there be compensation for those injured while working at the site?	The insurance company has processed compensation. The contractor is following up to speed up compensation.
	10. Francisca reported that it is hard to farm because of monkeys. Can KWS be requested to intervene?	Two KWS Wardens are manning the hippos at the project area. The hippos are in their habitat area, and the project leadership will engage KWS to create more awareness and resolve human-wildlife conflicts. A KWS office has also been proposed to be set up in the Project area to focus more on the hippos and crocodiles. The project has not planned to install an electric fence to prevent the hippos from reaching community farms.
	11. David Kithunga -Will the government help market the farm produce to improve the community's socio-economic development in the future?	The Ministry of Agriculture will work with the communities to address all agriculture-related issues, including marketing. In the report, we will recommend that relevant government ministries engage and empower locals to take advantage of the opportunities brought about by the Dam.
	12. The project will also bring mosquitoes. How will the project control malaria?	After the project is completed, the Dam will be handed over to the county governments. The county governments will address the affected communities' waterborne diseases and malaria issues.
	13. Faith Koki – Can a safe route from Kitui to Makueni be provided through the Dam to avoid attack by hippos and crocodiles when crossing the river?	The report will recommend that the contractor build a safe crossing route from Kitui to Makueni to avoid community attacks by hippos or crocodiles.
	14. Regina – Can a police post be built close to curb increased insecurity?	Construction of a police post at the Dam has been recommended and discussed in the project meetings. No decisions have been made. However, the report will recommend further establishing a police post to curb the increase in insecurity.
	15. Francis Musya suggested that there should be more	The Community Liaison team has been carrying out planned community engagement and sensitization on the

	community health sensitization through barazas or community engagement to update on project progress.	project's progress and other issues affecting the project. A Grievance Redress Committee was established, and the Chief is a committee member.
	16. Michael Kitonga – What is the project doing to employ the locals/ affected community members? He suggested policies should be implemented to engage all affected members.	The project has applied policies that have allowed the contractor to prioritize local employment opportunities. The group agreed to the many locals recruited and working on the project.
MIN. 5/02/2025	**Questionnaires Filling**	
	Madam Joyce and Madam Kambua guided the participants in filling out the questionnaires. The questionnaires aimed to collect more information on environmental and social impacts, which plenary discussions would fail to capture.	
MIN. 6/02/2025	**Closing remarks**	
	The PIT ESH thanked all members for taking the time to attend the meeting. There being no other business, the meeting ended at 12.40 PM.	

TMWDP – PIT ENVIRONMENT, SAFETY AND HEALTH EXPERT:

Name: ……Signature:……. Date:

Sociologist: **Name: ……**

Signature:……. Date:

EIA/EA Consultant: **Name: ……**

Signature:……. Date:

APPENDIX 2.2.1: KANYANGI MEETING ATTENDANCE

REPUBLIC OF KENYA

MINISTRY OF WATER, SANITATION AND IRRIGATION

THWAKE MULTIPURPOSE WATER DEVELOPMENT PROGRAM (TMWDP) PHASE1

PURPOSE: ESIA PUBLIC PARTICIPATION FORUM

DATE: 12TH FEB 2025 VENUE: Kanyangi (Chief's Camp)

	Name	PHONE	AGE	GENDER M/F	Signature
1	Patrick Wiru	0705132175	52	F	
2	Richard Nyaki	0717271947	78	M	
3	Muteti Mbaluka	0707941273	47	M	
4	Joseph Muanyi	0719871017	49	M	
5	Francis Mutiti	0726325492	47	M	
6	Athanasius Mutemi	0725665164	52	M	
7	Augustine M. Mwongera.	0727482997	56	M	
8	Mutuku Mumiva	0714549896	48	M	

REPUBLIC OF KENYA

MINISTRY OF WATER, SANITATION AND IRRIGATION

THWAKE MULTIPURPOSE WATER DEVELOPMENT PROGRAM (TMWDP) PHASE1

PURPOSE: ESIA PUBLIC PARTICIPATION

DATE: 13TH FEB 2025 **VENUE:** MAVIMOIMI (KYUSYANI CHURCH)

