



CENTRAL RIFT VALLEY WATER WORKS DEVELOPMENT AGENCY (CRVWDA)

**KENYA TOWNS SUSTAINABLE WATER SUPPLY AND SANITATION PROGRAM
(KTSWSSP)**

**CONSULTANCY SERVICES FOR FEASIBILITY STUDY, DETAILED DESIGN AND PREPARATION OF
TENDER DOCUMENTS FOR AMAYA/AMAIYA DAM WATER SUPPLY PROJECT**

Contract No.: RVWWD/KTSWSSP/C/AMAYA/2017-2018



ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

DRAFT REPORT

Submitted by the Joint Venture



BETA STUDIO S.r.l.

and

Z&A CONSULTING ENGINEERS INTERNATIONAL Ltd

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Final ESIA Report

Certification

CERTIFICATION

The Amaya/Amayi Dam Water Supply Project Environmental and Social Impact Assessment report has been prepared by Dr Rebecca HN Karanja NEMA Reg. 2860 assisted by Grace Muthoni Ng'ang'a NEMA No.7005. This EIA Study Report was prepared in accordance with the Environmental Management and Coordination Act no. 8 of 1999 (Revised 2015) and The Environmental (Impact Assessment and Audit) Regulations, 2003 for submission to the National Environmental Management Authority (NEMA).

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EXECUTIVE SUMMARY

The Central Rift Valley Water Works Development Agency (CRVWWDA) purposes to develop a water supply project through the construction of Amaya/Amaiya dam. The project financing will be by the African Development Bank (AfDB), African Development Fund (ADF) and Middle-Income Countries Technical Assistance Fund (MIC - TAF). The project will be supervised by CRVWWDA, as it falls within its area of jurisdiction. The funding is through the Government of Kenya and is geared towards supporting the Kenya Towns Sustainable Water Supply and Sanitation Programme (KTSWSSP). The project proposes abstraction of water from the proposed Amaya/Amaiya dam for both domestic and irrigation purposes. A hydropower component may be added if it's a feasible option.

Therefore, the CRVWWDA has commissioned a Joint Venture (J/V) composed of Beta Studio S.R.L. and Z&A Consulting Engineers International Ltd (Z&A) as Project Consultants to carry out the feasibility study, detailed design and preparation of tender documents for the Amaya/Amaiya dam water supply project. The project is located in Baringo, Laikipia and Samburu Counties, and lies within the Kenyan Rift Valley. The proposed dam will be located in Laikipia County, at the upstream part of the Amaya/Amaiya gorge. Water will be supplied to areas within Churo/Amaya, Tangelbei/Korosse, Silale, Suguta Marmar and Sosian wards, in the three Counties.

This development will contribute to reduction of possible conflicts arising from water scarcity, to increased agricultural activities and to improved livelihoods of the area communities. The proposed dam is expected to serve a population of about 50,000 people and their livestock, supply irrigation of about 20 Ha for demonstration farm and can provide for more acreage under small-scale farmers which can be considered in another phase. Currently, the target area is served by small water supply schemes that are not reliable due to low yields and susceptibility to long dry spells that are made worse by cyclic droughts and climate change. The water demand is also increasing due to population growth and changes in water use.

An ESIA is mandatory for the proposed development as highlighted in the Second Schedule of the Environmental Management and Coordination Act. (Part 4a-storage dams, 4b River diversions and water transfer between catchments, Part 8 (a) large-scale agriculture; (b) use of pesticide; (c) introduction of new crops and animals;(d) use of fertilizers; (e) irrigation and Part 10 Electrical infrastructure including; (a) Electricity generation stations; (b) Electrical transmission lines; (c) Electrical sub-stations;(d) Pumped- storage schemes).

Rift Valley Water Works Development Agency (RVWWDA) replaced the Rift Valley Water Services Board (RVWSB), one of the eight Water Services Boards established by the Government of Kenya under the Water Act 2002. In February 2020 by a gazette notice, RVWWDA was split to Central Rift Valley Water Works Development Agency (CRVWWDA) and Rift Valley North Water Works Development Agency (RVWWDA).

The Amaya/Amayi Dam Water Supply will attract both positive and negative impacts to the project area. **Positive impacts** include: provision of water supply for both human consumption and livestock; land use optimization; environmental conservation through soil, water and forestry improvement; management of storm water drainage; employment opportunities to local communities; and economic benefits to the local and national economies. **Negative impacts** are presented in two phases, namely the siting and construction phase, and the operation phase. Impacts arising from the first phase include, among others: loss of habitat and diversity; loss/disturbance to wildlife; change in landscape/ visual character; waste generation; pollution (air, soil and ground water); increased pressure on existing infrastructure; and social/ public health concerns around immigrant populations. Impacts arising during the operation phase include waste generation; loss/disturbance to wildlife; long term change in landscape/visual character; increased pressure on existing infrastructure; and social/public health concerns around immigrant populations. An Environmental Management and Monitoring Plan has been developed in this report, proposing mitigation measures of the foreseen impacts.

Scope of Work

Excavation of the reservoir to create storage of about 9.0 million m³ of water volume (10.4 million m³ total storage).

Dam ancillary works will comprise the following;

- ✓ Excavation of core trenches
 - ✓ Excavation of inlet channels
 - ✓ Construction of pipe draws off system
 - ✓ Construction of concrete spillway
 - ✓ Construction of cattle troughs
 - ✓ Construction of communal water points
 - ✓ Fencing of the reservoir
 - ✓ Bush clearing and uprooting to create space for the dam and dam reservoir area
 - ✓ Irrigation demonstration farm (20 Ha.). Grass planting on both sides of the embankment to control and prevent rainwater erosion
- If hydropower is deemed feasible:
- ✓ Power generator house
 - ✓ Erection of electricity poles and power generating cables

ESIA Project Objectives and Scope

The Amaya/Amayi Dam Water supply Project ESIA broad objective was to identify the impacts of the project to the environment and people of Samburu, Baringo and Laikipia Counties of

Kenya. The proponent is also guided through recommendations on appropriate measures that can be considered as mitigation measures of possible adverse impacts to the environmental and social components of the community during the different phases of project implementation.

The **Project baseline conditions** before the inception of the project are covered below:

- Environmental setting including the environmental challenges in the area that are likely to impact the project, flora and fauna, sensitive habitats, important habitats, energy source and possibility of use of green energy sources, and project impacts that may be detrimental to project sustainability.
- Socio-economic setting of the project including: Social infrastructure and amenities; (hospitals, schools, religious institutions, roads, water supplies, power supplies, etc.) land use, demographics (population, human settlements, economic activities), institutional aspects (key stakeholders and their role in the project, their concerns and contributions, project beneficiaries and persons affected by the project); Energy sources and coverage, water demand and use, health and safety, etc.; Policy, Legal and Institutional framework; Consultative Public Participation and Stakeholder Analysis, Project Alternatives and identification analysis of environmental and social impacts.

[Stakeholders Identification, Analysis of their Roles, Consultation and Public Participation](#)

This included community sensitization, mobilization, household field data collection; project data synthesis; public consultation from village to National and County government levels, Key Informant Interviews (KIIs), Focus Group Discussions (FGDs) and Local Leadership meetings. Stakeholders from the community, religious and opinion leaders, government line ministries and Private partners were consulted for their inputs to the study through public meetings, key informant interviews and completion of questionnaires. The outcomes of the consultations were that the project areas are dominated by pastoralists whose main livelihood source is livestock; the area is water scarce and in dire need of the resource; and the stakeholders will whole heartedly support the proposed project. The community needs to be capacity built on management of the water through Water Resources Users' Associations, and in a nutshell, the project will have both positive and negative environmental and social impacts after inception and completion.

[Policy and legal framework](#)

The study was carried out in accordance to the following policies: AfDB Operation and Safety Policies, National Water Policy, 2000; Water Catchment Management Policies; National Environment Action Plan (NEAP), 1994; Forestry Act 2006, Wildlife Act, The National Poverty Eradication Plan (NPEP), 1999.

Reference was also made to the following legal framework: Environmental Management and Coordination Act (EMCA), 1999; The Environmental Impact Assessment and Audit

Regulations, 2003; Water Quality Regulations, 2006; The Agriculture Act (Cap 318); Water Act, 2002; and the Public Health Act (Cap 242).

Key Findings

The study area covers Samburu, Laikipia and Baringo Counties. The community members including the leadership are supportive of the project and look forward to its implementation. The community members are sensitized and aware that during the different project phases such as construction, operation and decommissioning, there will be both positive and negative environmental and social impacts. The **anticipated impacts** as follows:

Construction phase: Positive impacts include but are not limited to creation of employment; improved cash flow in the local economy; creation of market for construction materials. Negative impacts include: de-vegetation, loss of flora and fauna, soil erosion, noise pollution and vibrations; air pollution through dust and gaseous emissions; loss of biodiversity; loss of pastureland; solid waste generation; and occupational safety, health and environment.

Operational phase: The anticipated positive impacts during the operational phase, include: clean domestic water supply, agroforestry, creation of employment; improved well-being of women and children in the area, saving peoples' time by reduced walking distances to fetch water, better prices for land, better infrastructure, growth of business enterprises in the area; If the hydropower option is feasible it will have positive impacts such as: provision of green sources of energy, reducing costs of power for pumping water from the dam, lighting up the area and enhancing security in the area. Anticipated negative impacts during this phase include water use conflicts: increase in water borne diseases, risk of dam wall collapse if poorly constructed, Siltation of dam reservoir, risk of people and animals drowning. For the hydropower component: Increased exposure to Electromagnetic fields (EMF); Risks of fire; Electromagnetic interference with radio telecommunications systems, Noise pollution, Corona effect and Electrocutation of birds.

Some of the **recommendations for the prevention and mitigation** of potentially adverse environmental and socio-economic impacts include: Agroforestry, avoiding clearing of indigenous trees where possible, selective clearing of vegetation; proper disposal of construction wastes; proper storage of oils, oil products and chemicals; staff training on occupational health and safety and first aid; ensuring safety of people, livestock and wild animals in the dam area by fencing to restrict access to upstream catchment protection and conservation; Capacity building of the community to manage the water resource, having bird feeding areas away from power lines to avoid electrocution and having bird diverters on electricity cables to make the lines visible to birds.

Proposed Management and Monitoring Plans

The project attracts both positive and negative impacts in all project phases (construction through to decommissioning). However due to the dire need of water in the project area, there is environmental economic and social justification for the proposed project to proceed.

A comprehensive environmental and social management plan (ESMP) has been developed to guide the entire project cycle. The ESMP provides the implementation framework and key actors to be involved in mitigating and monitoring of the potential impacts of the project on the environmental and social-economic settings and for the monitoring of the project performance in accordance to the policy, legal and regulatory requirements.

During the construction of the project, the proponent will be responsible for the day to day management and supervision of the construction activities, the contractor will be directly responsible for issues on the construction, and the Project Management Committee for operation and maintenance of the Dam in operational phase.

Issues to be monitored at operational phase include:

- ✓ Dam and Amaya/Amaiya River Water Levels
- ✓ Soil erosion and siltation
- ✓ Water quality in the Amaya/Amaiya dam reservoir
- ✓ Health and Safety.
- ✓ Power supply
- ✓ Birds safety

Conclusions and Recommendations

The conclusions and recommendations arising thereof are:

1. **Reversibility/Irreversibility of the identified Impacts:** The project is likely to do more good than harm when well executed with an elected project team. Being a transboundary project, during ESIA, key leaders in the area were consulted for their views and inputs. It's the Consultant's considered opinion that political good will and capacity building of the community is vital during all the phases of the project so as to enhance project sustainability. The foreseen environmental impacts can be prevented or reversed by use of environmental conservation measures and the mitigation measures proposed in the project study report.
2. **Geographical Extent of the Impacts:** The foreseen negative impacts on the environment and community are subtle when compared with the positive impacts of Amaya/Amaiya dam water supply. The impacts are also not expansive and but mainly localized to the area. Soil erosion and gully formation are already a major and prevalent problem in the area. Since the proposed project will harness flood waters, this is likely to control flooding and gully erosion. Incorporation of tree planting will lead to improvement of the vegetation cover. Pollution, devegetation and land degradation impacts that may occur can be effectively alleviated if all the proposed

mitigation measures are put in place. Possible conflicts over natural resources may be controlled through setting of monitoring and distribution committees for water and fodder.

3. **Ecological survey:** A comprehensive ecological study was done and there was documentation of flora and fauna of the area. Trees to rehabilitate in the dam site have been recommended in the report.
4. **Occupational health hazards during construction and project operational phases:** This could include accidents and any injuries to human health. Such impacts are significant and irreversible, and it is therefore critical that the project proponent puts in place all the proposed mitigation measures on occupational health and safety during construction while during operation, the community members should be capacity built on occupational health and safety. Construction workers should be provided with protective gears. The dam area should also be fenced to protect the people from accidents such as falls and drowning.
5. **Project Sensitization and Acceptability:** The local people and the political and religious leaders are receptive to the project terming it as a “game changer” to the community. During Community Public Participation and Interviews from local levels to the government offices, all the stakeholders and community are receptive of the project and promised total support. The project will reduce water scarcity, reduce possible resource conflicts, alleviate poverty and open the area for development.
6. **Consistency with the Government Policy Objectives (Agriculture and Environment among others):** The proposed project is in line with the government’s big Four Agenda, Kenyan constitution 2010 and policies touching on water and sanitation, green energy sources, employment creation, income generation and rural development. Private sector participation from the area is also expected to be significant. The project will also enhance environmental conservation and convert idle land into a useful resource. The project proponent should ensure adherence to the environmental laws and regulations from the onset of the project.
7. **Compliance with the existing Legislation, Conventions, Treaties, Covenants and Standards:** This project is not in contravention of any of the existing laws and standards. Further to this, the project proponent will ensure that the relevant laws and standards are upheld throughout the project cycle.

Other recommendations with respect to the proposed dam development project include:

- i. Water Abstraction permits should be sourced from WRA before the commencement of works
- ii. The project should only commence once it is licensed by NEMA
- iii. Project Designs should be approved by the relevant authorities before construction works commence
- iv. Construction works should be in line with relevant regulations, policies and laws

- v. Environmental audits should be undertaken and submitted to NEMA regularly once the project is operational to ensure compliance with proposed mitigation in the ESMPs
- vi. Green economy activities should be encouraged at all phases of the project
- vii. Catchment management, protection and conservation plans should be developed for the water catchments upstream as recommended by Water Act 2002, EMCA 2015 and any other applicable laws
- viii. The Operation and Maintenance of the water project should comply with the best water management practices and the principles of environmental management including the principles of sustainability, intergenerational equity, prevention, precaution, polluter pays and public participation; and
- ix. The Contractor and the staff from proponent are required to strictly adhere to the provided ESMP including the continuous evaluation and adaptation of this plan during project construction and operation.

In a nutshell, the project will benefit the people of Amaya/Amaiya region through domestic and livestock water provision. The irrigation demonstration farms will serve as capacity building centers for agricultural training and information dissemination. The project will be instrumental in enhancing peace and stability in the area through sustainable provision of water resources.

The consultants recommend trainings on fodder growing and processing to entice the community to reduce herds of animals and adopt a more sedentary lifestyle with minimized stocks.

The ESIA consultants recommend this as **a viable project with benefits outnumbering the negative impacts. If the attached comprehensive ESMP, is adhered to, the project will realize more gains than losses to the community.** Therefore, this ESIA Study Report should be approved and the proposed project licensed by NEMA.

Eighty six percent (86%) of the land demarcated for the project area predominantly lies within community/ trust land, 12% in private land and 3% on government land. From the Resettlement Action Plan (RAP) survey, a total of 111 project affected persons (PAPs) were found in the whole area but only 1 out of 111 respondents had land ownership documents in the form of an allotment letter. The other 110 did not have any form of land ownership documents.. There were 43 PAPs from the dam and reservoir area, and 68 from the irrigation area. The PAPs will need to be compensated or resettled before the project commences.

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LIST OF ABBREVIATIONS

AfDB	African Development Bank
ADF	African Development Fund
ADMB	Amaya/Amaiya Dam Management Board
ASAL	Arid and Semi-Arid Land
AWMC	Area Water Management Committee
AWRUA	Amaya/Amaiya Water Resources Users Association
CBO	Community Based Organization
DMC	Disaster Management Committee
DOSH	Directorate of Occupational Safety and Health
EFA	Economic and Financial Analysis
EMCA	Environmental Management and Coordination Act
E(S)IA	Environmental (and Social) Impact Assessment
ESMP	Environmental and Social Management Plan
FGD	Focus Group Discussion
GCF	Green Climate Fund
GDC	Geothermal Development Company
GoK	Government of Kenya
HIV/AIDS	Human Immunodeficiency Virus / Acquired Immunodeficiency Syndrome
ILO	International Labour Organization
KFS	Kenya Forest Service
KII	Key Informant Interview
KTSWSSP	Kenya Towns Sustainable Water Supply and Sanitation Program
KVDA	Kerio Valley Development Authority
KWS	Kenya Wildlife Service
MIC-TAF	Middle Income Countries Technical Assistance Fund
NDMA	National Disaster Management Authority
NEC	National Environment Council
NEAP	National Environment Action Plan
NEMA	National Environmental Management Authority
NGO	Non-Governmental Organization
NPEP	National Poverty Eradication Plan
PAP	Project Affected People
RAP	Resettlement Action Plan

RVWDDA	Rift Valley Water Works Development Agency
SDG	Sustainable Development Goal
SERC	Standards and Enforcement Review Committee
SE(S)A	Strategic Environmental (and Social) Assessment
STD	Sexually Transmitted Disease
ToR	Terms of Reference
UCCD	Convention of Control of Desertification
UN	United Nations
UNFCCC	United Nations Framework Convention on Climate Change
WIBA	Work Injury Benefits Act
WMC	Water Management Committee
WRA	Water Resources Authority
WASREB	Water Services Regulatory Board
WFP	World Food Program
WWDA	Water Works Development Agency

CHAPTER 1. INTRODUCTION

1.1. Project Background

Kenya is a water scarce country, with renewable freshwater per capita projected to be in the order of 235m³ in 2025, unless effective measures to address challenges in the water and sanitation sector are implemented (Kenya Vision2030, p. 115). The Vision for the sector is “to ensure water and improved sanitation availability and access to all by 2030”. Rapid urbanization, which characterizes the Kenyan social structure and is critical for the economic development of the country, poses several challenges in achieving this goal as it is projected that, by 2030, more than half of the people in Kenya will be living in towns and cities. The GoK has shown consistent commitment to reforming the water and sanitation sector and achieving the Sustainable Development Goals (SDGs); however, despite increased government investments access to effective services remains slow. This is partly due to rapid urbanization, population growth, weak institutional capacity and negative impacts of climate change.

Therefore, the GoK requested the AfDB’s support to finance the Kenya Towns Sustainable Water Supply and Sanitation Programme (KTSWSSP), with the aim of “*improving the access, quality, availability and sustainability of water supply and waste-water management services in multiple towns with a view to catalyzing commercial activities, driving economic growth, improving quality of life of people and building resilience against climate variability and change*” (KTSWSSP–ESMF Summary,p.2). Part of the KTSWSSP funds is directed, through the Rift Valley Water Works Development Agency (CRVWWDA), to the Feasibility Study, Detailed Design and Tender Documents of the Amaya/Amayi Dam water supply project.

1.2. Project Description

According to the CRVWWDA Terms of Reference (ToR), the project area would fall within the CRVWWDA area of jurisdiction, in Baringo County. The proposed dam would be located in Tiaty Sub-County, at the border of Baringo and Samburu Counties, about 91km northeast of Kabarnet town, the County Headquarter, and within the upper part of the catchment of the Amaya/Amayi stream in Luonyek/Luoniek Location. Water would be supplied to areas within Churo, Tangulbei and Silale wards in Baringo County and Amaya location in Samburu County.

Following the outcomes of the field and office works and public consultations, the project is located in Baringo, Laikipia and Samburu Counties, and lies within the Kenyan Rift Valley. The proposed dam will be located in Laikipia County, at the upstream part of the Amaya/Amayi gorge. Water will be supplied to areas within Churo/Amaya, Tangulbei/Korosse, Silale, Suguta Marmar and Sosian wards, in the three Counties.

The project area is presented in the subsequent figures.

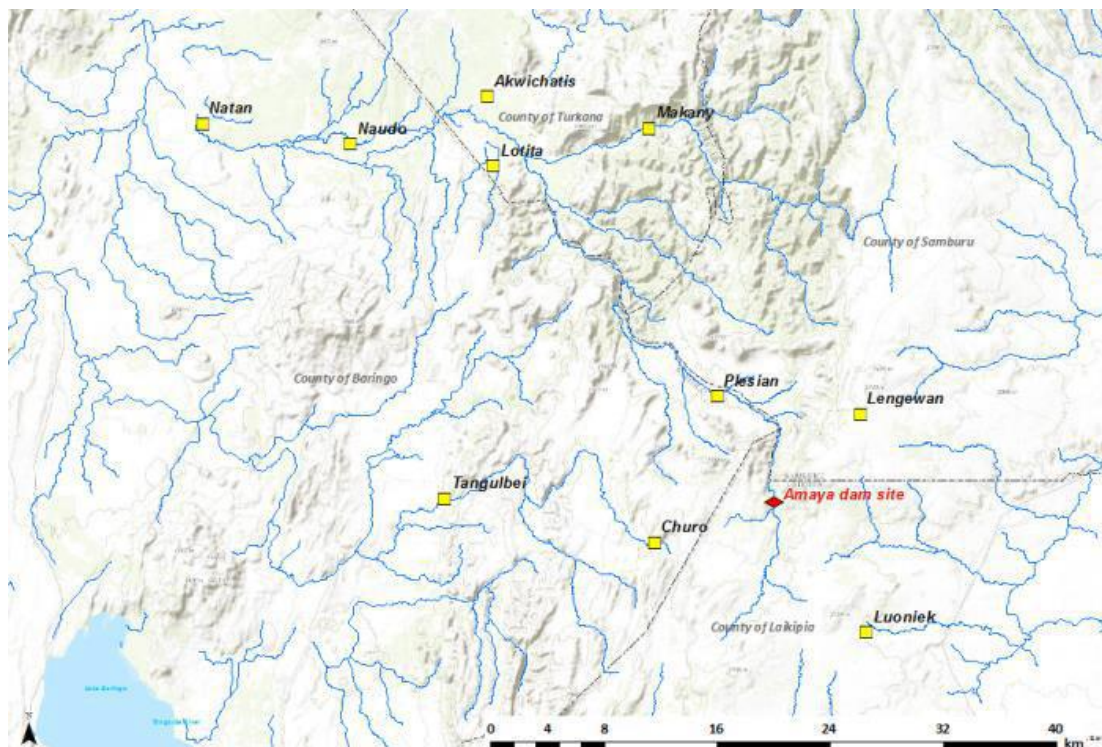


Figure 1-1: Map of the project area

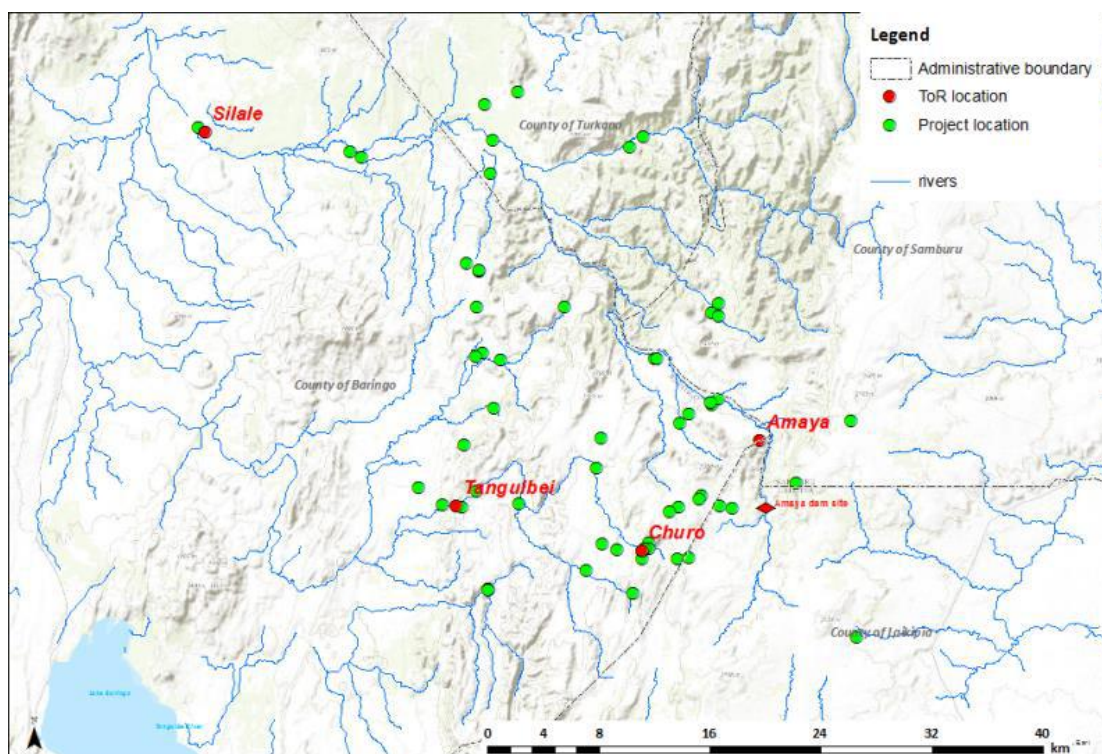


Figure 1-2: Target areas according to the ToR and the project design

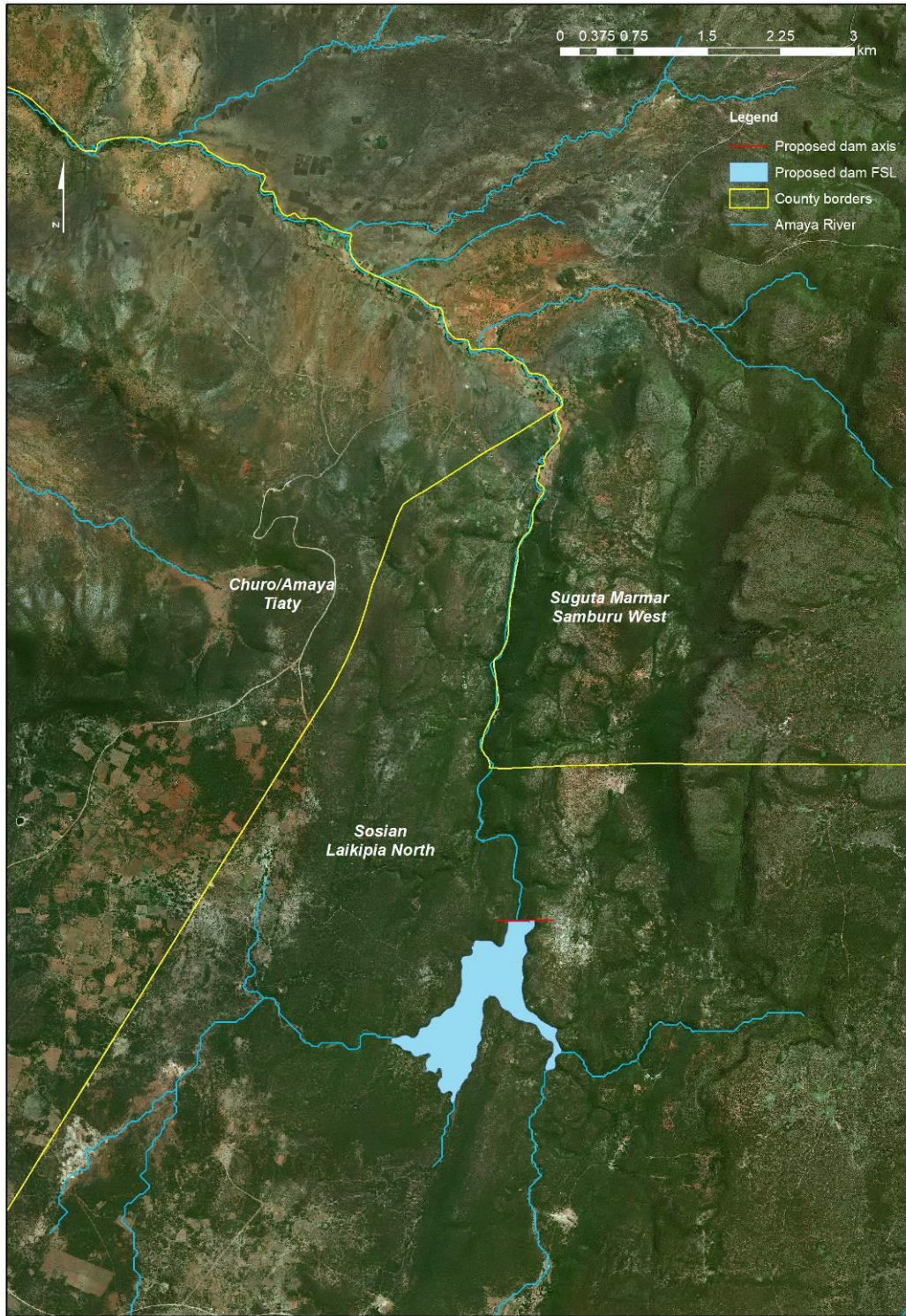


Figure 1-3: The Amaya/Amaiya dam location according to the project design

Table 1-1 on the following page briefly depicts the project works description by County and Location.