	Name	PHONE	AGE	GENDER M/F	Signature
1	Stephen Mutuku	0717577586	32	M	
2	SAMMUEL M. KULU	0113404549	75	M	
3	JONATHAN K. MATATA	0713213901	46	M	
4	SEBASTIAN M. MUTHOKA	0700504918	33	M	
5	AGATHA MUTHOKA	0790774-3090	27	F	
6	ROBAH K. KELI	0703640867	49	F	
7	MARGARET K. WAITA	0741277630	43	F	
8	CHRISTOPHER D. KATIKA	0703369037	55	M	

APPENDIX 2.3:- MAVINDINI – KIUSYANI CATHOLIC CHURCH STAKEHOLDERS MEETING

MINUTES OF PUBLIC PARTICIPATION AND CONSULTATION HELD ON 13TH FEBRUARY 2025, AT 10.00 AM AT KYUSYIANI CATHOLIC CHURCH, MAVINDINI.

ATTENDANCE:

1. Augustine Makau TMWDP – PIT ESH EXPERT Chairing
2. Rhoda Kambua Sociologist
3. Joyce Njigua EIA/EA Consultant - Taking minutes
4. Dominic Kyenza, Community Liaison Officer

Community Members: See attached List

AGENDA

1. Self-Introductions
2. Opening Remarks and Project Changes Overview – Augustine Makau
3. Project Impacts and Mitigation Measures
4. Open Forum Discussions
5. Questionnaire filling
6. Closing Remarks

MIN	MINUTE
MIN. 1/02/2025	**Introduction**
	Mr. Augustine (PIT EHS) called the meeting to order at 10:10 AM.
MIN. 2/02/2025	**Opening Remarks and Project Overview**
	The meeting started with a word of prayer and later self-introductions. The EHS informed the meeting of the day's agenda and informed the participants that stakeholder public participation and consultation is a constitutional right and, therefore, done within the law. He explained that the purpose of the meeting was to update the community on the project's progress and demonstrate the dam design changes and related impacts and mitigation measures. He emphasized that the main aim was to collect the communities' environmental and social concerns to update the previous ESIA report done in 2013, although noting the project and the community had interacted in the meantime in other forums. The ESH Expert gave a brief on the project's progress and said that 94% of the work has been done. The expert explained that the dam design and scope had changed because a detailed dam design was done after geotechnical investigations and hydrological studies were completed. It was realized that more water could be impounded, and therefore, the size of the Dam had to be increased. He informed the meeting that the changes proposed by the engineers include: ● reduction of dam height by 3.5m from 84m to 80.5m to impound an amount of water of 688 million m^3, ● The spillway size will increase from 200m to 235m wide. The spillway will be one instead of two, as designed earlier. ● Saddle dams: There will be two saddle dams. The expert explained that the increased dam height requires more storage space. Therefore, the dams will be constructed, one on the Kitui and the other on the Makueni side.

<table>
<tr><td></td><td>

- Employer's Camp houses: The houses will accommodate the staff operating the Dam. The meeting was informed that 59 acres of land have already been acquired, and 28 affected members have been compensated.

</td></tr>
<tr><td>MIN. 3/02/2025</td><td>Project Impacts and Mitigation Measures</td></tr>
<tr><td></td><td>The ESH expert explained that the new dam changes will capture more water for domestic and irrigation purposes. He informed the members that the meeting was convened to collect views on project impacts. He urged them to present the likely environmental and social impacts during the open forum discussions and in the structured questionnaires.</td></tr>
<tr><td>MIN. 4/02/2025</td><td>Open Forum Discussions/Plenary</td></tr>
<tr><td></td><td>The session was open to questions/clarifications/remarks from the meeting participants.
<table>
<tr><th>Questions</th><th>Response</th></tr>
<tr><td>1. Mr. Charles Mutua Nzau reported that the community's expectations have not been met, and there have been no regular meetings to provide updates on the construction works. Is it possible to have more community sensitization meetings?</td><td>It was agreed that since the Chief is a member of the GRMC, he ought to brief the community during barazas and community meetings on project updates. The community liaison team will also incorporate this during their community engagement forums.</td></tr>
<tr><td>2. Mr. Jonathan Kioko reported that the access roads are in poor condition. What is the project doing about the streets?</td><td></td></tr>
<tr><td>3. Human-Wildlife conflicts – Mr Christopher - What is the project doing about hippos damaging our crops?
The members suggested putting an electric fence near the rivers to prevent animals from entering the farms.</td><td>The PIT EHS said the issue is being addressed.</td></tr>
<tr><td>4. Mr. Samson Nguli reported that some houses have been cracked due to</td><td>All cracked houses will be assessed, and compensation for affected houses will be provided.</td></tr>
</table>
</td></tr>
</table>