Table 1-1: Project works description by County and Wards

County	Project Works Description
Baringo County: Tangulbei & Silale Churo/Amaya	<ul style="list-style-type: none"> • Tangulbei and Silale Wards will benefit from domestic and livestock water distribution. Inhabitants will not be affected by the resettlement activities; • The demonstration plot area is within Churo/Amaya Wards. Residents will have to be compensated for the loss of irrigation plot land. They will also largely benefit from irrigation downstream, connection to water for domestic use and for livestock.
Laikipia County: Luonyek/Luoniek Ward	<ul style="list-style-type: none"> • The dam and reservoir area fall in Luonyek/Luoniek area. Residents in this ward will be affected by reduced access to pasture lands and water points.
Samburu County: Lengewan Ward	<ul style="list-style-type: none"> • In Lengewan Ward, communities will benefit from water for domestic and livestock use. Inhabitants within this ward will not be affected by the resettlement activities

1.3. Project Objectives

The main project objective is to carry out an Environmental and Social Impact Assessment for the Proposed Amaya/Amaya Dam water development and submit the report to NEMA for consideration of project licensing. The main objectives of the Environmental and Social Impact Assessment Study report are to:

1. Comply with the Environmental Management and Coordination Act (1999) amended in 2015.
2. Comply with the Environmental (Impact Assessment and Audit) Regulations, 2003, Regulations;
3. Determine the sustainability of the project on environmental and social safeguards;
4. Provide a baseline description of bio-physical and socio-cultural environment of the project area;
5. Assess potential impacts of the project on the bio-physical and socio-cultural environment;
6. Allow for consultations with all interested and affected parties and the relevant authorities.

1.4. Project Justification

Samburu, Baringo and Laikipia areas where the proposed project lies are known to have erratic rainfall and unfavorable distribution of rainfall throughout the year. The water supply to the area through natural sources such as rivers and springs are unreliable due to the climatic nature of the area and due to the diminished catchment areas caused by destruction of forests

for fuel. Water pans constructed in the area dry out very fast and hardly have enough water. This has led to water shortages and had been source of conflict among the pastoralists in the past. The area experiences intense flooding during the rainy period. The floods cause havoc by cutting off infrastructure and drowning men and animals.

The proposed project will be instrumental in controlling floods, providing water for domestic animals and wildlife and providing clean water for domestic purposes.

Water for domestic animals and wildlife will reduce any remaining water-based conflicts while treated water for human consumption will reduce incidences of water borne diseases. Women and children will also be free from fetching water from far places. This will enable the community members get extra time to undertake other social economic activities.

The Amaya/Amaiya dam water supply project is proposed to address the above problem by establishing the dam to provide water for domestic and livestock. This will ensure sustainable water supply and reduce nomadism of the farmers in search of water for livestock. It is envisaged that the rockfill dam site could not only be a training site for issues on crop production and livestock keeping but also provide an avenue for a commercial tree seedlings production for the community.

The objectives of the project are:

- 1) Construct a dam with a live storage capacity of about 9.0 million m³ (10.4 million m³ total volume)
- 2) Provide water for domestic and livestock use
- 3) Have a 20 Ha irrigation demonstration farm
- 4) If feasible, harness hydropower from the dam
- 5) Improve community livelihoods

To in order to successfully implement the proposed project, the study encompasses:

- Environmental and Social Impact Assessment (ESIA) study so as to obtain the necessary NEMA license;
- A Resettlement Action Plan (RAP) to document the People Affected by the Project who may need to be compensated as they cede land for development of the dam area, dam reservoir and the Irrigation area;
- Institutional strengthening and capacity needs assessment;
- A climate change impact assessment, which will allow for the preparation of a proposal for the Green Climate Fund (GCF).

1.5. Project Cost

As per the Final Feasibility Study Report the project, including possible hydropower, was estimated to have a total investment cost in the order of USD 100,000,000, distributed as shown below:

Table 1-2: Summary of project cost

Study Component	Cost (excl. contingencies)	Cost with 10% contingencies
Dam	25,683,000	28,500,000
Water supply option A	43,769,000	48,145,900
20ha demonstration plot, various irr. Systems	256,000	281,600
Hydropower at the dam toe	1,200,000	1,320,000
Total cost I	70,908,000	78,247,500
Hydropower along the irrigation pipeline	14,742,000	16,216,200
Total cost incl. all HP options	85,650,000	94,463,700

Since the project Preliminary Study is still ongoing, the final cost of the works is yet to be finalized. It is however expected to increase, given the outcomes of the various field surveys and the request for inclusion of more water supply beneficiaries.

1.6. Project Components

Following the field and office works of the Feasibility Study, and after analyzing the Consultant's proposals with the Client and disclosing the findings to the involved communities, the project works have been determined as follows (at Preliminary Study stage):

1. Dam: A rockfill dam, 49m high (from riverbed to dam crest), located in Laikipia County at the upstream part of the Amaya/Amaiya gorge, with total storage volume of 10.4MCM (live storage 9.0MCM)
2. Water supply: A water supply system for domestic, non-domestic and livestock watering needs, which will serve around 116,600 people and 81,000 equivalent livestock units in 2040, in areas of Churo/Amaya, Tangelbei/Korosse, Silale, Suguta Marmar and Sosian wards
3. Irrigation demonstration plot: A 20ha demonstration plot at the north and south banks of Amaya/Amaiya River downstream of the dam, which will comprise various irrigation systems
4. Future irrigation projections: Potential for future development of circa 500ha of irrigation (net), assuming 50% surface irrigation and 50% pipe irrigation. The total command area will be finalized by the preliminary design.

5. Hydropower: Evaluation of the potential for small hydropower development at various locations along the system. The assessment of potential for hydropower production will be finalized by the preliminary design, depending also on the outcomes of the project economic and financial analysis (EFA).

CHAPTER 2. ESIA METHODOLOGY

2.1. Methodology Outline

Based on the understanding of the project objectives outlined in the Amaya/Amaiya Dam Water Project ToR, the methodology was structured into broad areas which include: Preparation Stage, Field Surveys, Census and Asset Inventory, Preparation of Plans and Reporting Phases that are briefly described below. The Consultant executed this assignment using a consultative and participatory approach (focus group discussions, Key Informant Interviews, key stakeholders' analysis, gender and institutional analysis) and field surveys including photography and recording of observations. A comprehensive desk study of all the relevant project documents, Acts, guidelines and legislations was also done.

2.2. Methodology of ESIA Study

The approach to this exercise was structured to cover the requirements under EMCA, 1999 as well as the EIA/Audit regulations as stipulated under the Gazette Notice No. 56 of 13th June 2003. It involved largely an understanding of the project background, the preliminary designs and the implementation plan as well as commissioning. In addition, baseline information was obtained through physical investigation of the site and the surrounding areas, public consultation (which included discussions with local administration and the community), photography, as well as discussions with the Proponent.

The key activities undertaken during the assessment were as follows:

- i. Literature Review: A detailed review of available documentation;
- ii. Consultations with the Proponent regarding the proposed project details, the site planning and implementation plan;
- iii. Interviews and consultations with the local community surrounding the proposed dam as well as representatives of various organizations;
- iv. Data collection and physical inspections of the proposed site;
- v. Evaluation of the activities around the site and the environmental setting of the wider area through physical observations as well as from existing information in literature; and
- vi. Reporting, review and submissions.

Below is a typical outline of the basic EIA steps that were followed during this assessment:

[Step 1: Environmental Screening](#)

This is the first stage where the proposed project is evaluated with the guidance of EMCA, 1999. The aim of screening is to confirm whether a project falls within a category that requires an ESIA prior to commencement. Screening assesses the viability of a project from an Environmental and Social perspective and guides on the extent of assessment required. A site

visit to the Project area was undertaken on 24th September 2018. During the site visit analysis was done. From analysis of the project components, an ESIA is mandatory for the proposed development as it is highlighted in the Second Schedule of the Environmental Management and Coordination Act. (Part 4a-storage dams, 4b River diversions and water transfer between catchments, Part 8 (a) large-scale agriculture; (b) use of pesticide; (c) introduction of new crops and animals; (d) use of fertilizers; (e) irrigation, and Part 10 Electrical infrastructure including; (a) Electricity generation stations; (b) Electrical transmission lines; (c) Electrical sub-stations;(d) Pumped-storage schemes). **Due to the magnitude of the project, geographical expansiveness and sensitivity of the area environmentally and socially, a comprehensive ESIA will be carried out.**

Step 2: Environmental Scoping

During the scoping exercise, preliminary physical assessment of the site and its surroundings helped to narrow down to the most critical environmental and social issues requiring attention for detailed evaluation. A comprehensive reconnaissance survey of the area was done from 21st October to 24th October 2018 with the help of CRVWDA, local and government leaders. This was done to survey the proposedwards to develop impression of topography, flora and fauna, and also map out the sensitive sites within the project area and preliminary scoping for Environmental and Social impacts. The visiting team made observation of the settlement pattern and physical boundaries of the beneficiary area and initiate communication links with local leaders in order to establish channels of communication.

Step 3: Desk Study

A comprehensive literature review of relevant documents was continuously done during the ESIA report development period. This included County Integrated Development Plans for Samburu, Laikipia and Baringo, environmental legislation and regulations, International Conventions, Resources Management plans etc. The review provided an understanding of the terms of reference, environmental and social status, demographic trends, land use practices, development strategies and plans as well as the policy and legal documents.

Step 4: Baseline Conditions

Physical inspections and observations in the study area constituted the exercise for collecting baseline information and this was done from 21st to 24th October 2018.

Step 5: Consultations

Consultative Public participation was done from 21st to 24th October 2018, 3rd to 7th December 2018 and again from 16th January 2019 to 4th February 2019. This was done concurrently with household surveys and Key Informant interviews, meeting with political leadership of the area, gender analysis and Focus Group Discussions. The proposed development was evaluated with

a view to establish the physical environment status, social and economic trends. The field assessment was also designed to establish potential positive and negative impacts through interviews, discussions and physical Consultative Public Participation was done through:

- Key informant Interviews with key stakeholders and opinion leaders
- Visit to the county offices in Laikipia, Baringo and Samburu for discussion with line ministries. Meetings with relevant government offices were undertaken to establish the prevailing social and Environmental conditions in the area
- Focus Group Discussions segregated by Gender were held to assess the general public opinion with respect to the project. Issues that came up included social, economic benefits, safety, conflicts over resources and any other perceived impacts of the project to the welfare of the people.

2.3. ESIA Reporting Format

The structure of the project ESIA report is as follows:

- Executive Summary: Gives an overall analysis of the full report
- Chapter 1: Describes the ESIA Background, project description, project design, objectives and scope of works
- Chapter 2: Describes the summary and detailed Methodology and Reporting Structure of ESIA Study.
- Chapter 3: Presents the policy, legal, Institutional and regulatory framework including international Conventions, treaties and covenants. Special attention is paid to the African Development Bank Policies
- Chapter 4: Describes the consultations and public participation. It includes outcomes of community sensitisation and participation meetings. The objectives, methodology and a summary of stakeholder's comments are presented in a table. The potential stakeholders' in the project and the roles they will play in the project are highlighted
- Chapter 5: Describes the baseline environmental and social conditions in the project area in sufficient detail to enable an adequate assessment of probable environmental impacts. The baseline studies were desk based, but supported with secondary data and interviews with stakeholders including the results of Household surveys.
- Chapter 6: Project Alternatives are explored including the "No Project option", and options that include alternative locations, dam types etc.
- Chapter 7: Describes the Potential environmental and social impacts and mitigation measures at the construction, operation and decommissioning phases.
- Chapter 8: Presents the Environmental and Social Management Plan (ESMP) showing the negative impacts, mitigation measures, and responsibility, monitoring means and frequency of monitoring.

Chapter 9: Presents the conclusions and recommendations of the ESIA study.

Chapter 10: References. This chapter highlights all the secondary data sourced for the project

Chapter 11: Appendices. This includes the Household survey questionnaire and attendance sheets for the meetings

2.4. Detailed Methodology

2.4.1. Study Task 1: Identification and Description of Guidelines and Standards

Task objective: To identify and describe the legal, policy and regulatory standards that ensure environmental quality at the national and local levels and ecological and socio-economic issues including compliance issues.

Methodology: In the process of identifying the regulations and the standards governing environmental quality, solid and liquid waste management, health and safety, protection of sensitive areas, land use and control at the national and local levels and ecological and socio-economic issues including compliance were considered. All institutions involved in development issues in the project area were consulted. The key institutions include the County Government offices in Baringo, Samburu and Laikipia, National Environmental Management Authority (NEMA), the Forestry Department, Kenya Wildlife Service, County Environmental Office, Water Resources Authority (WRA), County Irrigation Office, County Agricultural Office, NGOs and Local Leaders of Baringo and Samburu County. The EIA regulations issued in accordance with the provisions of Environmental Management and Coordination Act (EMCA) of 1999 will be applied.

The following Acts were considered in this study.

- The Constitution of Kenya, 2010;
- The Environmental Management and Coordination Act, 1999;
- Wildlife (Conservation and Management) Act 2013;
- The Occupational Safety and Health Act, 2007;
- Work Injury Benefits Act (WIBA);
- The Penal Code (Cap. 63);
- The Public Health Act (Cap. 242);
- The Water Act 2002(Revised 2016);
- National Environment Action Plan 2009 – 2013;
- The National Policy of Water;
- Physical Planning Act, 1999
- Explosives Act, Cap 115
- Land Act 2012

Other relevant laws that govern protection of the environment and executed by different arms of the law include;

- The Agriculture Act, and the Agriculture (Basic Land Usage) Rules, 1986
- The Forestry Act-1999 revised 2005
- The Food, Drugs and Chemical Substances Act – as revised 1992
- The Government Land Act (Cap 280)
- The Wildlife Conservation and Management Act. Cap 376, Laws of Kenya

Some of the policies and papers referred to while undertaking the assignment include:

- African development Bank Integrated Safeguard systems (Policy statements and Operational safeguards)
- National Environmental Action Plan (NEAP)
- Environmental and Development Policy (Session Paper No.6 1999)
- The World Commission on Environmental and Development (The Brundtland Commission of 1987)
- Structure plans and local physical development plans (LPDP)
- The National Poverty Eradication Plan (NPEP)
- The Poverty Reduction Strategy Paper (PRSP)
- International Conventions and Treaties

2.4.2. Study Task 2: Description of Baseline Environmental Setting and Mitigation Measures

Task objective: To describe environmental conditions and mitigation measures.

Methodology: With reference to ToR, the Consultant carried out an Environmental Impact Assessment/ Audit for the proposed project and incorporated the proposed mitigation and management measures into the design. Environmental and Social Management Plans as well as self-audit monitoring plans would be necessary for sustainability of the project. The Environmentalist carried out a due diligence to identify the significant environmental issues in the project areas. The consultant collected, collated and presented information on baseline characteristics of the existing environment within and around the proposed dam area, hydropower plants, irrigation area, domestic water supply and highlight the major issues and mitigation measures that need to be taken into account during construction, operation and decommissioning phases of the scheme.

The consultant collected data on the physical and biological environment; analyzed safety, risks, and sanitation and waste management implications by the project. The process also ensured public consultations and participations throughout the EIA study process. The new environmental challenges anticipated include water logging, water borne diseases, siltation, flooding, pollution etc. in the course of undertaking the task, the consultant identified and

analyzed alternatives and specified the assessment area. The study team distinguished between positive and negative impacts, direct and indirect impacts, immediate and long term impacts and identified irreversible impacts. This assisted in making appropriate recommendations and conclusions.

Questionnaires, observations, interviews and photographs to collect data were used. Relevant secondary data from all environmental and social institutions in the project area was gathered. Assessment data collection tools to adequately gather the required information were prepared. These tools included but not limited to:

- ✓ Household questionnaire
- ✓ Key Informant Interview Schedules
- ✓ Focus Group Discussion Schedules
- ✓ Observation checklist
- ✓ Public consultation guide
- ✓ Digital Camera

The consultant used professional programmes such as MS Excel 2007, SPSS and STATA for data management. Data entry was conducted concurrently with data collection in the field. After the data entry, cleaning was done to ensure the data entered will be in the form that enabled the ease of analysis.

All the data collected were analyzed using MS Excel, SPSS and STATA and other data analysis software that were deemed necessary. The consultant drew inferences from the qualitative data collected based on professional understanding and experience. The findings from the analysis of field data and document reviews guided the basis of the recommendations and conclusions made in the document.

Different ESMPs for different project phases were developed. A sample of ESMP is shown below.

Table 2-1: Sample of ESMP

Possible Impacts	Mitigation Measures	Monitoring Indicators	Performance Indicators	Timing	Responsible Party	Mitigation and Monitoring Cost (Ksh.)

2.4.3. Study Task 3: Description of Physical Environment

Task objective: To describe physical environmental conditions.

Methodology: Through literature survey, the study team collected, collated and presented information on:

- Climate
- Topography
- Drainage
- Geology
- Soil and soil erosion
- Water quality
- Wetlands, among others.

Assessment data collection tools to adequately gather the required information were prepared. Some of the tools used include but not limited to:

- ✓ Observation checklist
- ✓ Public consultation guide
- ✓ Digital Camera

There was also the process of evaluating the changes in sediment load of the river water as this is a likely cause of change of river morphology and increased turbidity.

2.4.4. Study Task 4: Description of Biological Environment

Task objective: To describe biological environmental conditions.

Methodology: The following data was collected, collated and presented information on:

- Flora and fauna types and their diversity
- Sensitive habitats
- Endangered species
- Protected areas etc.

The methodologies used include but were not limited to both quantitative (field sampling) and qualitative (desk-stop literature review) on biodiversity in rivers of the study area methods were employed. Assessment data collection tools to adequately gather the required information were prepared and they include:

- Observation checklist
- Public consultation guide
- Digital Camera

Field sampling / Ecological surveys:

Flora: Both Terrestrial and aquatic plants will be sampled within the project area and along the banks of Amaya/Amayiya river. Belt, random and meander transect methodology will be applied. Transects will be used and plots measuring at least 20m x 20m will be demarcated for sampling purposes. Each sampling zone will be geo-referenced using GPS and all vegetation occurring within a plot/enclosure identified and recorded. Samples that are not identified in the field will be pressed and identified at Kenyatta University Laboratories and voucher specimen stored there.

Fauna: of the project area will be sampled through field transects and aerial sweep netting: Sweep netting targeted the flying adult insects e.g. dragon flies, damsel flies, etc. and those resting in vegetation. Some specimens will be identified instantly on site while those that are not identified on site will be kept in butterfly envelopes awaiting further identification in the laboratory. The collected insects will be preserved in vials containing 70% ethanol.

Large and Small mammals, amphibians and reptiles will be visually observed, photographed and identified either in the field or later in the laboratory using identification keys. Presence of mammals; birds; amphibians; and reptiles will also be confirmed through:

- ✓ Spoons;
- ✓ Droppings;
- ✓ Hairs/feathers;
- ✓ Animal diggings; and
- ✓ Local knowledge /Indigenous knowledge

2.4.5. Study Task 5: Identifying Occupational Safety and Health Concerns

Task objective: To identify, analyze and describe the occupational health and safety concerns that are likely to arise as a result of proposed development.

Methodology: Data on occupational safety and health concerns was collected, collated and given descriptions. This was used in conducting analysis on safety, risks health, sanitation and waste management implications brought about by the project.

Data collection tools for adequate gathering of the required information were prepared. These tools include but not limited to:

- ✓ Household questionnaire
- ✓ Observation checklist
- ✓ Public consultation guide
- ✓ Digital Camera

Analysis and description of all occupational health and safety concerns that are likely to arise as a result of construction and operations of the proposed facility was also done.

2.4.6. Study Task 6: Carry out Survey to Collect Data on Anticipated New Challenges

Task objective: To provide information on anticipated new challenges with the development of the proposed Amaya/Amaiya Dam Water project.

Methodology: The Consultant collected both primary and secondary data and information related to:

- Flooding
- Water logging
- River siltation
- Water borne diseases
- Pesticides and fertilizers
- Salinization
- Possible location of community water access points
- Potential conflict over access and use of water resources
- Potential conflict over use of pastureland adjacent to the new water resource/access points and access to land demarcated for irrigation demonstration farms

All significant social and environmental changes expected due to the proposed project were analyzed and described by the Consultant. These encompass environmental changes are a result of interaction between the proposed project and the environment that are likely to bring about changes in the baseline environmental conditions. The consultant prepared assessment data collection tools to adequately gather the required information.

2.4.7. Study Task 7: Analysis of Project Alternatives

Task objective: To evaluate project alternatives alongside the proposed development alternatives to select the most appropriate alternative.

Methodology: Analysis of the project alternatives in terms of site, technology, scale and route options will be undertaken. The Environmental Impact Assessment Study will be used by the Consultant to identify and assess alternatives to the proposed development/project. Only the one with the least adverse impacts will be selected based on less negative impacts and cost-benefit analysis.

2.4.8. Study Task 8: Specify Through Maps at Appropriate Scales and Boundaries of the Study Area for Assessment

Methodology: To Consultant with the help of the community identified the project area showing their preferred water points.

2.4.9. Study Task 9: Identification of Potential Environmental Impacts that could Result from the Project

Task objective: To identify potential positive and negative environmental impacts that would result from project implementation.

Methodology: The Consultant distinguished and described positive and negative, direct and indirect and long term and immediate impacts resulting from the proposed Amaya/Amayi Dam Water Project. Any unavoidable or irreversible impacts and quantitatively describe in terms of environmental costs and benefits were also considered. The Consultant assigned the economic values where possible.

2.4.10. Study Task 10: Make Appropriate Conclusions and Recommendations

Task objective: To make appropriate and relevant conclusions and recommendations.

Methodology: Analysis and description of all concerns that are likely to arise as a result of construction and operations of the proposed facility were done. The consultant therefore made the necessary recommendations and conclusions on corrective and remedial measures to be implemented under the environmental management plan.

2.4.11. Study Task 11: Collect and Analyze Environmental Baseline Data and Identify Impacts of the Proposed Development

Task objective: To collect and analyze environmental baseline data and identify impacts of the proposed development.

Methodology: There was collection, analysis of baseline data, identification and evaluation of impacts of the proposed development option. There was an incorporation of the environmental mitigation measures and management plan in the preliminary and detailed design of the project up to the implantation stage. Some of the issues that the consultant addressed include:

- ✓ Soil erosion and sedimentation in the proposed development area
- ✓ Water logging
- ✓ Impacts of the water abstractions to downstream users
- ✓ Water borne diseases
- ✓ Application of pesticides and chemical
- ✓ Effects of the quality of water entering and leaving the project effects

2.4.12. Study Task 12: Socio-economic Situational Analysis

Task objective: To collect socio-economic data on the status of potential beneficiaries of the Amaya/Amayi dam and irrigation project.

Methodology: Socioeconomic status was assessed through income levels, wealth, education, and occupation. Other data was on demographics (population in the area & demographic patterns); seasonal land use patterns, livelihood activities; existing social infrastructure (schools, churches, health facilities, social centers and halls, markets, shopping centers, etc.); employment; labor availability across seasons; historical and cultural heritage sites; communication networks and households whose lands is likely to be affected by the project. Data on economic production activities, consumption, and distribution of goods among household members was useful for benchmarking the likely impacts of the project on social economic status of households.

Social economic survey was also intended to reveal existing social inequalities resources access and people with influence, privileges, power and control of communally owned resources. Knowledge of social stratification and inequalities gave indications of likely impacts to the project (access to irrigation and domestic water) beneficiaries and how the negative impacts should be mitigated.

Social capital and reciprocal relationships were assessed by looking at social organizations, and members interests/likely role in management of water resources. Social interactions that could threaten the project such as possible conflict and unhealthy competition were investigated.

Social survey data was collected using a socio-economic baseline survey tool. A cross-sectional approach was used to collect data once from a sample of respondents. The consultant used questionnaires, checklists, consultation guides and digital camera as data collection tools. The survey was conducted within and around the proposed project area.

The consultant sampled several wards /villages from which to collect the primary data. The survey utilized the household information contained in 2009 Kenya National Population and Housing Survey to develop a sampling framework within the sub- locations selected for the study.

Once the consultant established the number of wards/villages and the population in each, the respondents were selected through a simple random sampling method.

2.4.13. Study Task 13: Gender Analysis

Task objective: To investigate existing social economic inequalities in access and control of household and community resources, and the likely impact of the project on men, women and children.

Methodology: Through survey questions and focus group discussions, the following were investigated:

- ✓ Gender stratification, social economic roles and responsibilities

- ✓ Access and control of household resources along gender
- ✓ Potential impacts of the project on division of labour
- ✓ Potential impacts of the project along gender economic interests and gender economic empowerment/marginalization
- ✓ Likely impact of water distribution point and demo irrigation on gender
- ✓ Potential impact of the project on women's/men's health

2.4.14. Study Task 14: Stakeholder Analysis

Task objective: To identify and assess key people, groups of people and institutions that could lay claim on the water project and suggest how diverse interests would be considered. The aim of the analysis is stakeholder management which entails identifying, recognizing and acknowledging the stakeholders; determining their influence and interest; establishing communication and engaging them.

Methodology: Stakeholders were subjected to discussions guided by the following questions:

- ✓ What interests do stakeholders have in the outcome of Amaya/Amaiya dam? Is it positive or negative?
- ✓ What motivates the stakeholders mostly?
- ✓ What information do stakeholders want from the project?
- ✓ How do stakeholders want to receive information? What is the best way of communicating messages to them?
- ✓ What is the stakeholder's current opinion of the project? Is it based on good information?
- ✓ Who influences the opinion of stakeholders about the project? Are some of these influencer's important stakeholders in their own right?
- ✓ If stakeholders are not likely to be positive, what will win them around to support Amaya/Amaiya project?
- ✓ If it's not possible to win stakeholders, how are we going to manage their opposition?
- ✓ Who else might be influenced by their opinion? Do these people become stakeholders in their own right?

2.4.15. Study Task 15: Social Aspects and Beneficiary Participation

Beneficiary participation: Beneficiary participation is an important component in the process, it is vital to ensure ownership and hence sustainability. The Consultant intends to incorporate all beneficiaries and all aspects of principles for social impact assessment such as integrating the beneficiaries and incorporating a bottom up approach through consultations at all levels.

Enhancing beneficiary and stakeholder participation in the development process for the proposed irrigation development project:

1. Local leaders project orientation and consultative meetings

Elected local leaders, religious, administrative and the community had an important role to play in the mobilization of the community to participate in the development of the project. During the inception phase, the consultant in consultation with the client held a leaders' project orientation meeting involving County administration, line government ministries/departments, elected leaders, community leaders and opinion leaders to explain about the proposed project. This gave an early opportunity for the leaders to give their views and inputs on the proposed water project as a way of deepening local ownership of the process. Subsequent Ad hoc leaders 'consultative meetings were held address emerging issues as the study progressed.