		blasting operations at the Dam. How is the project going to deal with the issues?	
		5. Madam Stella said that the locals should be given priority when employment opportunities are available. What is the project doing to provide jobs for locals?	The PIT EHS expert explained that the policy was already in place, employment was given to locals, and not everyone would be accommodated.
		6. Mr Patrick Mbithi – Is there an emergency preparedness plan for the Dam break?	The PIT EHS assured him that highly qualified engineers were constructing the Dam and that the community should not have any fears.
		7. Mr.Kioko - Is there close monitoring of the ground vibrations?	Yes. The ground vibration levels are recorded every time a blast is done, and there are allowed levels the project cannot exceed.
MIN. 5/02/2025	**Questionnaires Filling**		
	Madam Joyce and Madam Kambua guided the participants in filling out the questionnaires. The questionnaires aimed to collect more information on the environmental and social impacts, which were possibly not captured in the plenary discussions.		
MIN. 6/02/2025	Closing remarks		
	Mr. Augustine thanked all members for taking the time to attend the meeting. There being no other business, the meeting ended at 12.45 PM.		

TMWDP – PIT ESH EXPERT: Name: ……Signature:……. Date:

Sociologist: Name: ……

Signature:……. Date:

EIA/EA Consultant: Name: ……

Signature:……. Date:

APPENDIX 2.3.1: MAVINDINI-KYUSYANI MEETING ATTENDANCE

REPUBLIC OF KENYA

MINISTRY OF WATER, SANITATION AND IRRIGATION

THWAKE MULTIPURPOSE WATER DEVELOPMENT PROGRAM (TMWDP) PHASE1

PURPOSE: ESIA PUBLIC PARTICIPATION

DATE: 13TH FEB 2025 VENUE: MAVINDINI (KYUSYANI CHURCH)

	Name	PHONE	AGE	GENDER M/F	Signature
1	Stephen Mutua	0714577586	32	M	
2	SAMUEL M. KULU	0113405449	75	M	
3	JONATHAN K. MUTUA	0713213901	46	M	
4	SEBASTIAN M. MUTHOKYA	0700504918	33	M	
5	AGATHA MUTHOKA	0790744309	27	F	
6	ROSAH K. KELI	0703640867	49	F	
7	MARGARET K. MUTUA	0741277630	43	F	
8	CHRISTOPHER D. KATIKA	0703369037	55	M	

APPENDIX 2.4: MAKUENI COUNTY STAKEHOLDERS MEETING AND ATTENDANCE

MAVINDINI - OFFICE OF THE CHIEF (4TH APRIL, 2025)

PRELIMINARY LIST OF PARTICIPANTS (MAKUENI STAKEHOLDER FORUM)

S.No	Name	Stakeholder Group	Organization
1	Paul N. Kituku	Faith Based Organization	Seventh Day Adventist Church
2	Nicholas Mutuku Nzeve	Faith Based Organization	African Inland Church
3	Hellen Mbuthu	Community Based Organization	
4	Stephen M. Nzioka	Assistant Chief	Mavindini Sub Location
5	Phidelia Kagai	State Department for Housing and Urban Development	State Department for Housing and Urban Development (SHUD)
6	Paul Nzili Mbuta	Ward Coordinator	Mavindini Ward
7	Damaris Nduku	Persons Living with Disability (PLWD)	Community
8	Jonathan Kimongo	Member of County Assembly	Mavindini
9	Miriam Mutuku	Village Administrator	Community
10	Jonathan S. Mutua	Opinion Leader	Mavindini Community
11	Abednego Kimanthi	Opinion Leader	Office of the Member of County Assembly
12	Philip Muia	Opinion Leader	Mavindini Community
13	Colleta Musau	Opinion Leader	Mavindini Community
14	Amos Mule	Non-Governmental Organization	Mavindini Community
15	Stephen M. Malila	Youth	Mavindini Community
16	Angelina S. Kimulu	CHP	Community
17	Bernard A. Onywoki	GMC-WWO	Community
18	Boniface Wanga	National Environmental Management Authority	Enforcement Officer
19	Ann Mbithe	National Environmental Management Authority	Officer
20	Stella Mutuku	Assistant Chief	Ministry of Interior
21	Victoria Mativo	Ward Administrator	Mavindini Location
22	Samson N. Nguli	Chief	Mavindini Location

IN ATTENDANCE

1. Augustine Makau - Environment, Health & Safety Expert (Program Implementation Team, Delegation Lead)
2. Rhoda Kambua – Gender and Social Development Expert
3. Godffrey Olali - Senior Communications Specialist
4. Dominic Kyenza (Senior Community Liaison Officer, SMEC)

AGENDA

a. Preliminaries- Opening prayer and introduction of participants
b. Remarks from the Program Implementation Team (PIT) Team Leader

c. Plenary and Way forward, Q&A
d. Any other business

MAVINDINI STAKEHOLDER FORUM (MAKUENI COUNTY) – 3RD APRIL 2025

Minute	Discussion
1/03/04/2025	The meeting was called to order at 10.20 am after opening prayers. The Senior Community Liaison Team thanked members for attending and appreciated the chief's office for hosting the forum. He further welcomed the host to conduct an introduction of the stakeholders who attended the forum. The host further welcomed the PIT Team Leader for opening remarks and general introductions of PIT members present. In his welcoming remarks, the PIT Team Lead thanked members for the support to the Project. He underscored the importance of coordinated collaboration between all stakeholders for the project's success. He informed the team that the main aim of the stakeholder forum was to get their views regarding the change of Thwake Dam Height from the initial 77.5 meters to 80.5 meters high after a similar forum was held in March for stakeholders drawn from Mbooni East and Kitui Rural constituencies. He indicated the importance of seeking views of the residents and other stakeholder groups since the variation would affect them in terms of water back flow, compensation issues, construction of a new saddle dam, enlarged spillway and acquisition of extra land. The stakeholders were further told that Government Laws requires that such views must be obtained and licences issues too.
2/03/04/2025 Plenary (Q&A)	○ **Concern** (Jonathan Mule): The stakeholder wanted to know whether, in the likelihood of water flow back and flooding caused by Dam Height, Project Affected Persons (PAPs) owning farms and houses would be paid ○ **Ans:** The PIT indicated that there would be no likelihood of water flow since the Employer already proposed the construction of an extra saddle dam and spillway ○ **Concern:** (Area MCA) – The MCA informed the forum that several factors must be considered because of the height change, including public participation. He further listed several positive aspects of the Project, including increased volumes of water, increased opportunities for residents – both direct and indirect, job creation, and historical impetus where geographically, the Mavindini area will be on the world map as a host of country's second largest dam, increase in land costs and value, etc. He, however, listed other disadvantages of the Project, such as early and unwanted pregnancies, drug and substance abuse, theft and increase in crime, pollution, increased human-wildlife conflicts, damage to critical infrastructure like roads, dilapidation, and degradation of the ecosystem. He proposed that the Contractor must give the County fuel to maintain the community roads. **Concern**: (Miriam Mutuku). The stakeholder also proposed that the Project consider repairing roads for the community. **Ans**: PIT informed the stakeholders that road repair issues were not contained in the BOQ for the Contractor, but the Ministry will take up this matter for further review during the upcoming downstream phases. The meeting also deliberated on proposals to include KURA/KERA in the road repairs. **Concern:** (Colleta Musau). The stakeholders wanted to know the steps to repair some classrooms whose repairs were substandard. She also wanted to know some of the measures to control communicable diseases. Another community member added that there was an outbreak of sexually transmitted disease on site. The issue of insufficient drugs in the local health centers was also raised.

		Ans: The PIT informed the stakeholders that community communication campaigns had been done to sensitize them on HIV, Aids, waterborne diseases, Corona, and others. They were further informed that waters flowing into Thwake Dam will be treated; hence, there is no cause for alarm regarding the spread of water bone diseases. Members were also informed that the Government has formed the Nairobi Rivers Commission, and an existing inter-agency technical team is mandated to clean the Athi River. Ministry is also working with several Water Resources Users Associations (WRUAs) who are already planting trees along the catchment areas and **Concern: (**Ms. Mumo). The stakeholder wanted clarity on whether community members whose farms will be affected by the water flow back will be compensated. **Concern:** The MCA suggested that to combat theft cases, the local police station must be empowered. The area chief also indicated that general security at the Thwake site be enhanced. **Concern:** A representative from the office of the Senator feared that human-animal conflicts would increase if the Saddle Dams were not adequately fenced. **Ans:** The PIT, however, indicated that Kenya Wildlife Services offices are on-site **Concern:** A forum member, Abeid Kimanthi, suggested that a CSR budget be set aside for Knowledge Transfer to locals. He indicated that this initiative has succeeded in other countries, such as Egypt **Ans:** The PIT informed the stakeholders that the Ministry already has a robust Graduate Trainee Program where university graduates are attached to the project as part of knowledge transfer