2. Community sensitization meetings

Community sensitization meetings were held in all the project areas with the following objectives:

- i. To explain to the community and create awareness on the proposed project development in general and in particular the scope of the project; stakeholders of the project; development approach; expected benefits to the community and the local economy; anticipated roles and responsibilities of the community and other stakeholders; role of consultant and role of the client.
- ii. To discuss with the community matters relating to project membership and ownership.
- iii. To discuss with the community on the likely social and environmental impacts of the project and how these will be addressed if they occur.
- iv. Discussing with the community about an appropriate scheme management structure that would ensure effective scheme operation, management and maintenance.
- v. Getting feedback from the communities on their views and expectations on the project, issues of concern to them and their proposals on how these issues could be effectively addressed.

3. Compilation of socioeconomic survey data

Data from the socio-economic survey was entered using SPSS software package for ease of analysis, data were then exported to MS Excel, analyzed and used to prepare compensation matrix.

2.4.16. Study Task 16: Requirements for Public Consultation

The Consultant(s) organized at least three (3) meetings per project area with the key stakeholders such as local people, farmers and business men, downstream users, local government in the project area, Community Based Organizations (CBOs), NGOs and vulnerable groups such as elderly, women, widows, youth, poor etc. within the study area. While

ensuring that these meetings are accessible to all interested parties, the consultants ensured that the views of interested parties are taken into consideration especially requests and comments regarding environmental issues as reflected in this report. Other methods used include FGD, public *barazas*, use of local administration and village elders/opinion leaders.

Documentary evidence for the list of participants with their signatures, the minutes and pictures have been provided. The methods, locations and frequency of public consultation were proposed by the Consultant(s) and approved by the client before organizing the meetings.

2.4.17. Study Task 17: Institutional Capacity of the Implementation Agencies

The Consultant assessed the institutional capacity of the agencies and make appropriate recommendations where appropriate.

Task objective: The aim of institutional assessment was to identify the institutions responsible for sustainable operation of the water supply systems and to carry out a capacity needs assessment.

Methodology: Institutions were identified and consulted to determine their role and functional capacity in managing water resources for domestic and irrigation.

Table 2-2: Sample template of institutional analysis

Institution name	Mandate and policy	Potential role in project implementation and management	Capacity strengths	Capacity gaps	Proposed areas of capacity development

Scope: The assessment also identified technical, core and enabling environment capacity lacking that could undermine the implementation and sustainability of the project.

- Core capacities to be assessed include capabilities in management and leadership, will, attitude and ability to formulate strategies, resource use and implementation of activities in line with strategies; capabilities in coordination and resolving possible conflict of interest, creating cooperative relationships with others and monitoring progress.
- Technical capacity assessment will focus on techniques, and particular knowledge of running the project, and assessment skills for solving problems.
- Assessment of enabling environment will focus on administration systems, infrastructure and tools, regulations and laws, behavioral modalities and institutional values.

Based on the analysis findings from the template above, the consultant proposed an institutional arrangement plan for implementation, monitoring and management during construction, operations and maintenance stages.

At beneficiary level, if there are no community-based institutions that can be adapted to manage the water resources, new ones will be proposed.

Capacity development may require training and therefore, the consultant came up with training plans pointing out specific areas of intervention and sources of specialized support.

Compilation of the Report: The Consultant has prepared the report as per the format in the ESIA guidelines of 2003.

Public disclosure: This will involve disclosure of findings, conclusions and recommendations of the ESIA report to stakeholders and public. Findings of the ESIA report will be disclosed during a stakeholders' workshop that will be held once the ESIA is completed and before the final document is sent to NEMA for project approval and licensing.

CHAPTER 3. POLICY, LEGAL AND REGULATORY FRAMEWORK

3.1. Background

This chapter reviews into detail the current policy, legal and regulatory framework governing environmental quality, solid and liquid waste management, health and safety, protection of sensitive areas, land use and control at the local, national and international levels in accordance with the provisions of Environmental Management and Coordination Act (EMCA) of 1999.

3.2. Policy Framework

The Kenyan Government has an environmental policy which seeks to promote environmental management for sustainable development. The policy recommends prudent use of environmental resources which requires that the present day usage should not “compromise the needs of the future generations”.

Construction of the proposed Amaya/Amaiya Dam Development project will lead to water availability and sustainability.

The Kenya Government’s environmental policy aims at integrating environmental aspects into national development plans, projects and programs. The broad objectives of the national environmental policy include:

- ✓ Optimal use of natural land and water resources in improving the quality of human environment;
- ✓ Sustainable use of natural resources to meet the needs of the present generations while preserving their ability to meet the needs of future generations;
- ✓ Integration of environmental conservation and economic activities into the process of sustainable development; and
- ✓ Meeting national goals and international obligations by conserving bio-diversity, arresting desertification, mitigating effects of disasters, protecting the ozone layer and maintaining an ecological balance on earth.

Relevance: The project will enhance environmental protection to ensure sufficient water supply for the present and future generations. The policy also emphasizes on optimal use of land and water resources. With actualization of this project, land that has been lying idle will be put to optimal use.

3.2.1. Environmental and Development Policy (Session Paper No. 6 1999)

Sessional Paper No. 6 of 1999 on Environment and Development since adoption by parliament in 1999 has been in use and influenced the formation of EMCA in 1999. Over time the paper has been reviewed and revised in order to incorporate emerging environmental concerns.

The revised draft of the National Environmental Policy, dated April 2012, sets out important provisions relating to the management of ecosystems and the sustainable use of natural resources, and recognizes that natural systems are under intense pressure from human activities particularly for critical ecosystems including forests, grasslands and arid and semi-arid lands.

The objectives of the Policy include developing an integrated approach to environmental management, strengthening the legal and institutional framework for effective coordination and promotion of environmental management tools.

Relevance: This ESIA study has developed an ESMP for the project which should be implemented to mitigate the resulting impacts during the construction and implementation phases of the project. This will ensure that the sensitive ecosystems are not destabilized by the subsequent project activities.

3.2.2. Water Catchment Management Policies

The policy on water catchment management is important because the benefiting communities need to conserve the catchment areas for sustained flow of the water resource. Water catchment managed policies have been supported by two Sessional Papers namely:

- Sessional paper No. 1 of 1968; and
- Kenya Forest Development Policy Sessional paper No. 9 of May 2005.

Sessional Paper No. 9 encourages the involvement of the private sector, communities and other stakeholders' participation in forest management in order to conserve water catchments areas and reduce poverty.

Relevance: Community involvement is an important aspect of community resources management such as water that ensures there is project sustainability.

3.2.3. National Environmental Action Plan (NEAP)

Dry lands in Kenya include arid, semi-arid and dry-sub humid areas and are rich in diverse plant and animal species. They occupy over 80% of the total land surface in Kenya mostly in ecological zones IV to VI. Significant wildlife, protected and unprotected, is found in ASAL areas. These areas have high habitat diversity including moist forests, dry forests, riverine habitats, woodlands, wooded grasslands, grasslands, bushes and scrub. Such habitats allow for high species diversity with direct and indirect values to communities. ASALs are home to some of Kenya's unique mammals, birds and reptiles species, which are adapted to the arid zones. The NEAP promotes:

- Use of indigenous knowledge in management of ASALs
- Adoption of climate change adaptation strategies.
- Provision of adequate watering points.

- Undertake research and enhanced collaborations on invasive and alien species
- Development and implement of drought coping mechanisms
- Prevention and management of possible conflicts associated with dry land resources

Relevance: The NEAP has been a guide in the construction of the dam while adhering to its guidelines in order to ensure conservation and management of the ASALs.

3.2.4. The National Poverty Eradication Plan (NPEP), 1999

The NPEP has the objective of reducing the incidence of poverty in both rural and urban areas by 50 percent by the year 2015; as well as strengthening the capabilities of the poor and vulnerable groups to earn income.

Relevance: The communities living in Amaya/Amaiya region are marginalized and among the poorest Kenyans. Their main source of livelihood is pastoralism and scarcity of the water resource had been document ted as a major source of conflicts in the area in the past.

3.2.5. National Climate Change Action Plan (NCCAP) 2018-2022

This National Climate Change Action Plan (NCCAP) 2018-2022 is a five year Plan to guide Kenya's climate change actions, including the reduction of greenhouse gas emissions.

Climate Change Act. NCCAP 2018-2022 sets out bold measures to ensure that our development remains sustainable in the event of any adverse climate change impacts, including droughts, floods, and other extreme climate events that have in the recent past occasioned far-reaching negative implications on our economy.

Kenya's priority climate actions are in the six mitigation sectors set out in the UNFCCC;

agriculture, energy, forestry, industry, transport, and waste. In order to achieve climate change actions that simultaneously advance economic and sustainable development objectives, NCCAP 2018-2022 is guided by the following principles: Responsiveness, Equity and social inclusion, Consultation and cooperation and Fairness .

Relevance: The project will mitigate flooding, land degradation through soil erosion and ensure sustainable development. Consultative Community participation has ensured inclusivity in decision making.

3.2.6. African Development Bank Policies

The Bank's commitment to improving environmental and social sustainability in its investments is reflected in the several related policies and tools it has adopted and the changes in its institutional set-up to ensure effective implementation of these policies and tools. The Bank's

ESAPs, produced in 2001 to make the Bank's sector and cross-cutting policies operational, have governed the implementation of the environmental and social safeguards over the past decade. The 2004 Policy on the Environment established the Bank's commitment to integrating environmental considerations into its operations through:

- (i) Systematic project categorization according to the level of environmental risk, and
- (ii) The application of appropriate types of environmental assessments, with commitments to public consultation and information disclosure.

The 2003 Involuntary Resettlement Policy provided a detailed and rigorous set of commitments and requirements related to Bank projects involving population displacement, relocation, compensation and restoration of living standards.

AfDB's OS 1 Policy: Environmental and Social Assessment

This overarching safeguard governs the process of determining a project's environmental and social category and the resulting environmental and social assessment requirements: the scope of application; categorization; use of a SESA and ESIA, where appropriate; Environmental and Social Management Plans; climate change vulnerability assessment; public consultation; community impacts; appraisal and treatment of vulnerable groups; and grievance procedures. It updates and consolidates the policy commitments set out in the Bank's policy on the environment.

AfDB's OS 2 Policy: Involuntary Resettlement: Land Acquisition, Population Displacement and Compensation

This safeguard consolidates the policy commitments and requirements set out in the Bank's policy on involuntary resettlement, and it incorporates refinements designed to improve the operational effectiveness of those requirements. In particular, it embraces comprehensive and forward-looking notions of livelihood and assets, accounting for their social, cultural, and economic dimensions. It also adopts a definition of community and common property that emphasizes the need to maintain social cohesion, community structures, and the social inter-linkages that common property provides.

The safeguard retains the requirement to provide compensation at full replacement cost; reiterates the importance of a resettlement that improves standards of living, income-earning capacity, and overall means of livelihood; and emphasizes the need to ensure that social considerations, such as gender, age, and stakes in the project outcome, do not disenfranchise particular project-affected people.

AfDB's OS 3 Policy: Biodiversity and Ecosystem Services

The overarching objective of this safeguard is to conserve biological diversity and promote the sustainable use of natural resources. It translates into OS requirements the Bank's

commitments in its policy on integrated water resources management and the UN Convention on Biological Diversity. The safeguard reflects the importance of biodiversity on the African continent and the value of key ecosystems to the population, emphasizing the need to “respect, conserve and maintain [the] knowledge, innovations and practices of indigenous and local communities and to protect and encourage customary use of biological resources in accordance with traditional cultural practices that are compatible with conservation or sustainable use requirements.

AfDB’s OS 4 Policy: Pollution, Prevention and Control, Greenhouse Gases, Hazardous Materials and Resource Efficiency

This safeguard covers the range of impacts of pollution, waste, and hazardous materials for which there are agreed international conventions and comprehensive industry-specific standards that other multilateral development banks follow. It also introduces vulnerability analysis and monitoring of greenhouse gas emissions levels and provides a detailed analysis of the possible reduction or compensatory measures framework.

AfDB’s OS 5 Policy: Labour Conditions, Health and Safety

This safeguard establishes the Bank’s requirements for its borrowers or clients concerning workers’ conditions, rights and protection from abuse or exploitation. It covers working conditions, workers’ organizations, occupational health and safety, and avoidance of child or forced labour.

Relevance: The African Development Bank policies have guided the implementation of the project. They will be especially relevant for application during consultation of People Affected by the Project (PAPs) allowing them to participate in the planning and execution of resettlement programs. For the PAPs that don’t require resettlement, the project will improve living standards, livelihoods and enhance peace.

3.3. Legal Framework

3.3.1. Constitution of Kenya

In article 69 of the Constitution of Kenya, 2010, the State clearly undertakes to carry out the following:

- a) Ensure sustainable exploitation, utilization, management and conservation of the environment and natural resources, and ensure the equitable sharing of the accruing benefits;
- b) Work to achieve and maintain a tree cover of at least ten per cent of the land area of Kenya;
- c) Protect and enhance intellectual property in, and indigenous knowledge of, biodiversity and the genetic resources of the communities;

- d) Encourage public participation in the management, protection and conservation of the environment;
- e) Protect genetic resources and biological diversity;
- f) Establish systems of environmental impact assessment, environmental audit and monitoring of the environment;
- g) Eliminate processes and activities that are likely to endanger the environment; and
- h) Utilize the environment and natural resources for the benefit of the people of Kenya.

Section 42 states that “Every person has the right to a clean and healthy environment, which includes the right:

1. To have the environment protected for the benefit of present and future generations through legislative and other measures, particularly those contemplated in Article 69; and
2. To have obligations relating to the environment fulfilled under Article 70 The constitution also emphasizes on that:
 - Land use and management shall by law benefit local communities;
 - Community land is protected from encroachment by State;
 - Equitable access to land;
 - County governments will manage land in trust of the people in accordance with the Proposed Constitution.

Relevance: The constitution of Kenya provides for sound environmental management and sustainability. This study provides one of the tools through which this can be achieved within the development.

3.3.2. The Environmental Management and Coordination Act, 1999 (Revised in 2015)

The Environment Management and Coordination Act (EMCA), 1999 provides for the establishment of an umbrella legal and institutional framework under which the environment in general is to be managed. EMCA is implemented by the guiding principle that every person has a right to a clean and healthy environment and can seek redress through the High court if this right has been, is likely to be or is being contravened.

Section 58 of the Act makes it a mandatory requirement for an ESIA study to be carried out by proponents intending to implement projects specified in the second schedule of the Act. Such projects have a potential of causing significant impacts on the environment. Similarly, section 68 of the same Act requires operators of existing projects or undertakings to carry out environmental audits in order to determine the level of conformance with statements made during the ESIA study. The proponent is required to submit the ESIA and environmental audit reports to NEMA for review and necessary action.

Relevance: Environmental Management and Coordination Act (EMCA), 1999 in its Second Schedule 4(b) requires river diversions and water transfer between catchments undergo Environmental Impact Assessment (EIA). This report has been compiled to comply with EMCA and the Environmental (Impact Assessment and Audit) Regulations. EMCA has provided for the development of several subsidiary legislations and guidelines that govern environmental management which are relevant to the proposed project as reviewed below.

The Environmental Management and Coordination (Waste Management) Regulations, 2006

These Regulations were published in the Kenya Gazette Supplement No. 69, Legislative Supplement No. 37, and Legal Notice No. 121 of 29th September 2006. The regulations provide details on management (handling, storage, transportation, treatment, and disposal) of various waste streams i.e.:

- domestic waste;
- industrial waste;
- hazardous and toxic waste;
- pesticides and toxic substances;
- biomedical wastes; and
- Radioactive waste.

Regulation No. 4 (1) makes it an offence for any person to dispose of any waste on a public highway, street, road, recreational area or in any public place except in a designated waste receptacle.

Regulation 6 requires waste generators to segregate waste by separating hazardous waste from non-hazardous waste for appropriate disposal. Regulation 17 (1) makes it an offence for any person to engage in any activity likely to generate any hazardous waste without a valid Environmental Impact Assessment license issued by NEMA.

Relevance: The proposed project, during construction, will generate substantial volumes of spoil materials among other wastes which will need to be disposed as per the guidelines in the regulations.

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

These regulations aim at enhancing preservation of biodiversity and safeguarding of endangered and rare plant and animal species within any human activity area. Section 4 of the legislation expressly prohibits any activity which may have adverse effects on any ecosystem, lead to introduction of alien species in a given area or result in unsustainable utilization of available ecosystem resources.

Relevance: A detailed assessment of the likely impacts of the dam on biodiversity in the area has been conducted to ensure their sustainability.

The Environmental Management and Coordination Act (Water Quality) Regulations, 2006

These Regulations were published in the Kenya Gazette Supplement No. 68, Legislative Supplement No. 36, and Legal Notice No. 120 of 29 September 2006. The Regulations provide for sustainable management of water resources including prevention of water pollution and protection of water sources (lakes, rivers, streams, springs, wells, and other water sources). It is an offence under Regulation No. 4 (2), for any person to throw or cause to flow into or near a water resource any liquid, solid, or gaseous substance or deposit any such substance in or near it, as to cause pollution.

Regulation No. 11 further makes it an offence for any person to discharge or apply any poison, toxic, noxious or obstructing matter, radioactive waste or other pollutants or permit the dumping or discharge of such matter into the aquatic environment unless such discharge, poison, toxic, noxious or obstructing matter, radioactive waste or pollutant complies with the standards for effluent discharge into the environment as contained in the third schedule to the regulations.

Relevance: During the operation and maintenance phases, the proposed water transfer from the river will require compliance with the standards established under these regulations.

3.3.3. The Environmental Impact Assessment and Audit Regulations, 2003

The Environmental (Impact Assessment and Audit) Regulations, 2003 state in Regulation 3 that “the Regulations shall apply to all policies, plans, programmes, projects and activities specified in Part IV, Part V and the Second Schedule of the Act”. Regulation 4(1) further states that: “...no Proponent shall implement a project:

- a) likely to have a negative environmental impact; or
- b) for which an environmental impact assessment is required under the Act or these Regulations, unless an environmental impact assessment has been concluded and approved in accordance with these Regulations...”

Relevance: Amaya/Amaiya Environmental and Social Impact Assessment (ESIA) has critically examined the effects of the project activities on the people and their property, physical and biological components of the environment and identified both negative and positive impacts. Mitigation measures for negative impacts have been outlined and the persons responsible for each action indicated.

3.3.4. The Occupational Safety and Health Act, 2007

This is an Act of Parliament to provide for the safety, health and welfare of workers and all persons lawfully present at workplaces, to provide for the establishment of the National Council for Occupational Safety and Health and for connected purposes. The Act has the following functions among others:

- Secure safety and health for people legally in all workplaces
- Prevents employment of children in workplaces where their safety and health is at risk.
- Encourages entrepreneurs to set achievable safety targets for their enterprises.
- Promotes reporting of work-place accidents, dangerous occurrences and ill health with a view to finding out their causes and preventing of similar occurrences in future.
- Promotes creation of a safety culture at workplaces through education and training in occupational safety and health

Relevance: The Contractor and CRVWDA are required to comply with all the provisions of the Act throughout the project cycle.

3.3.5. Work Injury Benefits Act (WIBA), 2007

This is an act of Parliament (No. 13 of 2007) to provide for compensation to workers for injuries suffered in the course of their employment. It outlines the following:

- Employer's liability for compensation for death or incapacity resulting from accident;
- Compensation in fatal cases;
- Compensation in case of permanent partial incapacity;
- Compensation in case of temporary incapacity;
- Persons entitled to compensation and methods of calculating the earnings;
- No compensation shall be payable under this Act in respect of any incapacity or death resulting from a deliberate self-injury; and
- Notice of an accident, causing injury to a workman, of such a nature as would entitle him for compensation shall be given in the prescribed form to the director.

Relevance: During construction period, the contractor will need to abide by all the provisions of WIBA. Similarly, the same will be required of the proponent during operation phase.

3.3.6. Public Health Act (CAP 242)

This is an Act of Parliament to make provision for securing and maintaining health. This act has several sections as outlined below:

- Section 115 of this act prohibits causing nuisance or other conditions liable to be injurious or dangerous to health.

- Section 118 provides a list of nuisances that includes any noxious matter, or wastewater, flowing or discharged from any premises, wherever situated, into any public street, or into the gutter or side channel of any watercourse, irrigation channel or bed thereof not approved for the reception of such discharge.
- *Sections 136 – 143 Breeding places of mosquitoes:* The civil and building contractors will ensure that during construction, breeding places of mosquitoes and nuisance yards are kept free from bottles, whole or broken. The project area shall not be overgrown by grass, the wells etc. to be covered together with the less pits.
- *Section 163 – Powers of entry and inspection:* It should be noted that a medical officer, health inspector or a police officer above the role of an inspector shall enforce compliance and offences are punishable by law.

The act further highlights the following:

[The Public Health \(Drainage and Latrine\) Rules](#)

Rule 85 provides that every owner or occupier of every workshop, workplace or other premises where persons are employed shall provide proper and sufficient latrines for use by employees. Rule 87 requires every contractor, builder or other person employing workers for the demolition, construction, reconstruction, or alteration of any building or other work in any way connected with building to provide in some approved position sufficient and convenient temporary latrines for use by such workers. Rule 91 provides that no person shall construct a latrine in connection with a building other than a water closet or a urinal, where any part of the site of such building is within 200 feet of a sewer belonging to the local authority that is at a suitable level, and where there is sufficient water supply.

Relevance: The project construction and operation activities are bound to expose both workers and members of the general public to situations injurious to health. All activities of the project are thus expected to abide by this act to ensure a healthy environment.

3.3.7. The Water Act 2002

The Government of Kenya formulated the National Policy on water Resources management in 1999. This was on realizing that the arrangement then on water supply was inappropriate. The national Water Policy has four broad objectives that include:

- a) To preserve, conserve and protect available water resources and allocate them in a sustainable, rational and economic way;
- b) To supply water of good quality and in sufficient quantities to the various water needs, while ensuring safe disposal of waste water and environmental protection;

- c) To establish an efficient and effective institutional framework to achieve a systematic development and management of the water sector promoting and supporting participation of users;
- d) To develop a sound and sustainable financing mechanism for effective water supply and sanitation development.

The National Policy on Water finally transformed to become the Water Act 2002 focusing on: management, conservation, use and control of water resources and for acquisition and regulation of rights to use water; to provide for the regulation and management of water supply and sewerage services. The Act also provides for national monitoring and information systems on water resources. The Act regulates abstraction and storage of water from water courses depressions or channels.

Section 18 of this Act provides for national monitoring and information systems on water resources. Following on this, sub-Section 3 mandates the Water Resources Authority (WRA) to demand from any person or institution, specified information, documents, samples or materials on water resources. Under these rules, specific records may require to be kept by a site operator and the information thereof furnished to WRA.

Section 94 of the Act makes it an offence to throw or convey or cause or permit to be thrown or conveyed, any rubbish, dirt, refuse, effluent, trade waste or other offensive or unwholesome matter or thing into or near to water resource in such a manner as to cause, or be likely to cause, pollution of the water resource.

In Kenya water is regarded as a national resource and therefore owned by the state for and on behalf of the people (Section 3). Thus the Minister in charge of water is empowered under the Act to control, plan and regulate the use of water. Further the Minister is vested with the duty to promote investigations, conservation and proper use of water.

Relevance: The Water Act has set up subsidiary bodies with power to operate and regulate functions assigned to them by the Act such bodies include Rift Valley Water Service Board and water resources management authority. The Act further gives conditions relating to construction of works in its Second Schedule. As such, the Client shall observe these conditions which are in line with the spirit of ESIA. The proponent should ensure that a Water abstraction permit for the project is obtained from WRA. The proponent will be required to ensure that project activities throughout all phases do not cause pollution of the water resources and also continuously monitor the quantity and quality of water being abstracted from the rivers.

3.3.8. The Wildlife Conservation and Management Act, 2013

This Act became operational on 10 January 2014. One of its guiding principles is the devolution of conservation and management of wildlife to landowners and managers in areas where

wildlife occurs, through in particular the recognition of wildlife conservation as a form of land-use, better access to benefits from wild life conservation, and adherence to the principles of sustainable utilization. Section 25 of the act provides for compensation for injuries and damages caused by wildlife (species listed in its third schedule) to humans and their properties respectively. Such compensation claims are to be reviewed and awarded by County Wildlife Conservation and Compensation Committees at the ruling market rates: provided that no compensation shall be paid where the owner of the livestock, crops or other property failed to take reasonable measures to protect the properties from damage by wildlife or land use practices are incompatible with the ecosystem-based management plan for the area.

The act in its sixth schedule list various animal and tree species that are nationally considered as critically endangered, vulnerable, nearly threatened and protected. It also lists in its seventh schedule, national invasive species for which control is required. Section 48 restricts activities involving the above listed species without a permit from KWS. KWS can make recommendations to the responsible cabinet secretary, to prohibit carrying out of any activity which: is of a nature that may negatively impact on the survival of species listed in sixth schedule; or is specified in the notice or prohibit the carrying out of such activity without a permit issued by KWS.

Relevance: The area is a rangeland and has some wildlife. Any critically endangered, vulnerable, nearly threatened or protected species found within the project area will have to be managed in line with this Act.

3.3.9. The Physical Planning Act, 1996

The Act provides for the preparation and implementation of physical development plans and for connected purposes. It defined development, in section 3(a), as the making of any material change in the use or density of any buildings or land or the subdivision of any land.

In order to promote health, safety, order, amenity, convenience and general welfare of all its inhabitants as well as efficiency and economy in the process of development and improvement of communications, the Act provides that every local authority must have a physical development plans “...*The basis for disposing of land acquired, or to be acquired under the plan by a local authority or relevant authority.* Section 29 of the Act vests powers in the local authorities to control development in their respective areas of jurisdiction, with legal mandate to vet development applications and approval or disapproval thereof.

Section 30 states that any person who carries out development within an area of a local authority without development permission shall be guilty of an offence and the development shall be invalid. Until such permission is granted, no development activity shall be carried out by the proponent. The act also gives the local authority power to compel the developer to restore the land on which such development has taken place to its original conditions within a

period of ninety days. If no action is taken, then the council will restore the land and recover the cost incurred thereto from the developer. In addition, the same section also states that no person shall carry out development within the area of a local authority without development permission granted by the local authority.

Section 36 states that if in connection with development application a local authority is of the opinion that, the proposed activity will have injurious impact on the environment, the applicant shall be required to submit together with the application an Environmental Impact Assessment report. The environmental impact assessment report must be approved by the National Environmental Management Authority (NEMA) and followed by annual environmental audits as spelled out by EMCA 1999. Section 38 states that if the local authority finds out that the development activity is not complying to all laid down regulations, the local authority may serve an enforcement notice specifying the conditions of the development permissions alleged to have been contravened and compel the developer to restore the land to its original conditions.

Relevance: For each development component of the Amaya/Amaiya dam, the stipulated procedure laid down by this Act shall be complied with before the activities begin.

3.3.10. The Penal Code (Cap. 63)

Section 191 of the Penal Code makes it an offence for any person or institution that voluntarily corrupts, or fouls water for public springs or reservoirs rendering it less fit for its ordinary use. Similarly, section 192 prohibits making the atmosphere in any place noxious to health of persons/institution in dwellings or business premises in the neighborhood or those passing along a public way.

Relevance: The Contractor and proponent are required to ensure strict adherence to the Environmental Management Plan throughout the project cycle in order to mitigate any possible negative impact associated with dust, noise, and effluent discharge.

3.3.11. The Land Act, 2012

This is an Act of Parliament intended to give effect to Article 68 of the Constitution, to revise, consolidate and rationalize land laws; to provide for the sustainable administration and management of land and land based resources, and for connected purposes. Parts 1 and 2 of section 4 of the Act outline the main guiding principles in land management and administration, binding to all land actors including state officers. These principles are to be applied when enacting, applying or interpreting any provisions of this Act; and when making or implementing public policy decisions.

The act vests management of land on National Land Commission (NLC). In discharging their functions and exercising of their powers under this Act, the Commission and any State officer or public officer shall be guided by the following values and principles;

- i. Equitable access to land;
- ii. Security of land rights;
- iii. Sustainable and productive management of land resources;
- iv. Transparent and cost effective administration of land;
- v. Conservation and protection of ecologically sensitive areas;
- vi. Elimination of gender discrimination in law, customs and practices related to land and property in land;
- vii. Encouragement of communities to settle land disputes through recognized local community initiatives;
- viii. Participation, accountability and democratic decision making within communities, the public and the Government;
- ix. Technical and financial sustainability;
- x. Affording equal opportunities to members of all ethnic groups;
- xi. Non-discrimination and protection of the marginalized; and
- xii. Democracy, inclusiveness and participation of the people; and
- xiii. Alternative dispute resolution mechanisms in land dispute handling and management.