APPENDIX 2.4.1: LIST OF ATTENDANCE MAKUENI COUNTY-MAVINDINI MEETING

REPUBLIC OF KENYA

MINISTRY OF WATER, SANITATION AND IRRIGATION

THWAKE MULTIPURPOSE WATER DEVELOPMENT PROGRAM (TMWDP) PHASE1

PURPOSE: STAKEHOLDER ENGAGEMENT

DATE: 04/04/2024 VENUE/LOCATION: MAVINDINI

	Name	ORGNANIZATION/DESIGNATION	CONTACT	GENDER M/F	Signature
1	BONFACE KHANGA	NEMA-EEO	0729725514	M	
2	ANN MBITHE	NEMA-SA	0112934449	F	
3	DOMINIC M. KYENZA	THWAKE DAM - SUB. CLO	0722322674	M	
4	STELLA M. MUTUKU	INTERIM ASSISTANT CHIEF I	0723302268	F	
5	ROBIN KAMBUA	GSOE-MWSI	0720210922	F	
6	VICTORIA MATUVA	WARD ADMIN	0706478160	F	
7	SAMSON N. NGULI	CHIEF-MAVINDINI	0729995211	M	
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REPUBLIC OF KENYA

MINISTRY OF WATER, SANITATION AND IRRIGATION

THWAKE MULTIPURPOSE WATER DEVELOPMENT PROGRAM (TMWDP) PHASE1

PURPOSE: STAKEHOLDER ENGAGEMENT

DATE: 04/04/2024 VENUE/LOCATION: MAVINDINI

	Name	ORGNANIZATION/DESIGNATION	CONTACT	GENDER M/F	Signature
1	PAUL N KIIVKU	FB (SDA)	0725929242	M	
2	NICOLAS MUSUKU NZOVE	FB (ACC)	0798[illegible]971 0720273931	M	
3	HELLEN W MBUTHU	C.B.O	0715272318	F	
4	STEPHEN M. NZIOKA	ASST. CHIEF MAVINDINI SUBLOC.	0716483712	M	
5	PAUL NZILI MBUVA	WARD CO-ODINATOR MAVINDINI WARD	0728397756	M	
6	DAMARIS NDUKU	PWD REPRESENATIVE	0793511750	F	
7	JONATHAN KIMOLOG	MCA	0725206267	M	
8	MIRIAM MUTUKU	VILLAGE ADMIN GROUP	0724604250	F	

REPUBLIC OF KENYA

MINISTRY OF WATER, SANITATION AND IRRIGATION

THWAKE MULTIPURPOSE WATER DEVELOPMENT PROGRAM (TMWDP) PHASE1

PURPOSE: STAKEHOLDERS ENGAGEMENT

DATE: 07/04/2022 VENUE/LOCATION: MAVINDINI

	Name	ORGNANIZATION/DESIGNATION	CONTACT	GENDER M/F	Signature
1	JONATHAN S MUTUA	Opinion Leader	0728112935	M	[illegible]
2	Abednego Kimanthi	Farmers leader (Mua 9ia)	0715094271	M	[illegible]
3	Mulli Philip	Ofeng Conf[illegible]	0748147839	M	[illegible]
4	COLLETA MUSAU	opinion Leader	07249917[illegible]	F	[illegible]
5	Amos Mule	NGO	0715980314	M	[illegible]
6	Stephen N. Matila	Youth	0112318683	M	[illegible]
7	ANGELINA S KIMULU	CHP	0713715547	F	[illegible]
8	Bernard A. Ouyundi	GMC - VVV10	0726720916	M	[illegible]

APPENDIX 2.5: KITUI COUNTY STAKEHOLDERS MEETING AT KANYANGI AIC CHURCH – AIC CHURCH, (3RD APRIL 2025)

IN ATTENDANCE

1. Augustine Makau - Environment, Health & Safety Expert (Program Implementation Team, Delegation Lead)
2. Rhoda Kambua – Gender and Social Development Expert
3. Godfrey Olali - Senior Communications Specialist
4. Dominic Kyenza (Senior Community Liaison Officer, SMEC)
5. Stakeholders in Attendance (Below)

S.No	Name	Stakeholder Group	Organization
1	Rev. Fr. Dominic Nzoka	Faith-Based Organization	Catholic Mission, Kanyangi
2	Priscila Wambua	Ministry of Interior	Local Administration
3	Augustine M. Mwongela	Senior Citizen	Kanyangi Community
4	Samuel Kalani	Resident	Kalulini Community
5	Elizabeth Peter	Resident	Kalulini Community
6	Benjamin Kioko Mbevi	Youth	Kanyangi Community
7	Florence K. Mulu	Business Community	Kanyangi Market
8	Patricia N. Willy	Business Community	Kanyangi Market
9	Miriam Mutuku	Village Administrator	Community
10	Erastus M. Muithi	Faith-Based Group	Kanyangi Community
11	Komu Ndembe	Kitui Water and Sanitation Company	Water Sector
12	Robert M. Kavita	Faith-Based Organization	African Inland Church, Kanyangi
13	Jacob D. Kasonzo	Community-Based Organization	Kanyangi Division Pastors Forum
14	Evalyne M. Mala	CSO Office	Kanyangi Division
15	Jona Ngei	Faith-Based Organization	Kanyangi Division
16	Peter Kitungai	Opinion Leader	Kanyangi Division
17	Saul Makali	Community Member	Kanyangi Community

AGENDA

a. Preliminaries- Opening prayer and introduction of participants

b. Remarks from the Program Implementation Team (PIT) Team Leader
c. Plenary and Way forward, Q&A
d. Any other business

KANYANGI STAKEHOLDER FORUM (KITUI COUNTY) – 4RD APRIL 2025	
PRELIMINARIES (Q&A)	
3/03/04/2025	**General Discussion** The meeting was called to order at 3:10 pm after opening prayers. The Senior Community Liaison Team thanked members for attending and appreciated the chief's office for hosting the forum. He further welcomed the host to conduct an introduction of the stakeholders who participated in the discussion. The host further welcomed the PIT Team Leader for opening remarks and general introductions of PIT members present. In his welcoming speech, the PIT Team Lead thanked members for supporting the Project. He underscored the importance of coordinated collaboration between all stakeholders for the project's success. He informed the team that the main aim of the stakeholder forum from Kitui County was to get their views regarding the change of Thwake Dam Height from the initial 77.5 meters to 80.5 meters high after a similar discussion was held in March for stakeholders drawn from Mbooni East and Kitui Rural constituencies. He indicated the importance of seeking the views of the residents and other stakeholder groups since the variation would affect them regarding water backflow, compensation issues, construction of a new saddle dam, enlarged spillway, and acquisition of extra land. The stakeholders were further told that government laws require obtaining such views and license issues.
	Concern: A member of the forum, Evans Muli, informed the meeting that a move by the Government and the dam builders to increase the height means that more parcels of land are to be taken by the Project. Another member, Samuel Makali, informed the forum that the road at the entry point to the dam was in a bad state and needed to be repaired. **Ans:** The PIT informed the members that since the spillway and two saddle dams have been constructed, water flow back may not affect the land. They were also told that the contract BQ does not provide for the repair of roads by the Contractor. **Concern**: According to Mr. Augustine Mwongela, there is a need to provide the residents with an access bridge, adding that as the immediate neighbors living near the dam site, they fear that water flow back is likely to affect their farms without any compensation being put in place **Concern:** The stakeholders also feared that the three remaining phases would likely take many years to complete, hence the need for the government to ensure the dam is quickly completed so that the residents can start enjoying the water. They also feared that Parliament would typically reduce the budget for Thwake Dam, adding that they did not know what would happen to the Project in the current regime.