Section 110(1) of the Act provides that land may be acquired compulsorily under this if the Commission certifies, in writing, that the land is required for public purposes or in the public interest as related to and necessary for fulfillment of the stated public purpose.

In such an acquisition, this Act, in section 111(1) provides that just compensation shall be paid promptly in full to all persons whose interests in the land have been determined.

The procedure for land acquisition is laid out in Part VIII of the Act. Elements for consideration under this procedure include the following:

- The Act requires that the owners, residents and their spouses should also be notified; as opposed to just the owners;
- The inspector would also have to get the consent of the occupier and give them not less than seven days' notice to enter the premises;
- The Commission shall have the power of a court to summon and examine witnesses and compel the production and delivery to the Commission of documents of title to the land;
- Separate award of compensation to every person. An award is final and conclusive evidence of the size of the land, the value in the opinion of the Commission and the amount of compensation payable, whether the person attends the inquiry or not.

Relevance: The project development needs people affected by the project who will need to cede land for development. A Resettlement Action Plan Study has been conducted to identify the affected people and their property so as to compensate them accordingly.

The National Land Commissions Act, 2012

This is an Act of Parliament to make further provision as to the functions and powers of the National Land Commission, qualifications and procedures for appointments to the commission; to give effect to the objects and principles of devolved government in land management and administration, and for connected purposes.

The mandate of the Commission, as provided for in the Act, Pursuant to Article 67(2) of the Constitution, shall be:

- To manage public land on behalf of the national and county governments;
- To recommend a national land policy to the national government;
- To advise the national government on a comprehensive programme for the registration of Title in land throughout Kenya;
- To conduct research related to land and the use of natural resources, and make recommendations to appropriate authorities;
- To initiate investigations, on its own initiative or on a complaint, into present or historical land injustices, and recommend appropriate redress;
- To encourage the application of traditional dispute resolution mechanisms in possible land conflicts;
- To assess tax on land and premiums on immovable property in any area designated by law; and
- To monitor and have oversight responsibilities over land use planning throughout the country
- On behalf of, and with the consent of the national and county governments, alienate public land;
- To monitor the registration of all rights and interests in land;
- To ensure that public land and land under the management of designated state agencies are sustainably managed for their intended purpose and for future generations;
- Develop and maintain an effective land information management system at national and county levels;
- Manage and administer all unregistered trust land and unregistered community land on behalf of the county government; and
- Develop and encourage alternative dispute resolution mechanisms in land dispute handling and management.

The Land Registration Act, Act No. 3 of 2012

This is an Act of Parliament intended to revise, consolidate and rationalize the registration of titles to land, to give effect to the principles and objects of devolved government in land registration, and for connected purposes.

Land registry: Section 7(1) of the Act provides for establishment of a land registry in each registration unit which shall keep registers of the following regarding land:

- A land register, in the form to be determined by the Commission;
- The cadastral map;
- Parcel files containing the instruments and documents that support subsisting entries in the land register.
- Any plans which shall, after a date appointed by the Commission, be geo- referenced;
- The presentation book, in which shall be kept a record of all applications numbered consecutively in the order in which they are presented to the registry;
- An index, in alphabetical order, of the names of the proprietors; and
- A register and a file of powers of attorney.

Maintenance of documents, including land title deeds: Further, section 9(1) provides that the Registrar shall maintain the register and any document required to be kept under this Act in a secure, accessible and reliable format. These documents include

- Publications, or any matter written, expressed, or inscribed on any substance by means of letters, figures or marks, or by more than one of those means, that may be used for the purpose of recording that matter;
- Electronic files; and
- An integrated land resource registers.

The register, as provided for in part 2 of section 9, shall contain the following particulars;

- Name, personal identification number, national identity card number, and address of the proprietor;
- In the case of a body corporate, name, postal and physical address, certified copy of certificate of incorporation, personal identification numbers and passport size photographs of persons authorized and where necessary attesting the affixing of the common seal;
- Names and addresses of the previous proprietors;
- Size, location, user and reference number of the parcel; and
- Any other particulars as the Registrar may, from time to time, determine.

Relevance: These provisions are essential to any new land acquisition or transaction processes arising from implementation of the project.

[The Land and Environment Court Act, 2012](#)

This is an Act of Parliament to give effect to Article 162(2) (b) of the Constitution; to establish a superior court to hear and determine disputes relating to the environment and the use and occupation of, and title to, land, and to make provision for its jurisdiction functions and powers,

and for connected purposes. The principal objective of this Act is to enable the Court to facilitate the just, expeditious, proportionate and accessible resolution of disputes governed by this Act.

Section 13 (2) (b) of the Act outlines that in exercise of its jurisdiction under Article 162 (2) (b) of the Constitution, the Court shall have power to hear and determine disputes relating to environment and land, including disputes:

- Relating to environmental planning and protection, trade, climate issues, land use planning, title, tenure, boundaries, rates, rents, valuations, mining, minerals and other natural resources;
- Relating to compulsory acquisition of land;
- Relating to land administration and management;
- Relating to public, private and community land and contracts, chooses in action or other instruments granting any enforceable interests in land; and
- Any other dispute relating to environment and land.

Section 24 (2) also states that the Chief Justice shall make rules to regulate the practice and procedure, in tribunals and subordinate courts, for matters relating to land and environment. Section 30 (1) states that all proceedings relating to the environment or to the use and occupation and title to land pending before any Court or local tribunal of competent jurisdiction shall continue to be heard and determined by the same court until the Environment and Land Court established under this Act comes into operation or as may be directed by the Chief Justice or the Chief Registrar.

Relevance: Any land or/and environmental cases arising from the project will be handled in accordance with the provisions of this act.

3.3.12. Explosives Act, Cap. 115

This is an Act of Parliament that regulates the manufacture, storage, sale, transport, importation, exportation and use of explosives. Some of the key provisions of this act relevant to the project include:

Section 8(1): No person, other than the manufacturer, shall sell, deal in or dispose of any explosive unless he is in possession of a license granted under this Act;

Section 9(1): No person shall purchase or otherwise acquire blasting materials except under the authority of, and to the extent authorized in, a written permit issued by an inspector.

Section 11 (1): No person shall use, or cause to be used, any blasting materials at a depth of ten meters or more, measured from the surface along or down a shaft, well or tunnel, unless he is in possession of a valid miner's blasting certificate issued to him under the Mining Act, or is under the immediate supervision of the holder of such a certificate; and

Section 13(1): No person shall convey explosives or cause them to be conveyed within Kenya, except under and in accordance with a permit in writing issued by an inspector

Explosives (Blasting Explosives) Rules

These rules provide detailed requirements for ensuring safe packaging, licensing and construction of magazines, storage and reporting accidents related to handling explosives.

Relevance: Use of explosives during construction is envisaged in the project design. The contractor engaged will have to abide by all relevant provisions of this act and its rules. All licenses required for handling, transporting, storage and use of the explosives must be obtained and remain valid throughout the construction period.

3.3.13. Licenses and Permits

For the project to commence permits and licenses are needed. The project should be assessed by NEMA for environmental and Social Impact soundness. The Proponent should comply with the legislation through acquisition of the appropriate licenses and permits.

Relevance: All the contractors and consultants who will be engaged during the feasibility should be registered by professional bodies including Kenya Institute of Environment, NEMA and Engineering bodies.

3.4. Institutional Framework

The following are the main institutions that perform regulatory roles and are relevant to the project.

3.4.1. National Environment Management Authority (NEMA)

The responsibility of NEMA is to exercise general supervision and co-ordination over all matters relating to the environment and to be the principal instrument of Government in the implementation of all policies relating to the environment.

Some of the NEMA functions are performed through committees established by EMCA. These committees are responsible for the proper management of the environment within the County in respect of which they are appointed. They are also to perform such additional functions as are prescribed by the Act or as may, from time to time be assigned by the Minister by notice in the gazette. The decisions of these committees are legal, and it is an offence not to implement them. The committees include:

3.4.2. Standards and Enforcement Review Committee (SERC)

EMCA provides for the establishment and enforcement of environmental quality standards to be set by a technical committee of NEMA known as the Standards and Enforcement Review Committee (SERC).

3.4.3. Public Complaints Committee

EMCA has also established a Public Complaints Committee, which provides the administrative mechanism for addressing environmental harm. The Committee has the mandate to investigate complaints relating to environmental damage and degradation. The members of the Public Complaints Committee include representatives from the Law Society of Kenya, NGOs and the business community.

3.4.4. County Environmental Offices

NEMA has offices at county levels contributing to decentralized environmental management.

Relevance: The project will have to be licensed by NEMA headquarters before construction starts and during operation the NEMA offices at County level will have overall supervision of environmental matters.

3.4.5. Ministry of Environment, Water and Natural Resources

The mandate of the Ministry is to protect, conserve and manage the environment and natural resources of Kenya sustainably with a view of supporting socio-economic development, reduce poverty, improve living standards and ensure a clean environment. The Ministry's Water Sector has its fundamental goal and purpose as conserving, managing and protecting water resources for socio-economic development. Its aim is to improve the living standards of people by ensuring proper access to available water resources.

Relevance: Water resources, land, flora and fauna and the air are core components of the natural environment. The proposed development project will utilize surface water and all the other resources at one stage or another. Any extractive or depository uses of the resources are guided by the various programs and regulations under the relevant ministries and consistent consultative partnerships, including adherence to relevant legal provisions will be required in the entire course of the project.

3.5. Water Resources Authority (WRA)

The Water Management Authority is a national organization with the mandate of regulation of water resources issues such as water allocation, source protection and conservation, water quality management and pollution control and international waters. WRA is a state corporation established under Section 11 of the Water Act, 2016. Pursuant to Section 6 of the Act which

came in to effect on 21st April, 2017 vide Legal Notice No. 59, the Authority is an Agent of the National Government responsible for regulating the management and use of water resources. The Water Act, 2016 makes extensive provisions on the Authority's role in regulating the use and management of water resources. WRA was operationalized vide Legal Notice No. 60 on 21st of April, 2017. However, the Authority has been in existence for 12 years following its establishment under the Water Act, 2002 as Water Resources Management Authority (WRMA). The services provided by WRA include:

- Planning, management, protection and conservation of water resources.
- Planning, allocations, apportionment assessment and monitoring of water resources.
- Issuance of water permits.
- Water rights and enforcement of permit conditions.
- Regulation of conservation and abstraction structures.
- Regulation and control of water use.
- Coordination of the Water resources management plan.

Relevance: WRA sub-regional offices at Samburu, Baringo and Laikipia will be responsible for issuance of water rights and enforcement of any conditions attached.

3.6. Water Services Regulatory Board (WASREB)

Water Services Regulatory Board (WASREB) regulates the provision of services by registered Water Services Providers (WSP) through the Water Works Development Agencies (WWDAs). WWDAs have been created for the various regional drainage basins in the country.

3.7. Ministry of Agriculture, Livestock, Fisheries and Irrigation

The overall function of the ministry is to enhance production of crops, livestock and fisheries, marketing and processing. The Ministry has also the mandate to provide development and extension services to smallholder farmers through its extension department. The functions of the ministry are as follows:

- Formulate, implement and monitor legislations, regulations and policies;
- Provide extension services;
- Support research and promote technology delivery;
- Facilitate and represent agricultural state corporations in the government;
- Develop, implement and coordinate programmes in the agricultural sector;
- Regulation and quality control of inputs, produce and products from the agricultural sector;
- Management and control of pests and diseases;
- Promote management and conservation of the natural resource base for agriculture; and

- Collect, maintain and manage information on the agricultural sector.

Relevance: The project area has potential for development of irrigated agriculture. Agricultural practices within the project area will require strict management to conserve its natural resources without harming its water production potentials. Any future irrigation development in the project area is likely to have implications on future water balance and hence sustainability of the project among other heavy water-reliant activities.

3.8. Kenya Forest Service (KFS)

Kenya Forest Service (KFS) is mandated to manage protected forests within the country. Protection of forests, forest reserves and hills in the area will be vital for sustained water supply for the project.

Relevance: The project area has indigenous vegetation that needs to be conserved during project construction.

3.9. Kenya Wildlife Service (KWS)

Kenya Wildlife Service (KWS) is principal institution responsible for implementation of the Wildlife Management Act, 2013. KWS is responsible for protection of all wildlife within an area.

Relevance: The broader project area hosts the Samburu game reserve which is a home to a diverse range of wildlife and a key income earner for the County.

3.10. Directorate of Occupational Safety and Health

Directorate of Occupational Safety and Health (DOSH) is a government agency responsible for enforcement of Occupational Safety and Health throughout the country for the protection of workers and the general public at all workplaces in line with OSHA, 2007.

3.11. County Governments of Baringo, Laikipia and Samburu

Amaya/Amaiya Dam Development Project lies in 3 Counties which will host the project and will have various inputs in the project implementation in line with constitutional functions of county governments. The functions of the county government relevant to the proposed project, as outlined in the Fourth Schedule, Constitution of Kenya 2010 are as follows:

- Provision of essential services such health services, county transport, education;
- Agriculture and husbandry;
- Control pollution and disasters management;
- Monitor cultural activities, public entertainment and public amenities;
- County planning and development;
- County public works and services;

- Implementation of specific national government policies on natural resources and environmental conservation; and
- Encourage public participation in county governance and development

3.11.1. National Environment Council (NEC)

EMCA 1999 No. 8 Part iii Section 4 outlines the establishment of the National Environment Council (NEC). NEC is responsible for policy formulation and directions for purposes of EMCA; set national goals and objectives and determines policies and priorities for the protection of the environment and promote co-operation among public departments, local authorities, private sector, non-governmental organizations and such other organizations engaged in environmental protection programs.

3.12. International Conventions and Treaties

A treaty is a binding agreement under International Law concluded by subjects of International Law, namely states and international organizations. Treaties can be called by many names including; International Agreements, Protocols, Covenants, Conventions, Exchanges of Letters, Exchanges of Notes, etc. However, all of these are equally treaties and the rules are the same regardless of what the treaty is called. Treaties can be loosely compared to contracts; both are means of willing parties assuming obligations among themselves, and a party to either that fails to live up to their obligations can be held legally liable for that breach.

Kenya is a signatory as well as a party to various international conventions, treaties and protocols relating to the environment and aimed at achieving sustainable development. According to the Registrar of International Treaties and other Agreements in Environment (UNEP 1999), there are 216 treaties, 29 of which are of interest to Kenya. The country is a signatory to 16 such agreements, which range from use of oil, protection of natural resources and protection of the atmosphere.

3.12.1. Protection of Natural Resources

There are 12 agreements of significance to Kenya under this category which the country has signed and ratified. This section reviews a number of policies that are triggered or met by the proposed project.

3.12.2. Convention of Biological Diversity

This global convention was held to foster conservation and sustainable use of biological resources, to preserve their diversity for posterity. Kenya is a signatory to this convention, having ratified it in 1994. The provisions of this Convention have since been integrated in the laws of Kenya, climaxed by the development of the Kenya National Biodiversity Strategy and Action Plan in 2000 by the Ministry of Environment and Natural Resources.

Relevance: The project will trigger this convention as it requires clearing of ground cover and minimal loss of biodiversity to allow construction of the dam. However, clearing of ground cover and other plants will be done within the convention's requirements and guidelines.

This project is in line with the spirit of the convention, since it has integrated biodiversity in water resource planning as the environment has been considered a legitimate user of water. Thus, the project shall ensure the volume of water abstracted leaves enough water for the existent ecosystems.

3.12.3. The Ramsar Convention

This is the Convention on Wetlands of International Importance. It was held in Ramsar, in 1971 and came into force in 1975, hence the name Ramsar Convention. The aim of this convention was to raise to global context the value of wetlands in our ecosystem and encourage partner states to develop instruments for conservation and management of wetlands. Kenya ratified the convention in June 1990. The convention defines "Wise use of wetlands" as "the maintenance of their ecological character, achieved through the implementation of ecosystem approaches, within the context of sustainable development". "Wise use" therefore has at its heart the conservation and sustainable use of wetlands and their resources, for the benefit of humankind. Under the "three pillars" of the Convention, the Parties have committed themselves to:

- Work towards the wise use of all their wetlands through national land-use planning, appropriate policies and legislation, management actions, and public education;
- Designate suitable wetlands for the List of Wetlands of International Importance ("Ramsar List") and ensure their effective management; and
- Cooperate internationally concerning trans-boundary wetlands, shared wetland systems, shared species, and development projects that may affect wetlands.

Relevance: To avoid detrimental effects of water abstraction, hydrological survey is done to ensure that the development of Amaya/Amaiya Dam Development Project is sustainable by abstracting water in quantities that will have minimal effect on water uses downstream. Environmental flow will be retained.

3.12.4. African Convention on the Conservation of Nature and Natural Resources

It was held on 15 September, 1968 in Algiers. The convention sought to awaken the continent on the need to preserve natural ecosystems and employ sustainable use of natural resources of economic importance, particularly the soil, water, flora and fauna.

Relevance: Some indigenous trees exist within the project area whose conservation are important. The project shall encourage the planting of indigenous trees to try to restore a balance within the ecosystem.

3.12.5. Kyoto Protocol to the United Nations Framework Convention on Climate Change

The Kyoto Protocol requires signatories to the United Nations Framework Convention on Climate Change to reduce their greenhouse emissions levels to 5% below 1990 levels by the year 2012. The Protocol came into force on 16th February 2005, after it received the prerequisite signatures. However, major countries like United States, China, India, and Australia are not signatories to the Protocol.

Relevance: Compliance with this convention will largely inform the technical and environmental evaluation of the project if any additional funding may be required in future. There is thus a necessity that proper adherence to minimal carbon emission levels be ensured during the operational phases of the project.

3.12.6. The United Nations Framework Convention on Climate Change (UNFCCC)

The Convention on Climate Change sets an overall framework for intergovernmental efforts to tackle the challenge posed by climate change. It recognizes that the climate system is a shared resource whose stability can be affected by industrial and other emissions of carbon dioxide and other greenhouse gases. The Convention enjoys near universal membership, with 191 countries having ratified. Under the Convention, governments:

- Gather and share information on greenhouse gas emissions, national policies and best practices;
 - launch national strategies for addressing greenhouse gas emissions and adapting to expected impacts, including the provision of financial and technological support to developing countries; and
 - Cooperate in preparing for adaptation to the impacts of climate change.
- The Convention entered into force on 21 March 1994.

Kenya signed the UNFCCC on 12th July 1992, ratified it on 30th August 1994 and started enforcing it on 28th November 1994.

Relevance: The Amaya/Amaiya Dam Development project implementation will most certainly be accompanied by use of a variety of hydrocarbon-based fuels and other chemical substances. Some of the gases or compounds resulting from consistent use of these substances are real threat to the ozone layer. The result is increase greenhouse gas emission into the atmosphere. There will thus be need to employ domesticated versions of the agreed carbon-curbing measures to protect the ozone layer from further depletion. This could include planting of more trees to reduce impacts of climate change.

3.12.7. Vienna Convention for the Protection of the Ozone Layer

Intergovernmental negotiations for an international agreement to phase out ozone depleting substances concluded in March 1985 with the adoption of the Vienna Convention for the Protection of the Ozone Layer. This Convention encourages intergovernmental cooperation on research, systematic observation of the ozone layer, monitoring of CFC production, and the exchange of information.

The Montreal Protocol on Substances that Deplete the Ozone Layer was adopted in September 1987 and was intended to allow the revision of phase out schedules based on periodic scientific and technological assessments. The Protocol was adjusted to accelerate the phase out schedules. It has since been amended to introduce other kinds of control measures and to add new controlled substances to the list.

3.12.8. United Nations Convention to Combat Desertification (UNFCCC) of 1994

The convention requires parties to take climate change considerations into account in their relevant social, economic and environmental policies and actions. The proponent has undertaken this EIA with the aim of minimizing adverse effects of the project on the economy, on public health and on the quality of the environment.

3.12.9. The World Commission on Environment and Development

The commission focuses on the environmental aspects related to development and requires all development projects to be sustainable economically, socially and environmentally. The principle of the organization emphasis that development project should have no permanent negative impact on the biosphere and particularly the ecosystems. It is recommended that the project proponent incorporates mitigation measures to ensure that the project impacts on the ecosystem are reduced.

Relevance: The consultants are using participatory methods to involve the target group and concerned stakeholders in order to inform and enlightened them on the likely negative environment and social impacts for them to prepare mitigation measures so as to ensure the proposed project is sustainable throughout its life span.

3.12.10. The Convention of Control of Desertification (UCCD) of 1992

This convention requires Parties to promote cooperation among affected parties in the fields of environmental protection and the conservation of land and water resources, as they relate to desertification and drought.

Relevance: The beneficiaries are advised to engage in activities geared towards eradicating drought through engaging in tree planting activities, encouraging clean energy use and prudent use of water resources.

3.12.11. Sustainable Development Goals

The Sustainable Development Goal that is most relevant to the Proposed Amaya/Amaiya Dam Water Development Project is Goal 6 which targets to ensure availability and sustainable management of water and sanitation for all.

Relevance: Amaya/Amaiya dam water development project is geared towards provision of water to a water scarce project area where conflicts due to water scarcity had been witnessed in the past.

CHAPTER 4. OVERVIEW OF THE DAM HYDROLOGY

4.1. General Overview

The importance of public consultation in Environmental and Social Impacts Assessment is to collect data on the environmental and social setting of the project, interrogate the impacts that can arise from the project, assess the community willingness to embrace the project, get individual and community goodwill, seek community participation and ownership and finally draft out the sustainable mitigation measures and compensation plans.

The main objective for the consultation process in Amaya/Amaiya Dam Water Development Project is to involve the community at the very early stages to identify likely negative impacts and find ways to minimize negative impacts and enhance positive impacts of the project.

Towards the fulfillment of the terms of reference, this ESIA has been conducted through a participatory process to ensure that all the stakeholders including target beneficiaries and persons affected by the proposed project are involved through provision of data and information, pointing out issues of concern and suggesting solutions on how various areas of conflict can be addressed.

4.2. Objectives of the Public Consultation

- ✓ Provide clear and accurate information about the project to the project stakeholders and beneficiary community;
- ✓ Obtain opinions and suggestions directly from the affected communities on their preferred mitigation measures;
- ✓ Identify local leaders with whom further dialogue can be continued in subsequent stages of the project.
- ✓ Obtain the main concerns and perceptions of the population and their representatives regarding the project;
- ✓ To obtain information from key informants regarding the anticipated impacts of the project on the physical, social and economic environment, and;
- ✓ To inform the surrounding community on the details of the proposed Amaya/Amaiya Dam Development Water Project

The three important aspects of the ESIA process included:

- Collecting information using questionnaires, checklists, photography (*See appendix*)
- Evaluating the information and
- Presenting relevant social & environmental information for use in project planning and decision making.

The purpose of stakeholders' participation is to ensure that all important environmental, social and economic issues relating to the project are clearly understood by all stakeholders to enable

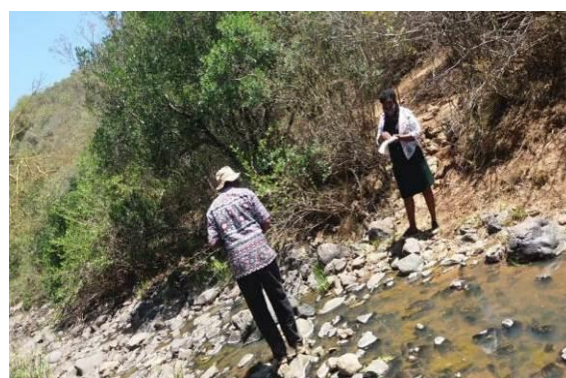
them to make informed decisions on the project including endorsement and provision of information and recommendations toward enhancement of positive impact and mitigation of negative impacts. The participation was achieved through the activities presented in the following sections.

4.3. Local Stakeholders Meeting and Familiarization during the Reconnaissance Survey

A site visits/survey was carried out between 23rd and 29th September 2018 with the aim of the consultants familiarizing themselves with the project area. The key community leaders in the area such as chiefs were met. During the site visit, the consultants observed some of the environmental issues that can affect project actualization.



A site near the dam axis point



River Amaya/Amaiya near the dam axis



Meeting with the Chief at Plesian



Meeting with Chiefs at Churo Amaya

Figure 4-1: Familiarization visit and local stakeholders' consultation

4.4. Consultation with Government Line Offices

This involved consultations with officials of key government departments, at the county level. Elected local leaders, religious, administrative and the community leaders have an important role to play in the mobilization of the community to participate in the development of the project. During the inception phase, the consultant in consultation with the client held a leaders' project orientation meeting involving County administration, line government ministries/departments, elected leaders, community leaders and opinion leaders to explain about the proposed expansion of the project. This is in order to give an early opportunity for the leaders to give their

views and inputs on the proposed expansion as a way of deepening local ownership of the process. Subsequent Ad hoc leaders' consultative meetings were held to address emerging issues as the study progressed.



Figure 4-2: Meeting with government officers at Tangelbei

4.5. Local Leaders Project Orientation and Consultative Meetings

Elected local leaders, both religious and administrative, have an important role to play in the mobilization of the community to participate in the project development. Very early in the project the Consultant held a leaders' project orientation meeting at Tangelbei on 18th January 2019. The meeting attracted elected leaders, community leaders and opinion leaders. This gave an early opportunity for the leaders to give their views and inputs on the proposed project as a way of deepening local ownership of the project.



Figure 4-3: Community leaders meeting at Tangelbei



Figure 4-4: Community meetings at Luonyek/Luoniek



Figure 4-5: Community meetings at Makany



Figure 4-6: Meeting with honorable Lotela MCA Silale

4.6. Community Sensitization Meetings

Community sensitization meetings were held in all the project areas with the following objectives:

- I. To create community awareness on the proposed project through description of the scope of the project; stakeholders of the project; development approach; expected benefits to the community and local economy; anticipated roles and responsibilities of the community and other stakeholders; role of Consultant and role of the Client;
- II. To discuss matters relating to project membership and ownership;
- III. To discuss on the likely social and environmental impacts of the project and how these will be addressed if they occur;
- IV. To discuss about an appropriate scheme management structure that would ensure effective scheme operation, management and maintenance;
- V. To get feedback on views and expectations of the communities regarding the project; on issues of concern and on proposals on how to effectively address such issues.



Figure 4-7: Community sensitization meeting at Churo



Figure 4-8: Community sensitization meeting at Silale



Figure 4-9: Community sensitization meeting at Natan



Figure 4-10: Community sensitization meeting at Makany



Figure 4-11: A gender desegregated meeting at Natan



Figure 4-12: A women only FGD at Akwichatis



Figure 4-13: A women only FGD at Makany



Figure 4-14: Community meeting at Lengewan Samburu



Figure 4-15: Community meeting at Luonyek/Luoniek

4.7. Preliminary Discussion on Project Beneficiaries

The Consultant proceeded to a preliminary identification and presentation of the potential project beneficiaries to the beneficiaries based on the evaluation of:

- Preliminary mapping and delineation of the dam location and supply target areas with the help of the local communities.
- The population and water demand assessment;
- The outcomes of the field visits in the study areas;
- The desk study of the various dam and reservoir characteristics and the hydrological regime of the area (water availability);
- The findings of the socioeconomic baseline survey in terms of the coexistence of different communities and the expectations of each community;

- Possible environmental limitations or constraints.

Based on the ToR, the project beneficiaries were located within Churo, Tangulbei and Silale wards in Baringo County and Amaya ward in Samburu County. In addition, the dam should provide water for about 50,000 people, and also allow for the future maximization of the potential irrigation areas.

Nevertheless, as noted during the reconnaissance survey and household survey, it appeared that some of the target areas were located in Laikipia County in Luonyek/Luoniek. In the Consultant's opinion the success of the project is directly related to its potential to maximize the benefits of the development with minimum costs, while including as many communities as possible. This was the principle used in identifying the proposed beneficiaries, who are not limited to the populations initially defined by the ToR.

A RAP study has been carried out and identified the People Affected by the Project (PAPs), their assets have been inventoried and a valuer will prepare a document indicating the costs of compensating the community.

4.8. People Affected by the Project (PAPs)

4.8.1. Results of RAP study

A field reconnaissance was first done to familiarise with the project area, dam area, reservoir area and the irrigation area that would include land take. Three public meetings were conducted with communities living in the Dam and reservoir area and those currently utilizing the irrigation area land.

An asset inventory study was done from 27th May to 5th June 2019. In total there were 111 project affected persons (PAPs), 43 from the dam and reservoir area, and 68 from the irrigation area. The dam and reservoir areas are mainly inhabited by pastoralists who migrate to the forest in dry weather conditions in search of water and pasture. Temporary structures made of wooden walls and roofed with polythene, and semi-permanent structures made of wood and mud walls, and grass roofs were observed. Temporary structures belong to the migrating pastoralists while the semi-permanent structures belong to the sedentary pastoralists.

The irrigation area is a farm land that lie in the Amaya/Amaiya valley, below the Tiaty catchment area. The area occupants moved in the area during the Freedom from Hunger project initiated in the 1970s. Farmers rely on rains to farm where they mainly plant maize and beans, and vegetables along the river. There are no permanent settlements within the project area.

PAPs are mainly pastoralists complimenting livelihood sources with subsistence farming. Main livestock kept by PAPs include cattle, shoats and camels mainly for meat, milk and income.



Irrigation area farms



Baraza at the irrigation area during RAP



Baraza at the dam area



Baraza at the dam reservoir area



Temporary houses at the dam / reservoir area

Figure 4-16: Resettlement Action Plan survey

4.8.2. Local leaders and community mobilization and sensitization meetings

Community mobilization meetings were held in Plesian, Churo, Makany, Akwichatis, Kokototo, Orusi, lotita, Natan, Lochokia, Nachurur, Nasur, Cheptuimet, Tangulbei, Longewan,

Luonyek/Luoniek villages. The area chiefs provided support in disseminating information about the project and engaged the community to get their views about various aspects of the proposed project. Effective information dissemination was important in cultivating and fostering trust and understanding between project authorities and local communities.

The key information disseminated included proponents of the project, consultants and responsibilities; scope of work; project location; project beneficiaries and benefits; project ownership and financing arrangements; type of studies that are earmarked, project time frame; and expected roles and responsibilities of communities. Other issues that were discussed centered on awareness of the proposed dam, affected community, compensation and relocation of displaced people. The consultants dispelled fears on whether the flow of Amaya/Amaiya River would be affected after construction of the dam. There were discussions about suitable water distribution and collection points that are accessible near community settlements.

Table 4-1: Community mobilization meetings

Date	Participants	Meeting Place	Key issues raised
22/10/2018	James Kipkulei, Senior chief -Amaya, Pastor Musa Maklab Village elder Mr. Panga	Plesian Market Churo	<ul style="list-style-type: none"> • Supports the proposed project • Should clarify the location of Amaya/Amaiya dam project and boundary between Samburu and Pokot communities • Need to mitigate potential for conflict over the project • Need to share water with Longewan
22/10/2018	Assistant Chief Madam Eunice	Silale	<ul style="list-style-type: none"> • Availability of quality water • Migration of livestock in search of pasture
23/10/2018	Sub-county Ward admin, Rhoda Lokwali Head of Women Enterprise Fund, Lawrence Nasir Senior Assistant Chief, James Loukoyang	Tangulbei	<ul style="list-style-type: none"> • Water is the source of conflict in the area • Available supplies e.g. boreholes are inadequate
14/12/2018	Local leaders meeting Chiefs and village elders of 14 villages	Luonyek/ Luoniek	<ul style="list-style-type: none"> • Supportive of the dam but concerned about the protection of dam catchment because charcoal burners have invaded the area. • Water reservoirs should be built on one of the hills in Longewan and distributed via gravity to Luonyek/Luoniek and Longewan. • Requested support for Luonyek/Luoniek area with water pans and boreholes if pumping water from Amaya/Amaiya dam becomes difficult • Alternative water sources for Longewan are waterpans and boreholes. • There is need for an irrigation project to broaden livelihood activities in the area.
14/12/2018	Local leaders meeting Chiefs and village elders of 10 villages	Longewan, Amaiya	<ul style="list-style-type: none"> • Agreed to support construction of Amaya/Amaiya dam due to its importance • Suggested that water can be pumped into a reservoir built on Ndonyo-Ereko hill in Longewan ,distributed by gravity and shared between Longewan and Luoniek

Table 4-2: Community sensitization meetings

Date	Participants	Meeting Place	Notes / Key issues raised
15/1/2019	Community sensitization meeting	Plesian, Churo/Amaya	<ul style="list-style-type: none"> • 60 members from the community were in attendance • Community is supportive of the Dam but worried that the dam could interfere with the flow of Amaya/Amaya River and prompt downstream users to create conflict. • Although irrigation is needed, there's lack of skills among locals
16/1/2019	Makanyi community sensitization	Makanyi, Tangelbei	<ul style="list-style-type: none"> • Community welcomed the Amaya/Amaya dam project and expressed need for livestock water points to ease water shortages in the area. • They have no knowledge of governing water projects as demonstrated by the defunct catholic funded borehole.
17/1/2019	Akwichatis community sensitization meeting	Akuchatis, Silale	<ul style="list-style-type: none"> • 33 members of the community were in attendance • Supported Amaya/Amaya dam if it could harness all flood waters because it could solve extreme downstream flooding and mitigate risks. • Community requested to be included in irrigation in order to diversify sources of livelihood
17/1/2019	Chiptuymet village community sensitization meeting	Chiptuimet, Silale	<ul style="list-style-type: none"> • Supportive of the project and requests water for irrigation and livestock and supply of Akuchatis health center • Dam security should be ensured for the sake of downstream people
17/1/2019	Natan village community sensitization meeting	Natan Kapendo East, Silale	<ul style="list-style-type: none"> • Happy about Amaya/Amaya dam project as there's high need for water in the area. Water supply into the area needed for irrigation, drinking and livestock.
18/1/2019	Tangelbei leaders and local community sensitization meeting	Tangelbei Center	<ul style="list-style-type: none"> • Community supported the proposed dam but worried what would happen to Amaya/Amaya river downstream users and whether piped water could reach Tangelbe center • Questions of compensation of people affected by pipes passing on their farms.

Date	Participants	Meeting Place	Notes / Key issues raised
19/1/2019	Luonyek/Luoniek community sensitization meeting	Luonyek/ Luoniek Center	<ul style="list-style-type: none"> Community relies on inadequate water supply from an old borehole. They support the proposed dam as it would increase water supply in the area.
19/1/2019	Longewan community sensitization meeting	Longewan	<ul style="list-style-type: none"> There is a high shortage of water in the area, so Amaya/Amaiya dam is welcome. Community were in agreement with suggestions given earlier in December by their leaders.
29/01/2019	10 women	Tangulbei	<ul style="list-style-type: none"> Analysis of potential impacts of Amaya/Amaiya Dam project on Gender such as improved livelihood, domestic workload, changing roles of men and women's health
29/01/2019	10 women	Churo	<ul style="list-style-type: none"> Analysis of potential impacts of Amaya/Amaiya Dam project on Gender-improvement of food security, equality in access to education by boys/girls

4.9. Potential Stakeholders and their Roles in the Project

Institutional assessment focused on existing structures and capabilities at community, county and national government, their mandate and future role in management of Amaya/Amaiya dam. The study also investigated the capacity and expected roles of stakeholders within those institutions. The assessment focused on core aspects of available capacity such as capability in management and leadership, technical and enabling environmental capability. The objectives of institutional framework are:

- Putting in place an appropriate framework for project organization and management
- Ensuring the beneficiary communities and stakeholders understand their role and participate in the project;
- Identifying project stakeholders, their needs and concerns
- Identifying a framework for community/farmers participation i.e. through Irrigation Water Users' Association (IWUAs)

The list of consulted key stakeholders is presented in the subsequent Table.

Table 4-3: Project stakeholders' meetings

Date	Participants	Venue	Views/suggestions
3/12/2018	Rift Valley Water Works Development Agency : Project Manager Rachel, Engineers Kimeli, Chesire and Leshinka	CRVWWDA, Nakuru	<ul style="list-style-type: none"> • CRVWWDA would participate in sensitization of Samburu and Laikipia counties • CRVWWDA would communicate with County Governors and other influential leaders • CRVWWDA would introduce consultants to the 3 County Governors
4/12/2018	County Chief Water Officer Mr. Ruto Engineer Komen Ministry of Water & irrigation	Kabarnet	<ul style="list-style-type: none"> • To end any remaining conflict, Pokot and Samburu communities should share Amaya/Amayi dam water for irrigation and livestock purposes.
4/12/2018	County Assemblies Churo/Amaya Member of County Assembly Ho. Selemoi	Kabarnet	<ul style="list-style-type: none"> • Expects the proposed dam to create peace/harmony among Laikipia, Baringo and Samburu people • Concern for downstream users in Silale, Lochokia and Akwichatis • Need for Laikipia, Samburu and Baringo boulder community meetings to discuss how water would be shared. • Of opinion that Laikipia, Samburu and Baringo boulder community meetings should be held to discuss how Amaya/Amayi dam water would be shared
4/12/2018	County Environment CEC Mr. Patrick Kitilit	Kabarnet	<ul style="list-style-type: none"> • Have a joint role with NEMA in approval of projects • Resettlement of displaced affected people • Provision of livestock water point • After completion of Amaya/Amayi dam, hand it over to WARMA & ministry of water

Date	Participants	Venue	Views/suggestions
4/12/2018	Ministry of Livestock & Fisheries Director of Livestock Mr Bundotich	Kabarnet	<ul style="list-style-type: none"> • Has interest in proposed Amaya/Amayi dam project as the project will solve conflict over water and development livestock • Compensation issues of communally owned land • Establishment of agriculture committees in Baringo, Laikipia and Samburu • Contention of Land ownership along the borders of the 3 counties • Fisheries department interested in stocking of Fish in the dam once complete
5/12/2018	John Chepkwony Chief Officer Environment , tourism and Wildlife	Baringo	<ul style="list-style-type: none"> • Emphasised that a lot of capacity building should be done in the irrigation demonstration farms since this is a new concept to the pastoral communities • Political goodwill should be sought since the project is transboundary
5/12/2018	John Kisang Chief Officer Mining and Natural Resources		<ul style="list-style-type: none"> • Hospitals and dispensaries should be well equipped to cope with the challenges of water borne diseases
5/12/2018	Josiah Nyandoro County Director Baringo		<ul style="list-style-type: none"> • He emphasized that a comprehensive ESIA should be done • Challenges of wildlife especially on the Laikipia side should be looked into • Provision of wildlife water points especially in the ranches would be critical to the success of the project • Currently an ESIA on Diatomite mining has been submitted for review • Land ownership is mostly communal but verification should be done to assess who privately own farms • There are some Internally Displaced Persons in the project area who came from Baringo

Date	Participants	Venue	Views/suggestions
5/12/2018	Jeniffer Kipkazi		<ul style="list-style-type: none"> • Setting of community conservancies should be encouraged • The project should tap on flood water • Invasive plant species are encroaching the area and efforts to eradicate them should be put in place • Fodder farming should be encouraged • Charcoal burning should be controlled upon the project inception
5/12/2018	National Drought Management Authority, Baringo Baringo County drought Management Officer Madam Leah	Marigat	<ul style="list-style-type: none"> • Supports the dam project as it will reduce migration and peace in the area and reduction of water borne diseases • The dam is likely to attract in-migration of people and livestock into the dam area • There is rampant charcoal burning activities on the upper side of the proposed dam
5/12/2018	Engineer Nyamwea Baringo South Sub-County	Marigat	<ul style="list-style-type: none"> • Pokot and Samburu people should share water resources from the dam • Location of the dam can be contested • Ensure water is pumped to all beneficiary areas bordering the dam • Registration of Irrigation /Water users association • Irrigation should be introduced to benefit people who don't own livestock
5/12/2018	Sub-County Irrigation Officer, Baringo - Philip Rotich	Marigat	<ul style="list-style-type: none"> • Available capacity for supporting operation of Amaya/Amayi Dam project after completion • Capacity development of community technical people to operationalize the project after completion

Date	Participants	Venue	Views/suggestions
6/12/2018	Baringo County Irrigation Office Eng Rotich	Marigat	<ul style="list-style-type: none"> • Supports the dam as it will control flooding in Natan, Silale area and increased river flow during dry period • Raised concern about the lack of irrigation management capacity by the community • Levies for management and maintenance of the project • Effects of current state of roads on marketing of agricultural produce • Conflict of land use between farmers and pastoralists • Invasion of wildlife from conservancies and ranches into irrigated areas • Size of irrigation demonstration land too small and intense competition could result.
6/12/2018	Baringo County Commissioner	Kabarnet	<ul style="list-style-type: none"> • In support of the project because it will reduce insecurity and open up new economic opportunities in the area • All manual jobs should be assigned to all communities residing in the area equally
			•
6/12/2018	Kerio Valley Development Authority (KVDA) Mr. David Biwott	Marigat	<ul style="list-style-type: none"> • Supports the project because it will reduce marginalization, increase food security and nutrition • KVDA would be keen to introduce other livelihood activities in the area • The project will change the communities way of life
7/12/2018	Deputy Governor, Baringo County -Hon. Chepkwony	Kabarnet	<ul style="list-style-type: none"> • There's need to have Amaya/Amayi Dam in order to open up Tiaty East • Water resources from the dam should be shared among the border communities of Laikipia, Baringo and Samburu • A formula for sharing resources generated by the dam should be identified by the 3 counties
8/12/2018	Tangulbei Women Network	Tangulbei	<ul style="list-style-type: none"> • Availability of water will improve livelihood opportunities
8/12/2018	East field Group	Tangulbei	<ul style="list-style-type: none"> • Amaya/Amayi dam project would enable pasture development and bee keeping in the area besides increasing availability of water during dry seasons

Date	Participants	Venue	Views/suggestions
8/12/2018	Disaster Management Committee (DMC) group	Tangulbei	<ul style="list-style-type: none"> • Supports the water project –it would improve health, school enrolment, and food security • Would create awareness of the dam to avoid risks • Laikipia and Samburu should be beneficiaries of Amaya/Amaiya dam water resources
8/12/2018	County Commissions Office- Steve Mwonge Assistant County Commissioner Tiaty East Sub-County	Tangulbei	<ul style="list-style-type: none"> • Supportive of the dam because it would reduce distances to outside water sources • Irrigated agriculture would open up the area and bring culture change • Land compensation should be addressed
9/12/2018	Africa Inland Church Chairman Mr. Daniel Kapendo	Churo/Amaya	<ul style="list-style-type: none"> • Land within the proposed dam area not likely to be demarcated, but adjacent areas belong to Laikipia people • Ensure normal river flow for the sake of downstream users • Regardless of ethnicity all residents of Amaya/Amaiya area should share water from the dam
9/12/2018	Nominated Member of County Assembly for Churo/Amaya -Madam Diana	Plesian, Churo	<ul style="list-style-type: none"> • Supportive of Amaya/Amaiya dam project because it will improve food security • Each village should get a water kiosk, cattle dips and water livestock water troughs • Water should be distributed in all centers and schools • Ensure Amaya/Amaiya river flows after dam construction because of downstream users • Dam safety should be observed to mitigate risks
10/12/2018	COO-Water, Samburu County- Eng. Wilson Maili	Maralal	<ul style="list-style-type: none"> • Supportive of Amaya/Amaiya dam project and Samburu County ready to collaborate • The 3 county governors should have discussions and define their roles • Need to know what type of work will be available for local community during dam construction

Date	Participants	Venue	Views/suggestions
10/12/2018	Deputy County Commissioner, Samburu, County Mr. Oloo and Assistant County Commissioner, Amayi, Samburu County Mr. Omari	Maralal	<ul style="list-style-type: none"> • Supportive of Amaya/Amayi dam project because it would solve possible conflict over water • There's need for clarity of border issues and the potential beneficiaries of the water project within Samburu and Baringo and Laikipia counties • The office would provide support during community consultations and household survey
11/12/2018	CEC Water & Environment Mr. Njenga Kahiro Laikipia County	Rumuruti	<ul style="list-style-type: none"> • Supports the construction of Amaya/Amayi dam because it would bring peace and stability in the area • Should address resettlement issues for Laikipia people likely to be affected by the dam • Should consider formation of a water company co-owned by Samburu, Laikipia and Baringo to manage Amaya/Amayi dam water
11/12/2018	Governor's Office- Laikipia County Hon. Ndiritu Muriithi	Rumuruti	<ul style="list-style-type: none"> • Supports the idea of having Amaya/Amayi dam in the area • High altitude areas bordering the dam with difficulties of water pumping should be provided with water pans and boreholes, which can minimize convergence of pastoralists around the dam area • Ensure all potential beneficiaries are supplied with water to avoid threat to the dam initiative
11/12/2018	Member of County Assembly Luonyek/Luoniek, Laikipia Joseph Endong	Rumuruti	<ul style="list-style-type: none"> • Supports the construction of Amaya/Amayi dam because of the benefits to the communities • Dam safety should be considered • Need to discuss whose land would be occupied by the dam • Should consider holding a cross-border joint meeting with communities and leaders from Samburu, Laikipia and Baringo

Date	Participants	Venue	Views/suggestions
11/12/2018	Member of parliament Laikipia North Laikipia County Madam Sara	Nanyuki	<ul style="list-style-type: none"> • Supports the dam but worried non-resident pastoralist could invade the surrounding area once a permanent water source (Amaya/Amayi dam) is established. • Need for the 3 county leaders to have round-table discussions due to the cross border nature of the project.
31/01/2019	National Disaster Management Authority- NDMA Mr. Mustafa –Coordinator Mr. Denis –Data Analyst NDMA Laikipia County	Nanyuki NDMA office	<ul style="list-style-type: none"> • Office supports dam to address water scarcity • Water can resolve or increase conflict in the area
31/01/2019	WARMA Director: Peter Ngubu Laikipia County	Nanyuki	<ul style="list-style-type: none"> • There is need to establish a Water Users Association in Amaya/Amayi Dam Area • Conflict over water by increased number of pastoralist and Wildlife in the area • Who should pay for the conservation of the upper catchment
13/12/2018	Coordinator, Amaya Initiative Laikipia County Madam Virginia Nyaguthie	Rumuruti	<ul style="list-style-type: none"> • Creation of a conservancy around the dam area can mitigate overgrazing and keep peace among the herders.

Date	Participants	Venue	Views/suggestions
13/12/2018	Mugie Ranch Management Mr. Josh, Mr. Martin Evans, Olemaiso Ranch Mr. Moses, Oltungai Conservancy	Mugie Ranch	<ul style="list-style-type: none"> • Supportive of Amaya/Amaiya dam project but concerned that the dam will attract many herders in the area hence high concentration of livestock which could damage the environment • Consider zoning off the dam area to prevent livestock accessing the dam area catchment, and introduce livestock and wild animal water troughs outside the dam area. • To ease pressure of livestock around the dam area, boreholes and water pans should be provided further from the dam and if possible pipe dam water to diverse water points • Should not interfere with Amaya/Amaiya river water flow because there's no other source of water for downstream people. • Amaya/Amaiya river downstream users should be supported with alternative livelihood opportunities
14/1/2019	Member of County Assembly, Silale Hon. Lotela	Nakuru	<ul style="list-style-type: none"> • Supportive of Amaya/Amaiya dam because of its potential contributions towards livelihood opportunities • Sought confirmation to dispel fears that downstream water users would not be affected by the dam, and that distribution of water would reach Silale people
30/1/2019	Member of County Assembly Samburu County Suguta/Amaya Ward Hon Lesoipa Shadrack	Maralal	<ul style="list-style-type: none"> • They are in support of the project • The project may solve some of the conflicts over resources that existed in the area in the past
1/2/2019	Governor's Office- Samburu County Madam Alice Lenanyoikie Personal assistant to the Governor	Maralal	<ul style="list-style-type: none"> • Having Amaya/Amaiya dam is a good idea as it will solve problem of water scarcity in the area • Dam will be a good measure for floods • County through ministry of agriculture would initiate irrigation in the area.

Date	Participants	Venue	Views/suggestions
1/2/2019	Director of Water & Environment Samburu County Mr. Benson	Maralal	<ul style="list-style-type: none"> • Wondered where the idea of the dam was mooted • Suggested the formation of a waters users association comprising representatives from the 3 counties • Agrees that dam would control flooding in Silale.
1/2/2019	Mr. Tyson Lemp Director of Agriculture Samburu County	Maralal	<ul style="list-style-type: none"> • Amaya/Amaiya dam project would enhance economic empowerment and diversification of livelihoods in the area.
1/2/2019	Godfrey V.C Makokha Kenya Forestry Services-KFS- Ecosystems Conservator	Mararal	<ul style="list-style-type: none"> • Efforts should be made to conserve the indigenous plant species found in the area • Endemic tree species such as Sandal Wood (<i>Osyris lanceolata</i>) exist in the area • Rehabilitation of degraded areas should be done • Tree nurseries should be encouraged as a youth enterprise
1/2/2019	Kenya Wildlife Services Ann Ronoh Senior Warden	Mararal	<ul style="list-style-type: none"> • The project area is a Rangeland with some areas having wildlife such as antelopes, elephants, zebras, giraffes, hyaenas, monkeys and baboons.

Table 4-4: Key institutions and their potential role in the project

Institutional stakeholder	Roles
National Drought Management Agency (NDMA)	<ul style="list-style-type: none"> • Provides a platform for long-term planning and action on drought • Provides drought early warning information • Strengthening the capacity of communities to enhance food security initiatives • Development of infrastructure for livelihood
Tangulbei Women Network (A community Based Organization)	<ul style="list-style-type: none"> • Promoting rights to food security • Responders during food disasters • Sensitizing others about land compensation matters
East Field Group (A community Based Organization)	<ul style="list-style-type: none"> • Environmental conservation activities • Environmental friendly livelihood practices such bee keeping • Pasture development to mitigate drought
Disaster Management Committee (DMC) (A community Based Organization)	<ul style="list-style-type: none"> • Creating awareness after construction of dam to avoid risks • Promoting livelihood activities for resilience building during drought • Promoting efficient use of water resources from the dam
County Ministries of Ministry of Agriculture, Livestock & Fisheries in Baringo, Laikipia and Samburu Counties	<ul style="list-style-type: none"> • Expanded Irrigation water supply will be implemented by County Governments in their respective areas • Providing County development policy guidelines • Providing county strategic development plan • Political support for the project • Assisting beneficiary communities in resource mobilization, planning and implementation
County Commissioner's Offices In Baringo, Laikipia and Samburu Counties	<ul style="list-style-type: none"> • Grass root mobilization of communities and participating in decision making forums • Resolving intercommunity disputes in the Amaya triangle • Enhancing security of beneficiaries and project staff • Holding tri-partite meetings to maintain peace
Amaya Triangle initiative (Co-owned by Baringo, Laikipia and Samburu counties?)	<ul style="list-style-type: none"> • Policy approach towards addressing cross-border development challenges particularly insecurity, resource based conflicts, food insecurity, environmental issues, drought emergencies, natural resource management and livelihoods
Members of Parliament Tiaty East, Samburu and Laikipia West	<ul style="list-style-type: none"> • Political leadership and goodwill • Lobbying for funding(implementation phase)

Institutional stakeholder	Roles
Members of County Assembly for Sosian, Churo-Amaya /Silale/Tangulbey and Suguta wards	<ul style="list-style-type: none"> • Political leadership and goodwill • Community mobilization • Lobbying funding(implementation phase) for wider irrigation coverage
National Irrigation Board	<ul style="list-style-type: none"> • Provision of secondary data/information • Policy/strategic guidelines • Project funding during irrigation construction phase • Building capacity of farmers during construction and operation phases
National Environment Management Authority (NEMA)	<ul style="list-style-type: none"> • Providing environmental management policies and guidelines • Approving Environmental and social Impact Assessment report and environmental management plan • Issuance of the project environmental management compliance certificate for construction
County Agriculture, Livestock & Fisheries Offices In Baringo, Laikipia and Samburu	<ul style="list-style-type: none"> • Policy guidelines • Technical support • Secondary data/information • M&E
County Social Development Office In Baringo, Laikipia and Samburu	<ul style="list-style-type: none"> • Community mobilization • Registration of farmers groups
County Water Offices In Baringo, Laikipia and Samburu	<ul style="list-style-type: none"> • Secondary data • Technical input
County Public Health Offices In Baringo, Laikipia and Samburu	<ul style="list-style-type: none"> • Secondary data • Technical input
County Irrigation Offices In Baringo, Laikipia and Samburu	<ul style="list-style-type: none"> • Provision if technical data on the project areas • Participation in community mobilization • Irrigation extension services during the operation phase
County Agriculture Office In Baringo, Laikipia and Samburu	<ul style="list-style-type: none"> • Provision of data and information on agriculture and livestock enterprises, marketing, land and crop husbandry practices, • Provision of agriculture support services • Provision of policy guidelines during the study • Agriculture extension services during the operation phase
County Livestock Office In Baringo, Laikipia and Samburu	<ul style="list-style-type: none"> • Provision of data and information on livestock enterprises, marketing, land husbandry practices, • Provision of livestock support services • Provision of policy guidelines during the study

Institutional stakeholder	Roles
Sub-County Irrigation Office	<ul style="list-style-type: none"> • Provides technical team for operations and maintenance of irrigation infrastructure • Gives advice on crop and use of irrigation water •
Water Resources Authority (WRA)	<ul style="list-style-type: none"> • Enforcement of conservation activities around the dam and the catchment areas • Regulating and protecting water quality from adverse impacts • Providing guidelines and procedures for the allocation of water resources; • Processing water permits
Kerio valley Development Authority (KVDA)	<ul style="list-style-type: none"> • Mandated to plan, initiate, co-ordinate and monitor implementation of irrigation projects within Rift Valley • Initiates programmes and projects that contribute towards poverty reduction and wealth creation. • Promotes irrigation and storage of surface water • Promotes catchment conservation and rehabilitation of degraded lands.
Kenya Agriculture & Livestock Research Organization (KALRO) Marigat	<ul style="list-style-type: none"> • Mandated to undertake improved beekeeping technologies and innovations that conserve the environment and contribute to improved livelihoods and economic growth
NGOs ACTED, Action AID, Kenya Red cross, World Vision, AMREF, World Food Program (WFP) and Child Fund.	<ul style="list-style-type: none"> • Responds to community needs during drought • Community mobilization • Farmers capacity building • Community health education and other interventions • Environmental issues
Companies Geothermal Development Company (GDC)	<ul style="list-style-type: none"> • Provides water to parts of Tiaty East in Baringo-complements by supplying water in areas that are beyond reach of Amaya/Amayi dam

4.10. Capacity for Managing Water Resources

Each county has executives (CEC and COO) and directors of water and irrigation who are in charge of policy. At the sub-county level, there are dedicated officers in charge of water and irrigation.

Below the top management is a technical team in charge of field level operations and maintenance of domestic water supply infrastructure and farm/field agricultural irrigation water system. The irrigation department also provides advice to farmers.

4.10.1. Capacity gaps at County Government:

- Lack of locally owned farmers associations for coordinating domestic and irrigation water users
- Inadequate allocation of financial resources for maintaining water supply systems
- Few field staff for maintaining domestic and irrigation water supply systems
- Inadequate transport for use by field technical staff

4.10.2. Capacity gaps at beneficiary/community level

- The Amaya/Amaiya river/proposed dam area has no WRUA
- Communities lack domestic water and irrigation system management skills
- Project beneficiaries lack skills in irrigated agriculture and water management
- Beneficiaries lack knowledge, skills and experience in managing community based organizations
- Beneficiaries also lack knowledge and skills in agribusiness
- Most farmers lack knowledge and skills in commercial horticulture farming
- Since majority of the people are predominantly pastoralists while only a minority engage in rain-fed agriculture, majority lack knowledge in irrigated agriculture and water management.
- Absence of office and equipment can affect operations and management of the proposed ADMC. ADMC would require an office building with basic office equipment such as furniture and start-off stationery to enhance safe custody of the project documents and its operations.