	Ans: The PIT, however, indicated that as soon as the first phase is done, the Government will invite bids for the remaining downstream phases, and the irrigation component will be given priority. Stakeholders were also informed that water tanks would be placed around Kanyangi center and to Kwa Vonza town. Residents were urged to involve their leaders and political class to ensure these matters are raised during stakeholder engagements. **Concern:** The stakeholders also expressed concerns that the presence of Kenya Wildlife Service rangers at the dam denies them the opportunity to fish around the river. They added that the Kanyangi community has many fishmongers who have been affected by the presence of KWS at the site. **Ans:** The PIT informed the forum that KWS owns the fish and the wildlife in the river; hence, special permits and licenses would be required to undertake fishing activities. Residents were further urged to form organizations and apply for such licenses. **Concern:** A member, Benjamin Kioko, wanted to know if compensation will be done in case of water backflow and damage to property following the increase in a dam wall **Concern:** The stakeholders also wanted to know what measures should be implemented in case of a possible dam break. **Concern**: The PIT informed them that sensitization sessions had been done, and the Ministry is planning to undertake another sensitization to people living in the downstream areas **Concern:** Members expressed concerns over rampant theft of fuel at the site. They were, however, told that the issue is being addressed in the presence of the Critical Infrastructure Police Unit (CIPU) at the site. **Concern**: Stakeholders also asked about the measures put in place by the Project to address child protection and how faith-based institutions will be involved	
4/03/04/2025	Any other business	There being no other business, the meeting was closed at 4:30 pm by a word of prayer

Minutes Confirmed by:

PIT Team Lead	Name: ……. Position: …….. Signature…… Date: ……

APPENDIX 2.5.1: LIST OF ATTENDANCE KANYANGI MEETING

REPUBLIC OF KENYA

MINISTRY OF WATER, SANITATION AND IRRIGATION

THWAKE MULTIPURPOSE WATER DEVELOPMENT PROGRAM (TMWDP) PHASE1

PURPOSE: STAKEHOLDER ENGAGEMENT

DATE: 3/04/2025 VENUE/LOCATION: KANYANGI

	Name	ORGNANIZATION/DESIGNATION	CONTACT	GENDER M/F	Signature
1	REV. FR. DOMINIC NZOKA	CATHOLIC MISSION KANYANGI	0725996768	M	
2	PRISCILLA WAMBUA	INTERIOR	0721387938	F	
3	AUGUSTINE M. MWONGELA	SENIOR CITIZEN	0727422877	M	
4	SAMUEL KALANI	KALULINI RESIDEND	0721179234	M	
5	ELIZABETH PETER	KALULINI RESIDEND	0712036952	F	
6	BENJAMIN KIOKO MBEVI	YOUTH REP KANYANGI	0702819581	M	
7	Florence K Mulu	Biz work Kanyangi	0717549491	F	
8	PATRICIA M WILLY	HANDWORK MARKET SECRETARY	0705132175	F	

REPUBLIC OF KENYA

MINISTRY OF WATER, SANITATION AND IRRIGATION

THWAKE MULTIPURPOSE WATER DEVELOPMENT PROGRAM (TMWDP) PHASE1

PURPOSE: STAKEHOLDER ENGAGEMENT

DATE: 03/04/2025 VENUE/LOCATION: KANYANGI

	Name	ORGNANIZATION/DESIGNATION	CONTACT	GENDER M/F	Signature
1	Nicholas Gitehu	World vision Kenya Lower Yatta AP	0721787448	M	
2	Paul Mbithi	World vision Kenya L/Yatta AP	0721236027	M	
3	REGINAH MUSEMBI	ADRA KENYA	072468245e	F	
4	MUSINDA MUSYOKA	KAWUKI (Kanyangi	0721800072	M	
5		area group farmers)			
6	DANIEL KITHOME	INTERIOR	0721738955	M	
7	Dr. MARTIN NKULEI	M.O.H. - KANYANGI HOSP.	0707655150 0721738955	M	
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APPENDIX 3: QUESTIONNAIRE RESPONSES

AUGUSTINE K. MAKAU (EIA/EA LEAD EXPERT)
TMWDP – PIT ENVIRONMENT, SAFETY AND HEALTH EXPERT
Telephone +254 717193863; Email: amakau60@gmail.com

12th FEBRUARY 2025,

Our Ref:EIA/ESIA-001/02/2025

Dear Stakeholder,

RE: PUBLIC PARTICIPATION & CONSULTATION QUESTIONNAIRE FOR UPDATING ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) STUDY REPORT FOR THWAKE MULTI-PURPOSE WATER DEVELOPMENT PROGRAM PHASE 1

The above subject refers.

We are undertaking a public participation and consultation survey to update the ESIA report for **THWAKE MULTI-PURPOSE WATER DEVELOPMENT PROGRAM** following design and scope changes effected on phase 1 as required under AfDB's financing agreement and facilitate application of the EIA license variation.