4.10.3. Enabling environment capacity

- The beneficiary communities have a positive attitude and are highly motivated to have the project which most think will open opportunities for irrigated agriculture.
- Baringo, Samburu and Laikipia counties are essentially agro-pastoral based economies. The project beneficiaries have inadequate experience in irrigated agriculture. We recommend the project should come up with systematic capacity building interventions for farmers on management of irrigation water. Interventions should be tailored for each area in order to change the community mind-set from over reliance on rain-fed agriculture to irrigated agriculture in order to transform the sector into a commercial one.
- There also exists a pool of highly educated youth who can be recruited and trained by ministry of water & irrigation on how to maintain the water supply system. There is also potential for revenue that could be levied from water users and these funds can be used to remunerate technical maintenance crew and purchasing worn out parts.

4.10.4. Managing the Hydropower Station (if deemed feasible)

- The proposed hydro-power station should be handed over to an institution/company with management and maintenance capacity.
- Power generated from Amaya dam hydro power station should be sold to Kenya Power and lighting Company (KPC).

4.10.5. Proposed structure for managing Amaya/Amaiya catchment and dam water resources

Amaya/Amaiya Water Resource Users Association (AWRUA)

We recommend the formation of an association of water users, riparian landowners and other stakeholders for purposes of sharing, managing and conserving Amaya/Amaiya water resources. The main objectives of the Amaya/Amaiya WRUA would be:

- Conservation of the dam catchment from destruction and water pollution through human activities
- Management of resources adjacent to the river/dam
- Overseeing proper economic utilization of water resources
- Engaging with institutions that are responsible for water management in the area
- Resolving possible conflicts over water use

Amaya/Amaiya Dam Management Board (ADMB)

We also recommend the establishment of “Amaya/Amaiya Dam Management board” (ADMB) to take over preliminary management of the project once it is completed. The board should have at an overall of 12 representatives. Each county (Baringo, Samburu and Laikipia), should nominate 3 members while the additional three should come from each Area Water Management committee. Board members should be nominated from county ministries of water and irrigation, agriculture, livestock and fisheries and environment, WRUA and governor’s office. Initially, ADMB should be answerable to CRVWDA. The day-to-day operation and management of the project will be under ADMB on behalf of the three counties. Duties of ADMB are:

- Overall management of Amaya/Amaiya dam water resources
- Preparing and Implementing operation plans for the plant
- Liaising with the Area Water Management Committee (AWMC)
- Ensuring equitable distribution of domestic and livestock water within the 3 beneficiary areas.
- Providing guidelines for determining fees for domestic/livestock and irrigation water
- Ensuring that AWMC receive management training to enhance their capacity
- Assisting AWMC to develop technical capacity for their infrastructure maintenance staff
- Ensuring that AWMC collect revenues for funding operations and maintenance works
- Communicating with the county governments to ensure smooth running of the project

- Ensures smooth running of both pumping station and water treatment plant

Area Water Management Committee (AWMC)

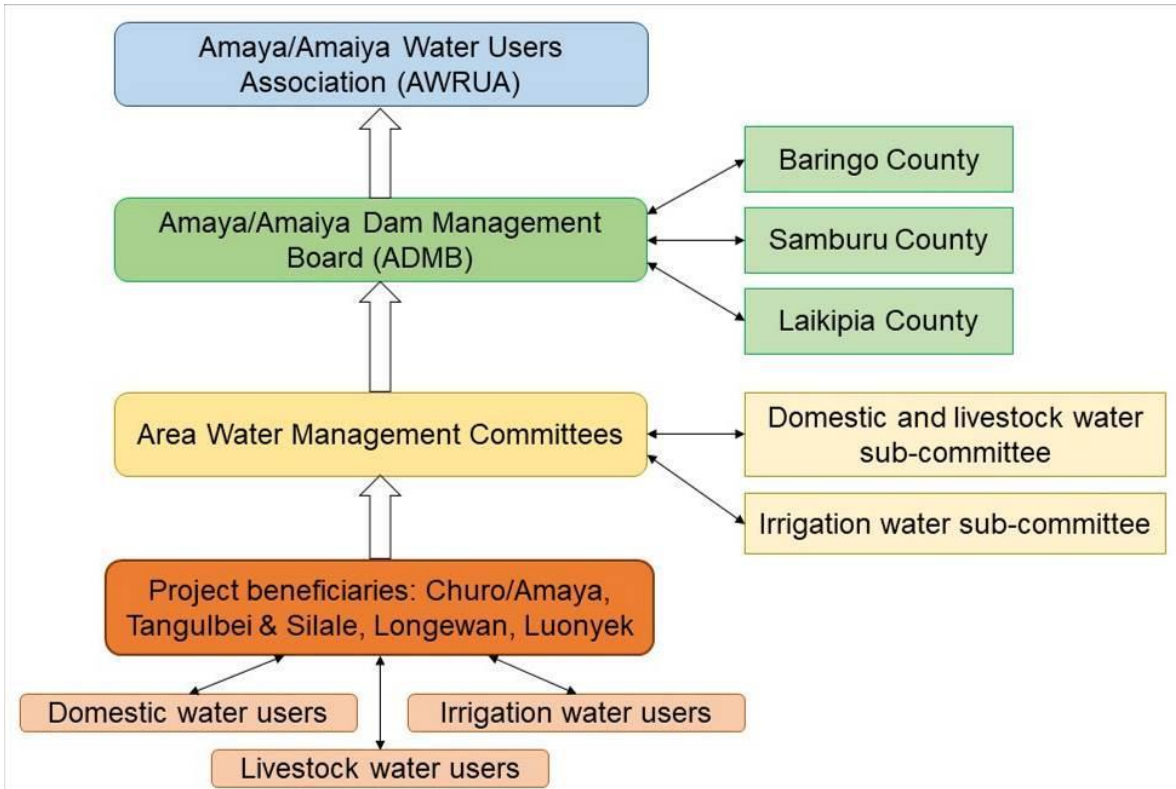
Another proposal is to have a third tier of management below the Amaya/Amayi WRUA. Each beneficiary area e.g. Luonyek/Luoniek, Longewan and Churo/Amaya/Tangulbei/Silale should form self-governing management committee, namely, “Area Water Management Committee (AWMC)” for managing domestic and irrigation water supply and usage in their respective areas. The duties of AWMC would entail:

- Preparing and Implementing operation plans
- Crafting by-laws i.e. internal regulations for each area
- Managing distribution schedules in all irrigation, livestock and domestic water supply points
- Supervising irrigation schemes in their areas
- Managing maintenance of water infrastructure in their areas
- Enhancing participation of water users in diverse aspects related to water supply
- Ensuring equity in water delivery to members
- Coordinating contribution of levies from members for operation and maintenance
- Facilitating extension of water connection to new members
- Resolving possible conflict between water users
- Ensuring day-to-day functioning of the water project
- Inspecting domestic and irrigation water distribution infrastructure
- Preventing water wastage
- Ensuring the environment adjacent to the dam catchment is always protected
- Promoting environmental protection activities in their respective areas

4.11. Institutional Management Structure

The proposed institutional management structure is shown below.

Figure 4-17: Proposed institutional management structure of the project



CHAPTER 5. BASELINE ENVIRONMENTAL AND SOCIOECONOMIC CONDITIONS

5.1. Overview

This Chapter identifies, discusses and gives a critical analysis of both positive and negative impacts associated with the proposed Amaya/Amaiya Dam water development project. The project cycle is divided into three (3) main phases based on activities. These include construction, operation and de-commissioning phases. Impacts associated with the construction phase are short term while the impacts associated with the operation are long term.

Questionnaires, observations, interviews and photographs were used for data collection. A cross-sectional approach was used to collect socio-economic data once, from a sample of respondents. Relevant secondary data from all environmental and social institutions in the project area was gathered. Assessment data collection tools to adequately gather the required information was prepared, such as household questionnaires; KII and FGD schedules; observation checklists; public consultation guides; digital camera.

Several villages were sampled, for which to collect the primary data. The survey utilized the household information contained in 2008 Kenya National Population and Housing Survey to develop a sampling framework within the sub-locations selected for the study. Once the consultant established the number of villages in the wards and the population in each; the respondents were selected through a simple random sampling method. Professional programmes such as MS Excel 2007, SPSS and STATA were used for data management and analysis. Data entry was conducted concurrently with data collection in the field.

5.2. Objectives of the Study

- To collect socio-economic data on the status of potential beneficiaries of Amaya/Amaiya dam water supply project with a focus on income, wealth, education, and occupation; demographics (population in the area & demographic patterns); seasonal land use patterns, livelihood activities; existing social infrastructure (schools, churches, health facilities, social centers and halls, markets, shopping centers, etc.); employment; labor availability across seasons; historical and cultural heritage sites; communication networks and households whose lands is likely to be affected by the project.
- To collect data on economic production activities, consumption, and distribution of goods among household members and existing social inequalities in resource ownership and access
- To collect data on social capital and reciprocal relationships
- Gender analysis: to investigate existing social economic inequalities in access and control of household and community resources, and the likely impact of the project on men, women and children.

5.3. Methodology

Social survey data was collected using a closed and open ended questionnaire (see annex). A cross-sectional approach was used to collect data once from a sample of 684 households. The survey was conducted within the proposed beneficiary areas of Tangelbei, Silale, Churo/Amaya, Luonyek/Luoniek and Longewan with the help of 26 enumerators, 2 field superiors under coordination of the Social and Environmental experts.

Through focus group discussions, the study elicited information on gender stratification, social economic roles and responsibilities, access and control of household resources; potential impacts of the project on division of labour; potential impacts of the project on gender and likely impact of water distribution point and demo irrigation on gender and the potential impact of the project on women's/men's health and potential benefits and negative impacts on the physico-biological systems.

5.4. Study Area and Sample Size

The study was conducted within the Amaya triangle which straddles 3 counties, namely Baringo, Laikipia and Samburu. A sample of 684 households was drawn from 124 villages.

Table 5-1: Household survey data

County	Study area	No. of villages	No. of households	Household Survey sample
Baringo	Tangelbei	40	3,185	109
	Silale	11	4,102	75
	Churo/Amaya	107	4,500	305
Laikipia	Luonyek/Luoniek	14	1,017	92
Samburu	Lengewan in Amaiya	8	1,060	103
Total		173	13,864	684

Data was collected in the following villages:

- a. Nasorot, Akwichatis, Naudo and Natan in **Silale ward in Baringo County**.
- b. Cheporoko, Kakongin, Katungur, Lotita, Makany, nasur, Orus, Sowo in **Tangelbei ward, Baringo County**.
- c. Adipo, Amaya, Chekumbo, Chepelow, Cheporoko, Cheposai, Cherelso, Cherumbo, Churo, Kachilitwa, Kakogh, Kanapus, Kaptari, Kao, Kaptuya, Kasilang, Kipkulul, Lokodi, Marram, Nachurur, Naminito, Namuria, Nangarua, Nasur Nyalipic, Plesian and Tebelek villages in **Churo/Amaya ward, Baringo County**.
- d. Ndonyoriw, Kampi, Kanjul B, Kaptugen, Kariwo, Lera, Matunda and Nakwang villages in **Luonyek/Luoniek settlement, Laikipia County**.

- e. Amaiya, Kao, leisene, Lmigiy, Loiting, Longewan, Lowamara, and Ntimnari in **Amaiya ward , Samburu County.**

5.5. Bio Data / Demographic Characteristics

Of the 684 respondents who participated in the study, 58% were men and the rest (42%) were women. Although the average age of the respondents was 46 years, majority (69%) were under 40 years.

Luoniek and Lengewan have an average of 4 children and 2 adults per household. Households in Silale, Churo/Amaya and Tangelbei have an average of 5 children and 3 adults. Majority (95%) of the adults in households fall within 18-50 years age bracket while most children are aged between 2-8 years.

5.5.1. Formal education

The proportion of people who can read and write varies across the 4 study areas. Longewan led with 47% respondents who can read and write followed by Churo/Amaya at 38%, Tangelbei and Luonyek/Luoniek tying at 35% with Silale coming in last at 21%. Only 17% of the respondents indicated they have attained secondary school education.

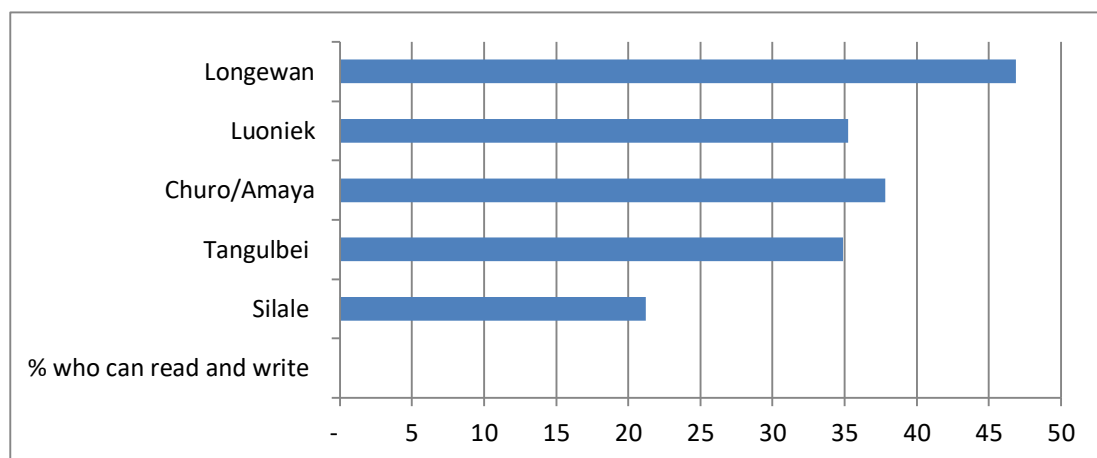


Figure 5-1: Formal education levels among respondents

Education level of respondents (mostly male) and their spouses (women)

As shown in the table below, Luonyek/Luoniek had the highest proportion of respondents (56%) and spouse (64%) with no formal education, followed by Baringo (Churo/Amaya, Silale and Tangelbei) respondents (49%) and spouse (55%). Amaiya ward (Samburu) had the lowest percentage of respondents (30%) and spouses (46%) with no formal education. These findings implied that there are more women with no formal education than men in the three (3) study areas.

Table 5-2: Respondents' spouses' education level

Level of education for Spouse	Churo/Amaya, Silale and Tangulbei		Luonyek/Luoniek settlement		Amaiya ward (Lengewan)	
	Spouse	Respondent	Spouse	Respondent	Spouse	Respondent
Lower primary	5%	6%	5%	4%	4%	11%
Upper primary	13%	14%	18%	20%	15%	26%
Lower secondary	3%	1%	-	8%	3%	4%
Upper secondary	4%	7%	2%	4%	8%	13%
University	2%	1%	2%	1%	1%	-
Technical/vocational	3%	5%	1 %	2%	3%	6%
Teacher training school	-	1%	-	1%	-	-
No formal schooling	55%	49%	64%	56%	46%	30%
Non formal literacy	15%	17%	5%	3%	12%	10%

Proportion of children attending school

Children attending primary school are the majority (66%), those in secondary school are 8% while 2% are at the university and 1.4% in colleges. 19% of the children had no formal education. The average number of primary school children per household in Amaiya (Samburu) and Baringo (Churo/Amaya, Silale and Tangulbei) are three and two in Luonyek/Luoniek (Laikipia).

At the time of the study, 75% of the respondents had children in Primary school. More than half (53%) of the households had 1-2 children in primary school, those with 3-4 children in school were 33% and those with 5-6 children in school were 12.3%. 38% of children from most households walk 2-3km and another 38% commute 4-10kilometers to reach school. The average distance to the nearest primary school in the area is 6 kilometers. Only 27% of respondents had children in secondary school.

5.6. Occupation and Sources of Livelihood

The main occupation and source of livelihood for most people in the study area was found to be pastoralism (81%), crop farming (10%), and mixed farming (5%). Other minor occupations were trading/business (3%).

The proportion of households deriving income from various agriculture activities was as follows: cattle 74%, goats 90%; sheep 69%; Maize 13%; beans 15%; sorghum 1%; honey 6%, milk 11% and charcoal 8%.

The table below shows the mean annual income from each farm related activity in each study area.

Table 5-3: Mean annual income per farm activity

Research site	Annual income from Agricultural sources									
	Cattle	Goats	Sheep	Maize	Beans	Sorghum	Honey	Milk	Charcoal	Other
Silale	96,147	49,509	18,736	1,353	820	-	1,600	-	-	533
Tangulbei	75,159	55,141	17,064	1,102	606	-	1,441	29	-	6,511
Churo/Amaya	42,902	23,935	10,193	4,580	1,548	240	721	484	1,125	398
Luonyek/Luoniek	26,971	12,749	4,833	4,960	2,911	180	701	1,430	1,278	429
Longewan	112,680	46,751	49,084	15,168	5,709	-	485	6,558	238	693
Mean	62,850	33,903	17,580	5,331	2,121	130	897	1,405	697	1,454

Non-agriculture activities also provided income to various households. The proportion of households benefiting from non-agricultural activities was as follows: civil service 2%; teaching 3%; craft making 2%; religious leader 1%; shop business 10%; Boda/motorcycle taxi 2%; Tailoring 1%; casual work 14%; pension 0.3% and remittances 3%. The table below shows the average annual income from each of the non-agriculture activities in each of the study areas.

Table 5-4: Mean annual income from non-agricultural activities

Research site	Income from non-agricultural activities										
	Civil servant	Teacher	Craft	Religious leader	Shop	Boda boda	Tailor	Casual work	Others	Pension	Remittances
Silale	-	-	196	-	1,236	588	41	19	116	-	35
Tangulbei	97	561	84	75	3,477	659	224	229	159	-	93
Churo/Amaya	1,526	1,496	-	373	585	344	89	1,056	352	-	30
Luonyek/Luoniek	-	3,910	65	-	1,619	1,192	-	1,009	329	54	68
Longewan	3,981	4,350	-	97	5,332	2,243	10	6,092	-	588	476
Mean	1,337	1,905	43	197	1,975	816	83	1,583	238	98	115

5.6.1. Household expenditure

Table 5-5: Average monthly expenditure

Average monthly household expenditure of income and Savings						
Expenditure Items	Study areas					Mean
	Silale	Tangulbei	Churo/Amaya	Luonyek/Luoniek	Longewan	
Food	7,400	7,370	7,799	7,084	9,863	7,900
Clothing	4,064	2,311	2,200	2,108	4,374	2,738
School	5,962	3,988	3,793	3,520	8,683	4,759
Travel/transport	1,786	1,140	871	867	3,437	1,401
Agric. inputs	1,670	1,923	2,388	1,265	6,382	2,695
Medical/hospital	3,816	2,039	880	725	4,811	1,967
Water	54	40	104	481	1,045	283
Savings	785	248	650	322	1,234	636
Communication	289	552	438	844	1,130	599
Recreation	-	16	7	33	287	54
Fuel (Kerosene, firewood, gas, charcoal)	343	98	104	251	1,123	305
Miscellaneous	67	153	90	128	371	146
Others	90	211	43	66	52	80

5.7. Food Security

Milk is the main type of meal that is consumed daily in most (50%) households, followed by beans (15%) and meat (5%). On Average, 2% of the households produced their own food, 41% obtained food by buying and 6% by providing labour for food. 49% of the households in Baringo buy food and this is more than households in Laikipia (17%) and Samburu (25%).

Male heads of households have greater responsibility of ensuring there's is food availability in the household. The number of meals consumed by different households in a day varies, with majority (51%) having two, others three (41%), one (6%) or four (2%) meals respectively. 39% of households had surplus food which is mainly kept in store for future use, sold or shared with relatives.

About 38% of the households in the study area had enough surplus food. Nearly 70% of the households within Churo/Amaya, Silale and Tangulbei have never had food surplus and experience hunger frequently. In Luonyek/Luoniek and Lengewan, 55% and 39% of the households have never had food surplus and they also experience hunger.

Many households (87%) experience hunger at different times of the year. This happened sometimes to 60% of the households, while 6% go hungry frequently. Only 13% of the households can be termed food secure since they don't encounter any food challenges.

Nearly 60% of the household's experience hunger from January-March while, 36%, 16%, and 13% of the households, experience hunger in April, May and June respectively. Throughout the months of July to October, nearly all households are food secure. About 13% of the households encounter hunger in November and December. During the months of food scarcity, 47% of households sell livestock to raise money for purchasing food, 23% purchase food, 13% provide casual labor, 7% borrow from relatives, 3% burn charcoal, 3% hunt wild animals and another 2% collect wild fruits. During the months of hunger, 91% of the households feed on ugali, githeri (mixture of maize and beans) or porridge, 4% on wild fruits and 3% on milk.

Food preservation methods employed in the area include drying while in the garden (36%) or on drying racks (28%). A few other households threshed/winnowed (9%), milled (11%) or used chemical preservatives (8%). Homes provide environment for learning food preservation. Some households (47%) depend on husband for livelihood support, 42% on both husband and wife, 7% on wife, 4% on children and another 1% on all-husband, wife and children. Decisions on use of household income is made by husband (78%), both wife and husband (17%) and wife (5%).

5.8. Housing

Only 34% of the respondents have lived in their current house for more than ten years. 18% have stayed in their present houses for 5-10 years, 32% 1-5 years and 4% less than 6 months. Houses are owned either by husband (25%) or wife (20%) while some (23%) are jointly owned by husband and wife.

The housing materials used for wall are mud and acacia (36%), hardened dung (22%), earth/clay (21%), iron sheet (6%) or un-burnt bricks (5%). Grass was commonly used for roofing as indicated by 76% of the households. Only 14% use iron sheets. Other roofing materials were earth/clay (4%) or hardened dung (6%). Floor housing materials that are used are earth/clay (84%), hardened dung (9%) or stone (3%). Observations made on the condition of various houses indicate that 4% were very good, 45% good and 31% were neither good nor bad. Other houses (14%) were in bad state and 7% in very bad condition. Other uses of houses by different households are storage (66%) and sharing with animals (28%).

5.9. Energy Sources for Cooking, Lighting and Electronic Gadgets

Firewood is the main source of fuel for cooking that is used by 95% of the household. Another 4% use charcoal and 1% cow dung. Moreover, 40% of the household's source of lighting is firewood while 34% use dry cell batteries, 12% use solar, 9% paraffin. 3% use nothing to light their houses. Batteries are used by 27% of the households to power electronic gadgets while 7% use solar energy. Electricity is available to only 4% of the households. Majority (96%) of the household have no electricity.



Figure 5-2: Charcoal burning and trade in the project area

5.10. Health

5.10.1. Common diseases and incidences of illnesses

At the time of the study, 64% of the households reported having experienced incidences of illness. The common types of illnesses were malaria (63%), flu/cough (14%), diarrhea (8%), pneumonia (5%) and typhoid. Common waterborne diseases experienced in households were typhoid (32%), Cholera (25%), diarrhea (22%), amoeba (13%) and dysentery. Common long-term illnesses experienced among members of households are diabetes (11%), tuberculosis (10%), hypertension (4%), epilepsy (3%), Tuberculosis (2%) and HIV/AIDS (1%).

5.10.2. Available health facilities

Most families use government hospitals (94%), private hospitals (2%) or private clinic (3%). In these facilities, patients are treated by nurses (85%), clinical officers (8%) doctors (3%) or nursing aids (4%). Only 43% of the households have health insurance. The distance to the health centers vary. 37% of households cover 1-5 kilometers, 37% travel 6-10 kilometers, and 7% go 16-20 kilometers while 7% cover up to 30 kilometers in order to reach health facilities. These distances mostly consume more than 2 hours (38%); others spend up to 1 hour (22%) and about 30 minutes to 11% of the households. More than half of the households (54%) expressed satisfaction with services offered at health facilities, 43% were dissatisfied and another 4% felt that the services were neither good nor bad. The causes for dissatisfaction with available health facilities was due to lack of drugs (47%), far distance (27%), expensive services (13%), delays in being attended (9%) and unfriendly doctors/nurses (3%). Out of 684 households, only 43 (6%) have health insurance.

5.10.3. HIV / AIDS awareness

When asked whether they were aware of any HIV/AIDS campaign strategies in the area, 24% said no. Churo/Amaya had higher level of awareness about HIV/AIDS campaigns. Those aware indicated that the mediums used in HIV/AIDS campaigns were baraza (37%), radio (20%), seminars (19%), posters (15%) and clinics (8%).

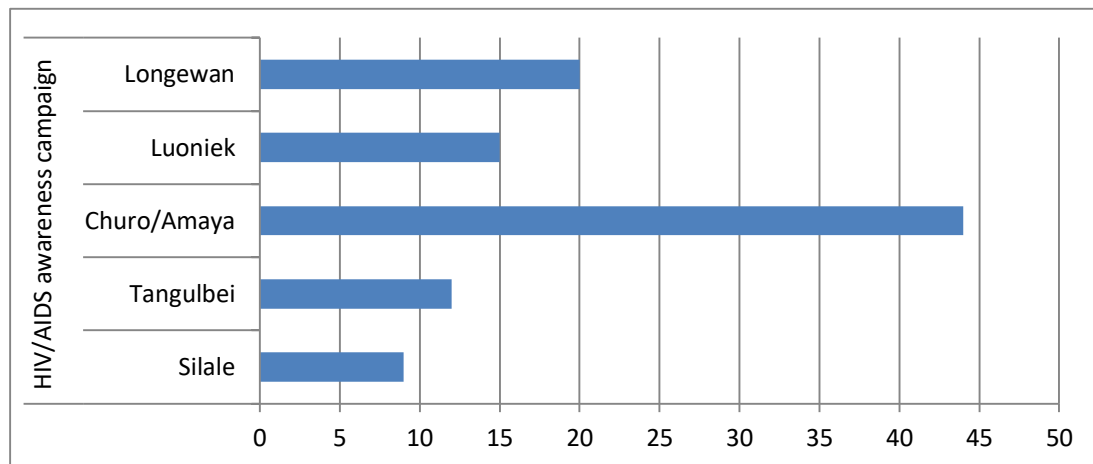


Figure 5-3: HIV/AIDS awareness

Awareness of how HIV/AIDS is transmitted varies. The highest level of awareness (91%) was noted in Longewan, followed by Silale (68%), Churo/Amaya (54%), Luonyek/Luoniek (52%) and lastly Tangulbei at 37%.

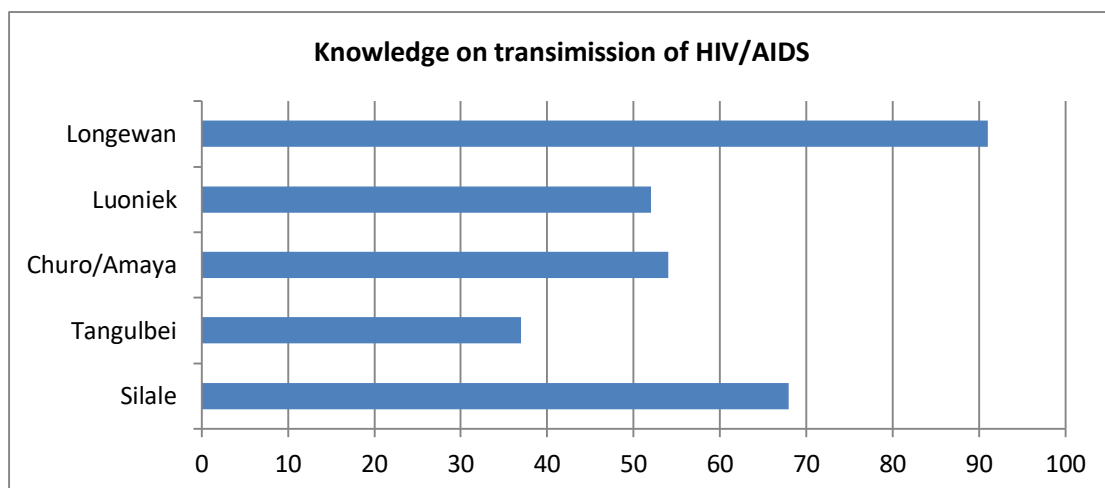


Figure 5-4: Knowledge on HIV/AIDS transmission

5.10.4. Immunization of children

Silale and Tangulbei had the highest number of households (33%) with children (0-5years) who are not fully immunized, followed by Churo/Amaya (13%) and Luonyek/Luoniek (2%). The reason for not being immunized is lack of interest (17%), lack of knowledge (23%) and prohibitive distance to health facilities (57%).

5.10.5. Prevention of malaria

Many households (52%) sleep without mosquito net. As shown in the figure below, households with no access to mosquito net are found in Luonyek/Luoniek (88%) and Longewan (70%) while Tangulbei has 45%, Silale 41% and Churo/Amaya (40%) households that are without mosquito net. Households that had mosquito nets allow children under 5years (39%), all members (31%) and pregnant mothers (30%) to sleep under the net.