Under the Act, public participation is recognized as an important input in the EIA/ESIA process.

The proponent of this ESIA is: **MINISTRY OF WATER, SANITATION AND IRRIGATION**
MAJI HOUSE, NGONG ROAD.
NAIROBI.

As a stakeholder/beneficiary, we request for your comments/concerns that you would like included in the Environmental and Social Impact Assessment report through this public participation. **Please note that your information is confidential and will be used for this report only.**

Thanking you in advance for your contribution.

Yours sincerely,

Augustine Makau.
LEAD EIA\EA CONSULTANT.

AUGUSTINE K. MAKAU (EIA/EA LEAD EXPERT)
TMWDP – PIT ENVIRONMENT, SAFETY AND HEALTH EXPERT
Telephone +254 717193863; Email: amakau60@gmail.com

PUBLIC CONSULTATION AND PARTICIPATION QUESTIONNAIRE

Name of Interviewer (s): Joyce NJIGU 4
Signature:
Date: 12/2/25

PART I: INTERVIEWEE PROFILE

Name: NICHOLAS M KINYUA
Signature: ..... (this confirms your participation in the ESIA process)
Tel: 0728306227
Occupation: Student
Gender: ☐ Male ☑ Female ☐ Other
Age: ☐ 18-30 ☑ 31-45 ☐ 46-60 ☐ 61+
Residence (Sub-location/Ward) & Period of residency in the area:
< 5yrs ☐ 5 – 10yrs ☐ 10 – 20yrs ☑ >20yrs ☐

PART II: ANTICIPATED ENVIRONMENTAL IMPACTS ON THWAKE DAM/ DEVELOPMENT

1. *Provide any environmental positive impacts of the dam and any enhancement measures and 2. Negative impacts as well as mitigation measures that may be used in managing the negative impacts*

Positive Impacts and Enhancement Measures	
① Improvement of business in the area. ② Climate change in an area.	
Negative Impacts	**Mitigation Measures**
① Attack of wild animals ② Pollution ~~of~~ of area.	Building of perimeter wall

PART 3: SOCIO-ECONOMIC STATUS

1. Number of Household members living with you[ ] 5
   Number of males [ ] 3 Number of females [ ] 2 Children [ ]
2. Level of Education
   Primary ☑ Secondary ☑ College/University (Certificate/Diploma/Degree/Masters)
3. Source of income of the respondent
   I. Farmer ☐ II. Casual labourer ☐ III. Employed ☑ IV. Self-employed (Specify) ☐
   V. Student ☐ VI. Retired ☐ V.. Unemployed ☐
4. Can you give a rough estimate of your household income per month?
   ...20,000.....
5. What are the different sources water for your household? How far are the water sources?
   River (10 km)
6. How will this project affect your livelihood?
   ☑ Positively ☐ Negatively ☐ No impact ☐ Not sure
7. What positive benefits do you expect from the dam project? (Tick all that apply)
   ☑ Job creation ☑ Improved water supply ☑ Better infrastructure ☑ Increased business opportunities
   ☐ Others (specify) Irrigation

APPENDIX 3.1: PHOTOGRAPHY

Stakeholders meeting at Kanyangi Chief's Camp

Questionnaires filling at Kanyangi Chief's Camp

Stakeholder meeting at Kathulumbi, Kalawa – ABC Church

Stakeholders meeting at Mavindini- Kiusyani Catholic Church grounds

Community members are asking questions at stakeholders' meetings at Kyusyiani Catholic Church, Mavindini.

Environment, Health, and Safety Expert at the Program Implementation Team (PIT), Mr. Augustine Makau (front), explains a point to stakeholders from Makueni County during the meeting held at the Mavindini Chief's office on April 4, 2025. **Picture/Courtesy/PIT**

Members of the Program Implementation Team (PIT) attend to the stakeholders from Kitui County during an engagement session held at the Kanyangi AIC Church on April 3, 2025. ***Picture/Courtesy/PIT***

Different groups of stakeholder groups from Kitui County give views during an engagement session held at the Kanyangi AIC Church on April 3, 2025. **Picture/Courtesy/PIT**

Program Implementation Team (PIT) members join stakeholders from Kitui County for a group photo during the meeting held at the Kanyangi AIC church on April 3, 2025. ***/Picture/Courtesy/PIT***