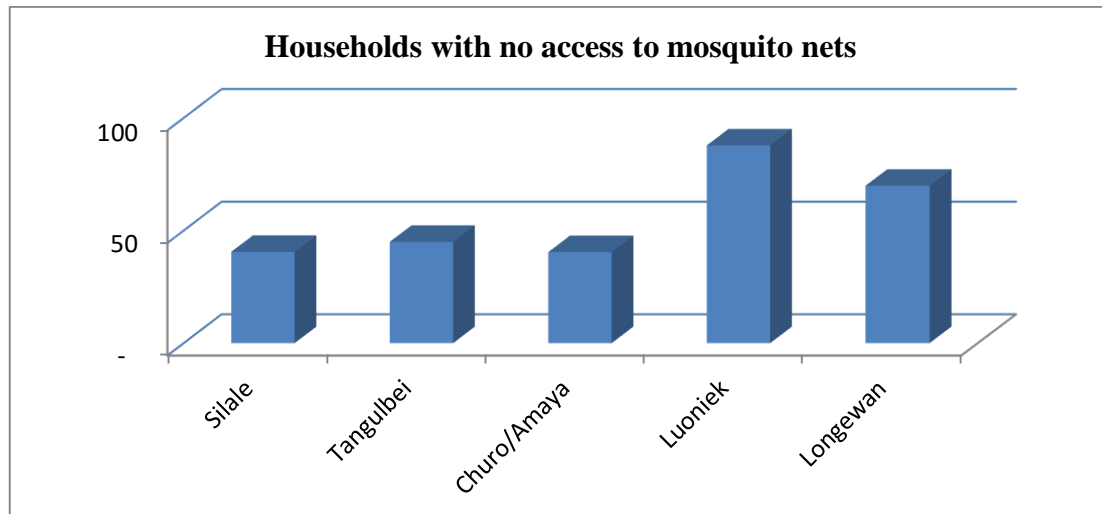


Figure 5-5: Access of mosquito nets in households

The action that is taken by households to control mosquitoes and prevent malaria include clearing bushes (35%), drying stagnant water (7%), lighting fire to scare mosquitoes (10%) and using mosquito spray (4%). Other disease carrying vectors common in the area are tsetse flies (26%), ticks (17%), and fleas 91.3%).

5.11. Water Access, Facilities and Sanitation

5.11.1. Amaya/Amayi river water analysis

The Amaya/Amayi dam water project proposes to provide safe drinking water for the community in addition to livestock water, an irrigation demonstration farm and possibility of hydropower provision. The provision of safe and quality drinking water is a high priority for human health. The appearance, taste and odor of drinking water should be acceptable to the consumer. Safety of water is affected by several factors including environmental, the nature of the source, human activities are undertaken on or around the sources, and the water harvesting, handling, and treatment that may be conducted. Thus, water can be exposed to physical, chemical, and microbiological contamination that may make water unsafe for human consumption. The quality of river water is described by the levels of physicochemical and microbiological parameters.

Amaya/Amaiya river water was sampled both by the Consultant and the Client. CRVWWDA in particular undertook a water sampling campaign in the Amaya/Amaiya River and the catchment springs, and the results indicated that water could confront to potable standards after treatment using conventional methods.

Some of the parameters, namely Turbidity, Iron, Lead, Fluoride, Nitrite and microbiological contaminants, are above acceptable limits for some of the sampling stations. The Consultant thus recommended further investigation of water quality for all parameters, including Suspended materials, Aluminium and Phosphates, to be conducted by the Utility. CRVWWDA should consider a permanent monitoring water quality program of the Amaya/Amaiya river before the construction starts but also after the filling of the reservoir (Water Analysis Certificates are attached as **Appendix II**).

5.11.2. Sources of drinking water

The different sources of drinking water where households obtained drinking water were boreholes (28%), river/spring (26%), unprotected well (15%), protected well (4%). Other households obtained water from stagnant ponds (8%), public tap (16%) and rain harvesting (2%). On average most households used 60 liters of water per day for drinking and other domestic needs. However, the amount of water varies as follows –Tangulbei 77litres, Longewan 75 litres, Silale 61 liters, Churo/Amaya 58 litres and Luonyek/Luoniek 45 liters. Water that is currently available and the distance determine how much water is consumed.

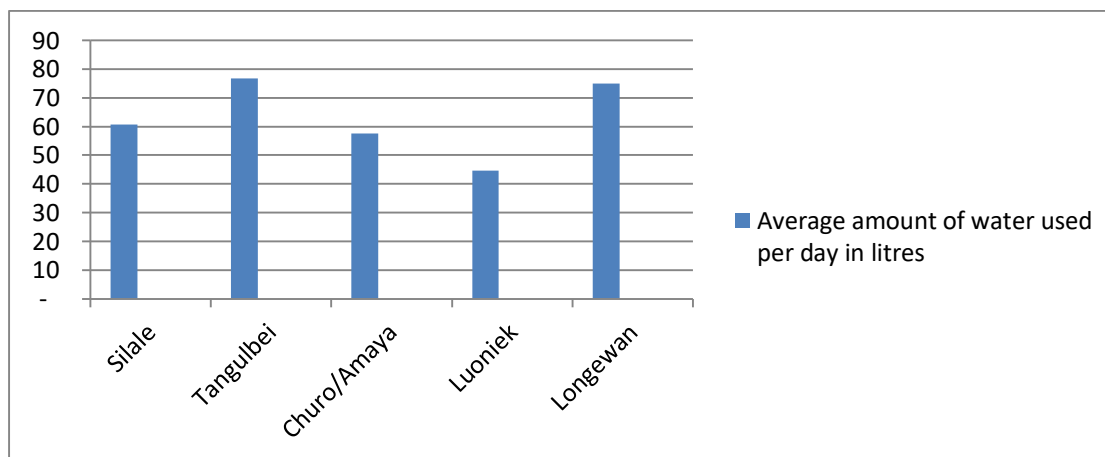


Figure 5-6: Average amount of water used per day in liters

87% of the households don't pay for the water used. The areas where residents pay for water consumed on daily basis are: Longewan (54%), Luonyek/Luoniek (10%), Tangulbei (7%) and Churo/Amaya (5%). These households spend an average of 15 shillings per day.

5.11.3. Water for domestic animals

The main source of water for livestock were stream/river (30%), stagnant pond (17%), unprotected well (10%), protected well (5%) and borehole (11%).

5.11.4. Seasonal uses of water

During the wet season households use available water for diverse needs such as drinking and cooking (72%), personal hygiene (48%), washing clothes/utensils (37%), livestock needs (22%) and growing crops (4%). However, the allocations of water during dry season changes. 71% of the households use water for drinking/cooking; fewer households (18%) use it for bathing, while more households (34%) use water to meet livestock needs. Only 2% of the households irrigate crops during dry season. Most households access drinking water from a 5 kilometers distance. Unlike during the wet season when most households spend 15-30 minutes to fetch water, time spent during the dry season is usually more than 1 hour.

Only 16% of the households were satisfied with the current water supply, the rest (82%) were not. 97% of the households would like the current water supply changed while 82% are even willing to pay about 300 shillings per month per household for improved water services. Some households felt constrained to pay for the water services due to poverty.

Closed plastic containers are the ones mostly used to store water by 84% of the households. Other households use open water containers (9%); open traditional pot (5%) and others closed traditional pots (2%)

56% of the respondents indicated that adult women were the ones responsible for fetching water for household use. 28% of the households also indicated that girls support their mothers to fetch water. Other households indicated that 6% of boys and 5% of adult men also fetch water. Only 29% of the households harvest rainwater for household uses. This could be due to low usage of iron sheet for roofing houses. Water that is harvested during rainy season is usually put in tanks, and containers such as jericans, basins, pots and pans.

5.12. Sanitation Facilities and Services

Most respondents (87%) indicated that they wash their hands before eating and others after eating (11%) and using toilet (2%). Toilets availability is as follows; Silale (2%), Tangulbei (0%), 8% in Churo/Amaya and Luonyek/Luoniek respectively and 25% in Amaiya ward (Samburu).

The few available toilets have wall and roof but only a few have a cover. An examination of the status of the latrines showed that 62% are clean and the rest (38%) dirty. The distance of water storage from the latrine from the houses varies from 20-50 meters. Most homes (94%) that had a toilet had no hand washing facility next to the toilet. In addition, bath shelters were only available in 20% of the homes. Most people bathe and wash clothes in rivers.

Long distances to water sources limited the uses of water that is delivered home to cook, drink and wash utensils. Drying rack for placing utensils after washing was available in 61% of the households.

5.13. Sanitation Challenges

The sanitation challenges that are faced by majority households were lack of latrine (60%), insufficient water supply (33%), smelly cow dung (5%), and poor drainage (2%). In order to improve drainage in the area, 53% of the households suggested that this could be done through construction of pit latrines. Others suggested that water supply should be increased in the area (30%), public education (7%) and assistance from water and sanitation providers in the county (7%). Majority (72%) of the respondents indicated there were no water service providers in the area. Others mentioned national government (5%), county government (19%) and NGOs (3%).

5.14. Use of Farm Inputs

Most households (56%) do not use farm inputs. Of the 44% households that used farm inputs, manure is used by 28%, certified seeds by 10% of the households. Fertilizer and pesticides were used by (4%) and (3%) of the households respectively. Households obtained planting seeds from stockists (59%), cooperatives (7%) while (29%) used their own seeds. Pesticides are purchased from stockists (8%) and cooperatives (2%).

5.15. Farm Labour

Farm activities mostly depend on family labour for 84% of the households with 73% of the households using 2-4 household members to perform farming activities. Other households (15%) use 5-6 household members. Some households (28%) hire casual workers for their farm activities. The number of hired workers varied with each household. The highest number of hired workers is 20 and the lowest 1.

Jembe/hoes were the most common farm tools owned by 69% of the households followed by panga (22%). Most households own several (2-3) Jembes and pangas. Only 2% of the households have a plough.

5.16. Sources of Capital for Farming Activities

Farming credit is only accessible to 8% of the households and is sourced from friends (3%), groups (2%) and cooperatives. The services sought by 11% of the households to support farming activities are credit, extension services and marketing.

5.16.1. Marketing

Surplus produce for sale was only available in 11% of the households and was sold in local markets, cooperatives and middlemen. 43% of the households experienced marketing challenges due to poor transport, low prices, and lack of ready market, competition and insecurity.

5.16.2. Social and cultural values

Only 7% of the households belong to social groups, such as women groups (3%), men's group 1% and farmer's cooperatives (2%). Being a member of social group helps one to receive credit (8%), extension services (2%) and marketing (2%).

5.16.3. Support by NGOs

Nearly half (48%) of the respondents were aware of NGOs working the area. There are 7 NGOs operating in the area. World Vision is widely known by 25% of the households.

Table 5-6: NGOs operating in the project area

Name of NGO	HHs aware of NGO presence in the area	Percent (%)
ACTED	58	8
Action Aid	29	4
Red Cross	22	3
World vision	174	25
Amref	9	1
WFP	4	1
Child Fund	14	2
GDC	10	1
WFP	10	1
Total	330	48

5.17. Cultural Heritage / Cultural Sites

71% of the households had knowledge of cultural sites in the area. In particular, 46% of the households knew ritual grounds where ceremonies such as circumcision and age grade transition take place. Caves, shrines and graves were other cultural sites found in the area.

5.18. Environmental Issues

5.18.1. Environmental problems

Households cited major environmental problems in the area with the leading being soil erosion (63%), drought (28%), climate change (25%) and reduction of agriculture produce. Other challenges were loss of soil fertility (11%) and flooding (10%).

Table 5-7: Environmental problems in the project area

Environmental problem	Frequency	Percent (%)
Soil erosion	434	63
Reduction in agriculture production	132	19
Climate change	173	25

Soil The	Famine/drought	193	28	erosion soils in
	Loss of soil fertility	77	11	
	Flooding	65	10	
	Use of agrochemicals	5	1	
	Siltation	12	2	
	Invasive species	4	1	
	Total	1095	160	

Amaya/Amaiya area are fragile and both gulley and sheet erosion were rampant in the area. During the dry seasons, strong winds generate dust storms that blow away the loose top soils. During the rainy seasons, the top soils are carried by the heavy storms that cause floods in the area.



Figure 5-7: Evidence of soil erosion in Amaya/Amaiya

Flooding

Rainfall in the area is unreliable and erratic and sometimes occurs torrentially leading to flooding in the area. In some incidences human life has been lost, animals killed, trees uprooted and houses destroyed.



Figure

5-8:

Trees uprooted by flooding

Invasive plant species

The area has also been heavily encroached by invasive plant species such as *Prosopis juliflora*, *Lantana camara*, *Opuntia exaltata* and *Acacia reficiens*. These plant species have threatened the integrity of the vegetation and compromised on the fodder quality through suppressing grass and other undergrowth.



Figure 5-9: Invasive plant species (*Opuntia spp*)

Devegetation

Rampant clearing of land was noted in the project area especially in the Laikipia boarder where communities are clearing land for agricultural purposes. This has led to loss of indigenous vegetation and accelerated soil erosion by wind and water.



Figure 5-10: De-vegetation in the project area

In order to mitigate environmental challenges, 63% of the respondents suggested public education, re-forestation (15%), control of soil erosion (9%) and terracing (4%).

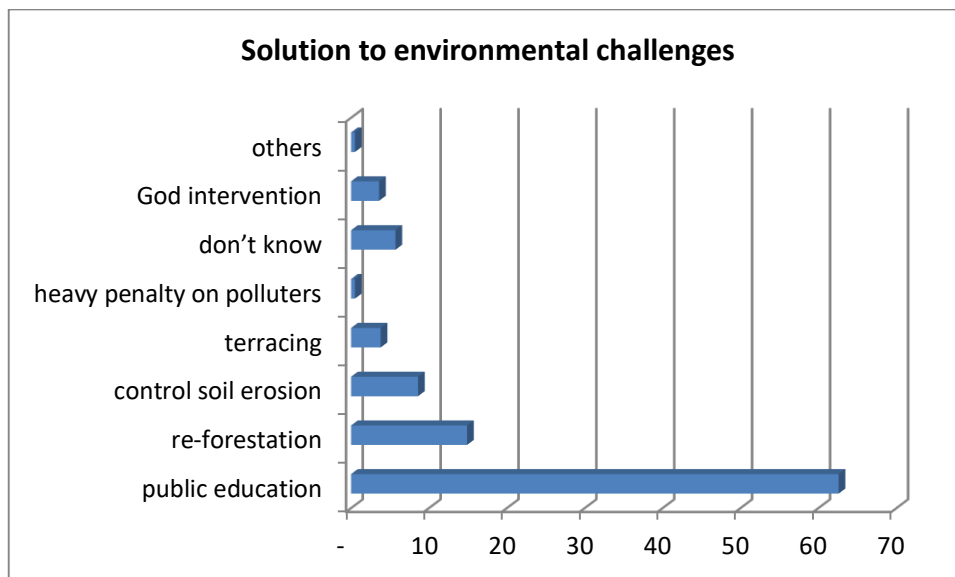


Figure 5-11: Solutions to environmental problems

Disposal of solid waste and water

Households disposed solid waste by burning (47%), open land (39%) and in compost pit (11%). Water is disposed in open land (76%), open ditches (16%) and sewer system (7%). Respondents obtained information about environmental issues from public meetings (52%), radio (14%) and educational institutions (2%).

5.18.2. Flora and fauna of the project area

Vegetation description of the study area

The vegetation type of the project site is characteristic of a dry Savannah and forest (along the riparian area). The overall natural vegetation consists of several acacia, grasses, shrubs, and liana among others. However, *Dodonea viscosa* locally known as Tobolokwo (Pokot) is the most dominant species colonizing the project area. The local community claim the species is becoming locally invasive due to its high proliferation in the area.

The dam and irrigation sites are inhabited by different types of vegetation. The dominant vegetation identified during the survey is trees and shrubs. Herbaceous plants were also identified in the two sites. Aquatic and mesophytic plants (Riparian vegetation) were identified along River Amaiya within the irrigation sites. In general dominant plant species identified in the two areas included; *Dodonea viscosa*, *Croton dichogamus*, several species of *Acacia* (Genus *Vachelia* and *Senegalia*), Epiphytes (Climbers), *Aloe* spp, family *Lamiaceae*, Family *Rubiaceae*, *Euphobia* sp., and *Sansevieria* species. It is expected that construction within irrigation and dam site will lead to clearing of these plants and eventually submerging of plants in the reservoir. Therefore, mitigation through re-vegetation and afforestation efforts is recommended.

A total of 115 plant species were sampled in the project areas. This includes both terrestrial and plant species (A comprehensive list of flora and fauna has been presented in a separate document). Acacia trees were the most common and are also widely known by most 96% of the households as the most common tree species. Trees provide fruits (17%), firewood (61%), medicine (18%) and wood for making household vessels (2%).

Common animals in the area and conflict with humans

Wild animals in the area include: Elephants, Zebras, Buffaloes, Foxes, Lions, Monkeys, Leopards, Mongooses, Warthogs, Giraffes, tortoises, Hyenas and Gazelles. Domestic animals included Donkeys, cows, sheep, goats and camels. 90% of the households have wildlife in their vicinity. There are animal migratory corridors near 53% of the households. Elephants are the most common animals that pass through these corridors. 79% of the households confirmed occurrence of human wildlife conflict in these areas. The main source of conflict is wildlife predated on domestic animals (46%), wildlife damaging crops (27%), human attack by wildlife (26%) and human death caused by wildlife (5%). 82% of the households revealed that cases of human-wildlife conflict have never been resolved. The conflict resolution mechanisms that were available for use were clans/elders (36%), family (19%), local courts (7%), sub-county chief (12%), and courts of law (10%). 26% of the household don't know any conflict resolution mechanism.



Figure 5-12: Zebras grazing near Luonyek/Luoniek



Figure 5-13: Giraffes and gazelles grazing near Luonyek



Figure 5-14: Snakes found in the project area



Figure 5-15: Ostriches spotted near Tangulbei

Value / use of animals

Domestic animals provide food and income/ wealth; skin, transport and prestige. Wild animals provide game meat and are a tourist attraction.



Figure 5-16: A caravan of camels traversing the project area



Figure 5-17: Cattle and goats at Silale

Notable sensitive habitats within the area

Forests were widely mentioned by 63% of the respondents as the most notable sensitive habitats in the study area, followed by sloppy lands (11%) and cultural sites (8%).

Table 5-8: Sensitive habitats in the project area

Habitat	Frequency	Percent (%)
Forest	400	63
Wetlands	6	1
Cultural sites	49	8
Dams	25	4
Sloppy lands	73	11
None	75	12
Others	11	2
Total	639	100

Sustainable land management practices in the area

Apart from 30% of the respondents who didn't have knowledge of sustainable land management practices, the rest mentioned crop rotation (13%), soil conservation (13%), minimum tillage (9%), afforestation (8%), fallow (8%) and organic farming method (4%). In practice 44% of the household didn't engage in any sustainable land management practices, 13% did soil conservation, 9% left their land fallow, and 8% practiced minimum tillage while 3% practiced agro-forestry.

Table 5-9: Land management practices

Land Management practices	Frequency	Percent (%)
Zero tillage	11	2
Crop rotation	77	13
Agro forestry	11	2
Minimum tillage	51	9
Afforestation	44	8
Soil conservation	78	13
Creating buffer zones in the riparian areas	49	8
organic farming	22	4
Leaving fallow areas	49	8
None	175	30
Other	17	3
Total	584	100

5.19. Land Tenure System

Communities in the 4 project areas (Silale, Tangelbei, Churo/Amaya, Luonyek/Luoniek and Longewan) have access to different type of land tenure. A specific analysis shows that trust

land is owned by communities as follows: Silale (68%), Tangelbei (73%), Churo/Amaya (67%), Luonyek/Luoniek (7%) and Longewan (90%). Communities under Private land free holding is as follows - Luonyek/Luoniek (87%), Churo/Amaya (24%), Longewan (9%), Tangelbei (6%) and Silale 2%.

Silale, with 31% and Tangelbei (21%) have significant proportion of households under government land. Only 5% and 6% of households in Churo/Amaya and Luonyek/Luoniek respectively are under private leasehold. Overall, landowners are the majority (89%) while squatters are 6% and tenants 4%.

Table 5-10: Land management practices

Type of land tenure system	Silale	Tangelbei	Churo/Amaya	Luonyek/Luoniek	Longewan
	% of HH				
Private land(freehold)	2	6	24	87	9
Private land(leasehold)	0	0	5	6	0
Trust land	68	73	67	7	90
Government land	31	21	4	1	1
Total	100	100	100	100	100

The most common resources that are shared on communally owned land include forests (51%), firewood (25%), wildlife (24%), water points (17%), wild food (10%) and sand/stone (4%).

5.19.1. Land use

The current land uses were residential (56%), subsistence farming (18%), cash crop farming (12%), pastureland (10%) and business premises (3%).

5.20. The Proposed Amaya/Amaiya Dam Water Project

5.20.1. Awareness of the proposed dam project

On average, 65% of the households within Amaya triangle were aware of the proposed water project. However, the proportion of households not aware of the proposed project in each study area was as follows: Churo/Amaya 44%, Tangelbei 38%, Luonyek/Luoniek 33%, Longewan 18% and Silale 17%. Community sensitization through barazas and other meetings have increased the awareness.

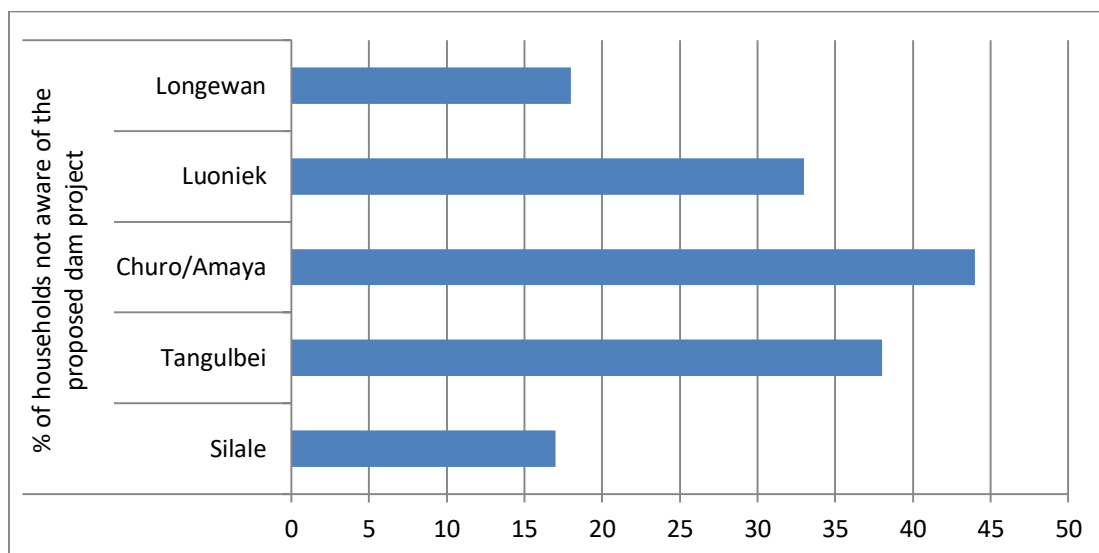


Table 5-11: Project awareness

Households that were aware of the project got information from local government (26%), local government officials (20%), village barazas (13%), local politicians (10%), and friends/relatives (11%) other sources of information were local church (3%), radio (3%), and extension workers (4%). Those who haven't heard about the water project suggested that they could receive information better through village barazas, local government authority, traders and local church.

5.20.2. Community support for the proposed project

Almost all households (98%) would like the proposed project to be implemented. 57% of the households felt the project would increase water supply in the area while others indicated that the project would bring other development initiatives (23%) and improve the standards of living.

Nearly all households (94%) are willing to cede land for the reservoir, pipelines, and canals if they are to pass or are planned to be built on their land. Those opposed (6%) to cessation of their land indicated that they have no other land to dwell in while others indicated that they must be compensated first.

5.21. Community Proposal Over the Use of Water from Amaya/Amaiya Dam

Overall analysis of water needs in the 4 research sites shows that 67% of the households would prefer to use water from Amaya/Amaiya dam in irrigated farming. Another 57% would prefer to use the water for domestic needs. Others see opportunities in recreational activities (14%), livestock (32%) and agro-forestry (1%). The graph below shows intended use of water by households in each area of study. The highest preference over the use of water from Amaya/Amaiya dam is irrigation for Longewan, Silale, Churo/Amaya and Luonyek/Luoniek. Domestic water need ranked as first priority for Tangulbei, followed by irrigation needs. For the other four areas (Longewan, Luonyek/Luoniek, Churo/Amaya and Silale) water for domestic emerged as the second priority. Water for livestock emerges third rank in all the 5 areas.

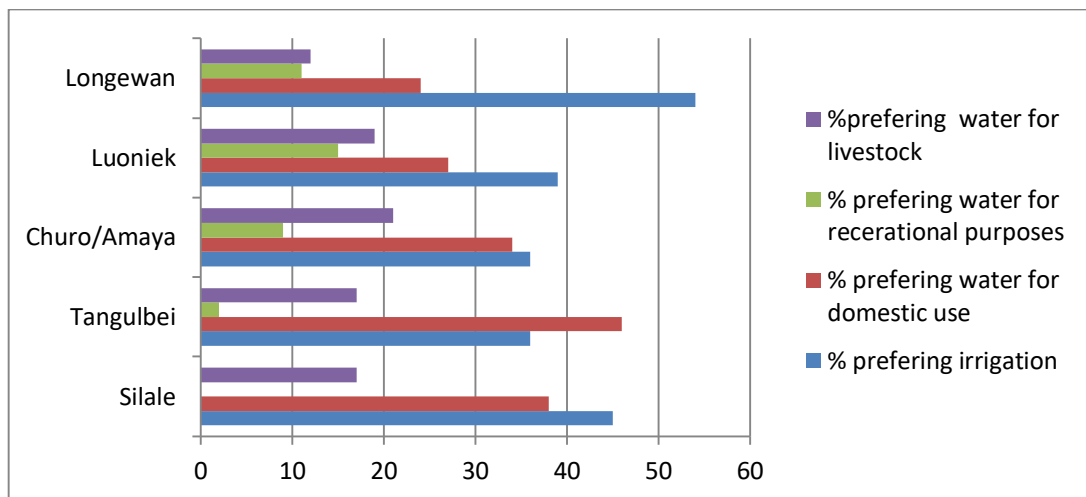


Figure 5-18: Community proposals over Amaya/Amaiya water use in the area

5.21.1. Project financing

Community members had diverse views about financing of Amaya/Amaiya project. 38% of the households suggested that financing should be done jointly by government and donors, 20% said donors alone and another 20% government. Another 15% of the households said donors/government and farmers should undertake financing responsibility. 74% of the households are willing to make contributions towards project cost if called upon and 33% of the households are willing to make in-kind contributions, 16% would make cash contributions while those willing to provide both cash and in-kind contributions were 23%. The reason for the 17% (118 households) that were not willing to contribute towards the project was lack of money and unwillingness to allow any infrastructure on their land.

5.21.2. Environmental benefits anticipated from the proposed project

According to Amaya triangle communities, Amaya/Amaiya water project would help reduce water loss (58%), control flooding (54%), control soil erosion (28%), maximize use of land (23%), enable afforestation (9%) and agro forestry (9%). 12% of the households felt that the project would enable fodder cultivation, while 11% said it would mitigate charcoal burning. The project would also mitigate climate change (8%), improve water use efficiency (12%) and enhance control over grazing (4%) and land degradation (5%).

5.21.3. Anticipated environmental challenges

Respondents expect multiple environmental challenges to occur with the execution of the proposed project. These are soil erosion (33%), excess use of agrochemicals (22%), drying up of Amaya/Amaiya River (20%), formation of hard pan (17%), flooding (13%) increased water borne diseases (12%), human wildlife conflict (10%), devegetation (8%), and introduction of new pests and diseases (7%). Others are loss of indigenous crops (8%), leaching (4%), siltation

of water bodies (4%), loss of aquatic and terrestrial fauna and aesthetic value of land (2%). Others expect contamination of ground water (1%) and water logging (1%).

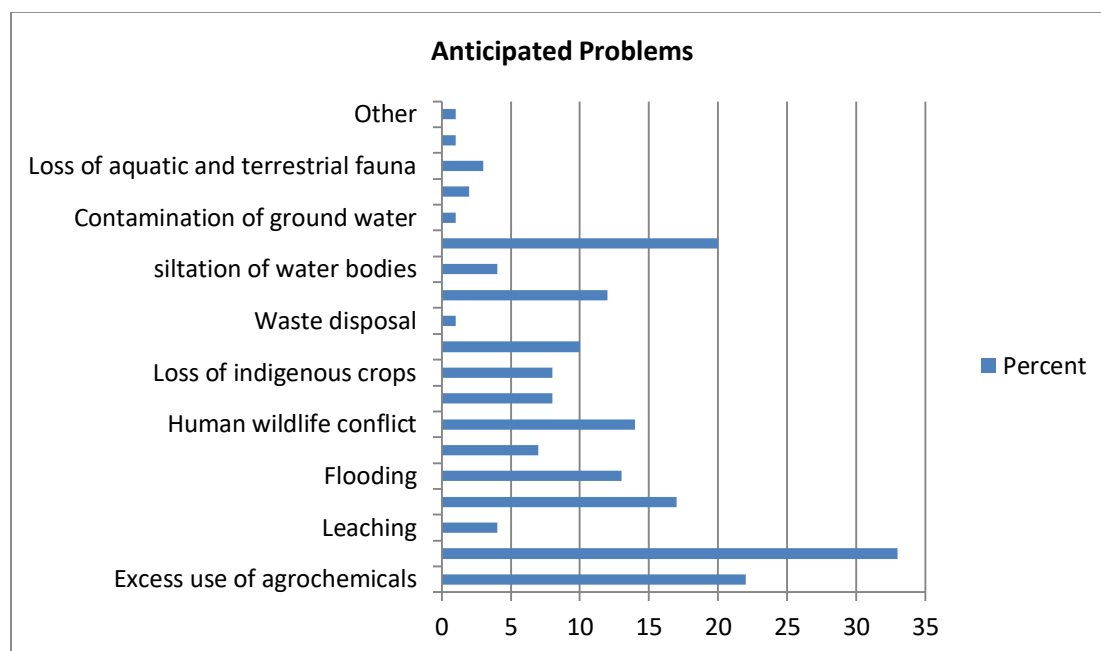


Figure 5-19: Projects' anticipated problems

5.21.4. Mitigation of anticipated environmental problems

In order to mitigate environmental challenges, the actions suggested entail planting trees (27%), fencing Amaya/Amaiya dam (13%), educating the public (21%), minimizing amounts of agrochemicals used (8%), digging terraces (8%), and building gabions (7%).

5.21.5. Preferred crops upon completion of the Amaya/Amaiya dam

Upon completion of the water project Amaya/Amaiya community would prefer to grow vegetables (57%), beans (44%), Maize (72%), potatoes (10%), yams (8%) and water melon (5%).

5.21.6. Potential impacts of having an irrigation scheme

The possible impacts of having an irrigation scheme are increased food security (69%), all year cultivation of crops (31%), improved farming (32%), increased production (28%), and introduction of new crops (7%). Other benefits are better income (6%), challenges of marketing surplus produce (2%), absorption of idle labour (4%) and increased workload (1%).

5.21.7. Other services expected from the irrigation scheme

Half of the households (50%) expect job creation while others expect control of soil erosion (26%), catchment conservation (33%), development of fish farming (13%), and water for livestock (18%), markets (15%), roads (15%), hydropower (9%), and agro-processing (5%).

5.22. Gender Analysis

5.22.1. Women and girls

- ✓ There exists inequality in education attainment between men and women. Cultural practices force young girls into early marriages hence denying them schooling opportunities.
- ✓ Domestic chores such as fetching water from the river, boreholes and springs are mainly done by women. This often consumes a lot of time and energy to women and girls. Girls are also assigned to graze small stock nearby. Mothers build houses and do farming.
- ✓ Girls are considered to be sources of wealth. Bride wealth is paid to fathers in form of cows and are later used to pay bride wealth in case the father or brothers want to marry.
- ✓ Although women are entitled to milk cows and goats, they can be classified among the poor because traditions do not allow them to own assets or properties except those of low value such as chicken.
- ✓ Whenever women are permitted to sell farm produce, they must account all monies to their spouses, and must seek approval of the things they would like to purchase and submit the remaining money for “safe keeping”.
- ✓ In times of drought, women are compelled to dig shallow wells along riverbeds, from where they water goats and fetch water for household uses. Women also go to fetch water for domestic use for 2-8 kilometers away.
- ✓ Women are employed to do casual work and support in feeding the children. However, lack of control of financial resources curtails women participation in social development activities such as merry-go round or other group saving initiatives.
- ✓ Public participation: Women do not openly speak in community meetings unless they are granted permission by men. They are not allowed to make decisions on behalf of the community at large.

5.22.2. The role of males

- ✓ Men are usually concerned about the locations where their livestock can access water and pasture. In order to safeguard livestock, surveillance of security threats preoccupies men most of the times. Men are also engaged in seasonal farm work such as digging and fencing.
- ✓ Making decision about sale or slaughter of animals for food
- ✓ After sale of livestock, men buy household items, pay school fees and uniform their children.
- ✓ Store harvest and control how much food is consumed at any given time.
- ✓ Boys attend school
- ✓ Young men also help in farm work and grazing animals

- ✓ Public participation: can express views in public meetings unhindered and are the ones who make decisions.

5.22.3. Project impacts

- ✓ Provision of domestic water nearer to settlements will reduce distance, save on time and increase accessibility of water to women. This will afford them with time to pursue other opportunities and improve their wellbeing and reduce incidences of miscarriage.
- ✓ During drought, men migrate with livestock in search of pasture and water hence leaving women and children behind without access to milk. Provision of livestock watering points in the vicinity and irrigated farming will help to improve household diet. Also school dropout during dry seasons will be mitigated when piped water from Amaya/Amaiya dam becomes available.
- ✓ Improved health particularly in communities depending on boreholes with excess levels of salt/fluoride and hot water especially in Silale: communities affected after using contaminated water which cause waterborne diseases.
- ✓ Elderly people who could not walk long distances in search of water will have easy access.
- ✓ Having separate water points for livestock and people will help to improve hygiene
- ✓ The dam will reduce flooding which affects movement of people and goods in village along downstream. This will reduce hunger during rainy season and increase mobility of people and access to schools and trading centers.
- ✓ With increased food security, provision of relief food by donor organizations is expected to end.

CHAPTER 6. PROJECT ALTERNATIVES ANALYSIS

6.1. Alternatives for Development

Several alternatives exist to determine whether the proposed works are necessary or not.

6.1.1. “No project alternative”

The first alternative is the NO PROJECT ALTERNATIVE. This alternative describes a situation where the proposed project will not be put up. It is advantageous in that the status quo is maintained and there will be no negative environmental and social impacts from the project, but it would potentially have negative implications on improved food security, water and sanitation provision for the Amaya/Amaiya community.

6.1.2. Alternative location option

The second option, the ALTERNATIVE LOCATION option, suggests that the proposed project may be in a different area. This would mean that the status quo of Amaya/Amaiya community is maintained and there would be no improvement on food security, water and sanitation in the area, meaning that the option is no better than the NO PROJECT ALTERNATIVE. The project proponent, CRVWWDA had identified the project as a key need in the Amaya/Amaiya area.

6.1.3. Different alternative sites option

During reconnaissance survey 6 possible dam sites were explored. Among them, 4 were brought forward for further analysis. Moreover, at the Feasibility Study the Consultant identified 4 more potential sites, based on the available digital elevation model. The 8 sites are summarized in the following Table:

Table 6-1: Alternative dam sites

Feasibility Report Site	Corresponds to:
A	Existing weir, site identified by the Inception Report
B	CRVWWDA tentative location, site identified by the Inception Report
C	Site of a previous NIB Study, identified by the Inception Report
D	Site identified by the desk study
E	Site close to Tararket spring, site identified by the Inception Report
F	Site identified by the desk study, close to Pkurlul/Chepkurlul spring
G	Site identified by the desk study
H	Site identified by the desk study

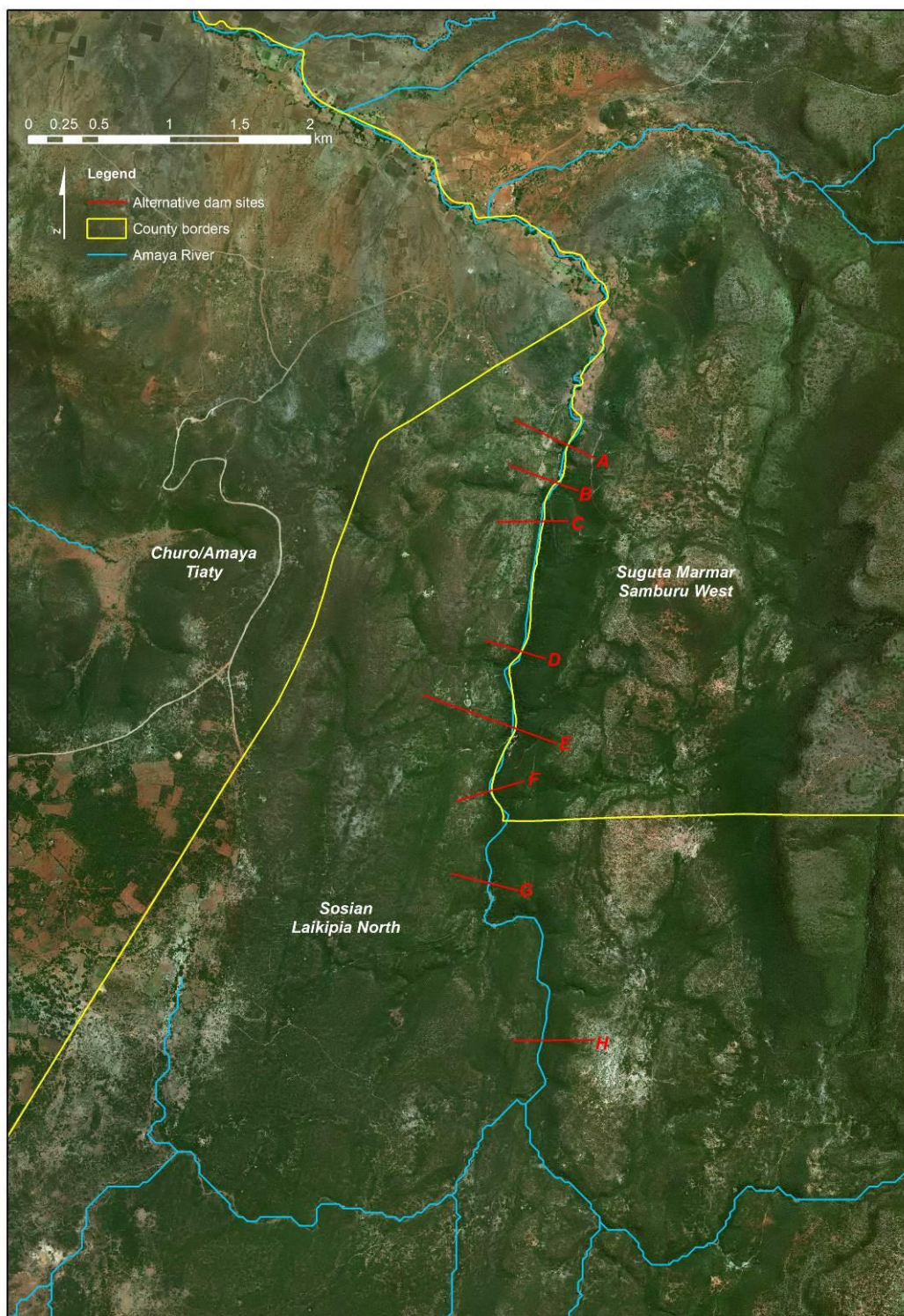


Figure 6-1: Dam sites alternatives

The alternative dam sites were evaluated based on a series of qualitative technical, environmental and socioeconomic criteria, including:

- Dam length and height (and thus embankment volume) for a given reservoir volume;
- Available head for the various uses;

- Land submergence and likely displacement of persons;
- Site accessibility;
- Likely foundation conditions;
- Likely dam type for each site;
- Administrative boundaries at the project site;
- Construction and O&M complexity;
- Acceptance by the local communities;
- Displacement of persons;
- Adaptability to climate change;
- Devegetation due to works' construction;
- Impact on downstream flow regime;
- Impact on aquatic life, flora and fauna;
- Construction and operation side effects, such as noise, vibrations, dust and waste.

Some of these parameters were similar for all alternatives, or could not be accurately evaluated at the feasibility stage, while others differed a lot and were decisive for the final selection.

In terms of geometrical characteristics for the given 10.4 million m³ reservoir storage, locations H, E and G (i.e. the most upstream ones) require lower dams, of relatively smaller lengths with respect to other locations to ensure the required volume. These dams also ensure higher available heads, and thus reduce the need for pumping for the various uses. They are also preferable in terms of the features that will be inundated by the reservoir, as shown below.

Site	Features inundated by the reservoir
A	Houses (limited number), part of the Amaya/Amaiya gorge, Tararket and Pkurlul/Chepkurlul springs, path at the left bank, path crossing the gorge close to the springs
B	Part of the Amaya/Amaiya gorge, Tararket and Pkurlul/Chepkurlul springs, path crossing the gorge close to the springs
C	Part of the Amaya/Amaiya gorge, Tararket and Pkurlul/Chepkurlul springs, path crossing the gorge close to the springs
D	Part of the Amaya/Amaiya gorge, Tararket, Pkurlul/Chepkurlul and part of Chepinyiny springs, path crossing the gorge close to the springs
E	Part of the Amaya/Amaiya gorge, Tararket, Pkurlul/Chepkurlul and Chepinyiny springs, path crossing the gorge close to the springs
F	Limited part of the Amaya/Amaiya gorge, Pkurlul/Chepkurlul and Chepinyiny springs, limited parts of paths
G	Limited part of the Amaya/Amaiya gorge, Chepinyiny springs, limited parts of paths
H	Small part of the Amaya/Amaiya gorge, limited parts of paths

The upstream dam locations, and particularly Site H, are most favourable in terms of technical and, possibly, social and environmental criteria. The most important factor is that the dam height at Site H is much lower than in other locations for the given reservoir volume of 10.4 million m³. An additional reason for its selection is that it is the most upstream site, ensuring higher elevation for the operation of the project networks and thus reducing the needs for pumping. A third reason for its selection is the environmental advantages that it presents, as the bigger part of the Amaya/Amaiya River gorge, as well as the river springs inside the gorge, are not affected by the works. According to the Consultant's proposals, in case the outcomes of the site surveys rendered the construction of a dam at this location impossible, Sites E or G could also be considered.

6.1.4. Different dam types alternatives

The most common dam types, whose applicability depends on geological considerations, technical limitations and availability of construction materials on site, are the following:

- A **homogenous dam**, provided that ample quantities of fine material originating from weathered bedrock exist on the side slopes of the wider area. This material is usually sandy and silty and can be used for construction of the embankment of a homogenous dam.
- A **zoned earthfill dam with clay core**, provided that clay material is also found in the area close to the site, in addition with the fine weathered sandy and silty materials
- A **concrete or stone masonry gravity dam**, which is applicable in cases of good quality rock for dam foundation, provided that the suitable bedrock is found almost at the ground surface of the riverbed.

6.1.5. Selected dam type for Amaya/Amaiya

A zoned rockfill dam with clay core, which requires the existence of clay and good quality rock that lies close to the ground surface. An earthfill or rockfill dam appear to be the most suitable options for the Amaya/Amaiya area, provided that suitable materials for clay core are found in the vicinity of the construction site. Based on the preliminary evaluation of the gorge geology, the abundant bedrock will allow for the construction of a rockfill dam, which is preferred due to the steeper slopes and, thus, smaller embankment volumes.

CHAPTER 7. POTENTIAL ENVIRONMENTAL AND SOCIAL IMPACTS AND PROPOSED MITIGATION MEASURES

7.1. Introduction

This chapter highlights the impacts the proposed project will have on the environmental, social and health components of Amaya/Amayia area. All the phases of the project namely Pre-construction, construction, operation and decommissioning phase are evaluated for both positive and negative impacts. This is because these impacts are interlinked and any fault in one component will affect all the other phases of the project. Both positive and negative impacts are anticipated from the proposed project. Positive impacts should be enhanced through enhancement measures while negative impacts should be mitigated to reduce them.

After the impact were identified and assessed, suitable mitigation measures have been defined to reduce or totally avoid the impacts. Mitigation measures were proposed based on national requirements, best practices, preliminary stakeholders' views, ESIA experts' advice, and according to the following mitigation hierarchy:

- avoid as much as possible;
- where avoidance is not possible, minimize following best practices;
- where minimization is not sufficient, mitigate through specific measures;
- where mitigation is not sufficient, compensate for residual risks and impacts.

7.1.1. Impact assessment scoring

To systematically identify, predict, evaluate and determine the significance of impacts resulting from the project construction and operation, generic criteria developed by Haug et al (1984) were adopted. Precautionary principle was used to establish the significance of impacts and their management and mitigation i.e. where there is uncertainty or insufficient information, the Environmentalist erred on the side of caution.

Table 7-1: Impact significance rating criteria

SEVERITY OF IMPACT	RATING	CONSEQUENCE
Insignificant / non-harmful / less beneficial	-1/ +1	
Small/ Potentially harmful / Potentially beneficial	-2/ +2	
Significant / slightly harmful / Significantly beneficial	-3/ +3	
Great/ harmful / beneficial	-4/ +4	
Disastrous/ extremely harmful / extremely beneficial	-5/+5	
DURATION OF IMPACT	RATING	
One day to one month	-1/ +1	
One month to one year	-2/ +2	
One year to ten years	-3/ +3	
Life of operation	-4/ +4	
Post closure	-5/+5	

SCOPE OF IMPACT		RATING	LIKELIHOOD
Activity specific		-1/ +1	
Right of way specific (within right way)		-2/ +2	
Local area (within 5km of the project)		-3/ +3	
Regional		-4/ +4	
National		-5/+5	
FREQUENCY OF ACTIVITY / DURATION OF ACTIVITY		RATING	
Annually or less / low		-1/ +1	
6monthly / temporary		-2/ +2	
Monthly / infrequent		-3/ +3	
Weekly/ life operation/ regularly / likely		-4/ +4	
Daily / permanent / high		-5/+5	
FREQUENCY OF IMPACT		RATING	
Almost never/ almost impossible		-1/ +1	
Very seldom / highly unlikely		-2/ +2	
Infrequent / unlikely/seldom		-3/ +3	
Often / regularly/ likely/ possible		-4/ +4	
Daily / highly likely/ definitely		-5/+5	

Table 7-2: Significance rating matrix

CONSEQUENCE (Severity+ Spatial Scope + Duration)															
LIKELIHOOD (Frequency of activity + frequency of impact)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30
	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45
	4	8	12	16	20	24	28	32	36	40	44	48	52	56	60
	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75
	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90
	7	14	21	28	35	42	49	56	63	70	77	84	91	98	105
	8	16	24	32	40	48	56	64	72	80	88	96	104	112	120
	9	18	27	36	45	54	63	72	81	90	99	108	117	126	135
	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150

Table 7-3: Mitigation ratings

Significance Ratings	Value	Negative Impact Management Recommendation	Positive Impact Management Recommendation
Very High	126-150	Improve proposed management	Maintain proposed management
High	101-125	Improve proposed management	Maintain proposed management
Medium - High	76-100	Improve proposed management	Maintain proposed management
Low - Medium	51-75	Maintain proposed management	Improve proposed management
Low	26-50	Maintain proposed management	Improve proposed management
Very low	1-25	Maintain proposed management	Improve proposed management

7.2. Potential Positive Impacts

7.2.1. Pre-construction phase

During this phase, the following occurs: community sensitization and organization; development and agreement of protocols and processes with communities; mobilization of equipment, land clearing, access road construction, set-up of workers camps, recruitment). This section presents the potential positive impacts at pre-construction stage which need to be enhanced during the other phases of the project. The section also discusses the negative impacts anticipated to occur at the onset of project activities including pre-construction. Mitigation measures are also proposed in this section based on information on the preferred state of environment by the lead agencies, communities, and international best practice standards.

Enhanced environmental and social awareness of the community

Community members will be trained in preparation for the proposed project inception; preparation of the contractors team, especially the work groups / camps on social responsibilities and policies and laws related to the interaction of the work teams with the communities; minimum standards that should be adhered to by the contractors; institutions that will regulate / arbitrate as well as those that will monitor any issues between the communities and the contractor. Set up of a local monitoring team; all of which will improve the outlook of the community members.

Increased land value

Due to the presence of the project, the area will open up, there will be water and electricity. Land value will appreciate, and more people may settle there in opening the area for more development activities.

Impact Analysis

Impact without Mitigation	
Severity of impact	+4
Spatial scope of impact	+4
Duration of impact	+4
Frequency of activity / duration of activity	+3
Frequency of impact	+4
Result	+84 medium to high

It is recommended that:

- There should be capacity building of the community members to avoid careless selling of the land
- There should be Involvement of local administration in the area for any land transaction

Recruitment/employment of local communities during the preconstruction and community mobilization

Local people will be engaged to provide labor during construction activities and some of them will be involved in community mobilization. Income generating activities for the locals will arise due to the number of people involved in the project

Impact Analysis

Impact without Mitigation	
Severity of impact	+5
Spatial scope of impact	+3
Duration of impact	+3
Frequency of activity / duration of activity	+5
Frequency of impact	+4
Result	+99 medium to high

It is recommended that:

- Priority should be given to residents of the communities within close proximity to the project site;
- Equal treatment of men and women should be emphasized during the employment process; Guidelines to ensure equal opportunities and fair treatment should be set in place; as well as monitoring processes.

No children will be hired on the project for any work in keeping with the International Labor Organization, (ILO) Convention No. 138, (1973), that defines the minimum age of employment and the Labour Act. This will include indirect forms of using child labour such as using products produced through child labour off the site.

Licenses and permits

Abstraction permits are paid for, so there will be local revenue generated to the government.

Land compensation

Land allocated to the dam may attract compensation from the developer and this could be used to improve social infrastructure for the community. Land that has individual ownership may attract individual compensation, which will bring in income for the people concerned. In addition, the value of the land will appreciate.

Impact Analysis

Impact without Mitigation	
Severity of impact	+5
Spatial scope of impact	+4
Duration of impact	+5
Frequency of activity / duration of activity	+5
Frequency of impact	+5
Result	+140 very high

It is recommended that:

- Based on recommendations of Resettlement Action Plan, the People Affected by the Project, should be compensated.
- Community members receiving compensation should be capacity built to explore other sources of livelihood and business opportunities.

Social cohesion

The community members will be capacity built creating awareness and making them more enlightened. There will be increased community joint activities and possibly cohesion and interaction with local leaders.

Impact Analysis

Impact without Mitigation	
Severity of impact	+5
Spatial scope of impact	+5
Duration of impact	+5
Frequency of activity / duration of activity	+4
Frequency of impact	+4
Result	+120 high

7.2.2. Construction phase

Employment

During construction of the dam, job opportunities both skilled, semi-skilled and unskilled labour opportunities will arise in supervising the works, earth moving works, construction of power generator house, toilets and cattle troughs. This will lead to economic empowerment of the locals since unskilled labor will be used in laying of pipes works and transport of construction materials, semiskilled labour in construction and highly skilled labour in engineering. Socially community members will be engaged in productive employment. This positive social change in the social behavior will be one of the anticipated transformational indicators in the project area.

Impact Analysis

Impact without Mitigation	
Severity of impact	+4
Spatial scope of impact	+4
Duration of impact	+5
Frequency of activity / duration of activity	+5
Frequency of impact	+4
Result	+135 very high

It is recommended that:

- Local people should be given priority during the recruitment process unless the expertise needed is not available locally
- There should be gender mainstreaming in recruitment opportunities
- During recruitment there should be a balance in opportunities allocation among the different ethnic communities

Growth of local economy

During construction huge sums of the project money shall be released into the local economy due to the construction activities, the hired persons will get money and get greater purchasing power of local goods and services. Business opportunities in the local areas will improve through purchases of construction materials, food and accommodation services.

Impact Analysis

Impact without Mitigation	
Severity of impact	+4
Spatial scope of impact	+4
Duration of impact	+3
Frequency of activity / duration of activity	+4
Frequency of impact	+4
Result	+88 medium to high

It is recommended that:

- Business opportunities such as provision of food to construction workers should be left for the local communities.

Creation of market for construction materials

The project will require materials, some of which will be sourced locally within the project area. This includes ballast, sand and hardcore for the construction of the structures that are necessary for the dam including cattle troughs, latrines and bathrooms etc. The constructor should ensure that local suppliers are given first priority in supply of construction materials.

Impact Analysis

Impact without Mitigation	
Severity of impact	+4
Spatial scope of impact	+3
Duration of impact	+3
Frequency of activity / duration of activity	+4
Frequency of impact	+4
Result	+80 medium to high

It is recommended that:

- Locally available materials needed for construction should be sourced from the local community.

Increase in land value

Land in Amaya/Amaiya is fertile but lack of water has limited its usefulness. Once the community has heard about the water project, investors will be interested in buying land in the area for development purposes. Due to construction of the dam, increment of the price of lands located in the surroundings of the reservoir will be advantage to the community.

Impact Analysis

Impact without Mitigation	
Severity of impact	+4
Spatial scope of impact	+5
Duration of impact	+5
Frequency of activity / duration of activity	+5
Frequency of impact	+4
Result	+126 very high

It is recommended that:

- Involving the local administration such as chiefs in all land transactions
- Avoiding middlemen during land transactions
- Capacity building of the community to avoid reckless sale of land.

Reduction of poverty

Reduction in poverty levels at the household level due to income earning during construction.

Impact Analysis

Impact without Mitigation	
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Severity of impact	+5
Spatial scope of impact	+3
Duration of impact	+3
Frequency of activity / duration of activity	+5
Frequency of impact	+5
Result	+110 high

7.2.3. Operation phase

Increased water supply

Construction of the dam will greatly enhance all year provision of domestic treated water and untreated water for livestock and wild animals. The dam will also trap flood water and release water in a controlled way to Amaya/Amaiya River greatly increasing the water supply in the area.

Impact Analysis

Impact without Mitigation	
Severity of impact	+5
Spatial scope of impact	+4
Duration of impact	+5
Frequency of activity / duration of activity	+4
Frequency of impact	+5
Result	+126 very high

Efficiency in water harvesting and use

There will be improved efficiency in water harvesting during wet seasons. This water will be arrested in dams and used during dry seasons / scarcity.

Impact Analysis

Impact without Mitigation	
Severity of impact	+5
Spatial scope of impact	+4
Duration of impact	+4
Frequency of activity / duration of activity	+4
Frequency of impact	+5
Result	+117 high

Improved livelihoods

The residents of the area will be enabled to diversify their socio-economic activities from pastoralism to agro-pastoralism and business ventures, thus improving their livelihoods.

Impact Analysis

Impact without Mitigation	
Severity of impact	+3
Spatial scope of impact	+3
Duration of impact	+4
Frequency of activity / duration of activity	+4
Frequency of impact	+4
Result	+80 medium to high

Human settlement

The residents of the area are mostly nomadic pastoralists moving from one place to another during drought. Due to the presence of the dam, the community may opt to set up and build permanent homes in the locality and this will lead to development of the area due to development of social infrastructure.

Impact Analysis

Impact without Mitigation	
Severity of impact	+3
Spatial scope of impact	+4
Duration of impact	+4
Frequency of activity / duration of activity	+4
Frequency of impact	+4
Result	+88 medium to high

Improved food security

Construction of the dam will improve the quality of livestock by reducing trekking distance hence improve growth rate and fattening of beef cattle and higher milk production generating higher income. The community members can farm on kitchen gardening throughout the year. This will enhance food security and improved nutrition and health of the local people.

Impact Analysis

Impact without Mitigation	
Severity of impact	+3
Spatial scope of impact	+3
Duration of impact	+4
Frequency of activity / duration of activity	+3
Frequency of impact	+4
Result	+70 low to medium

Tree nurseries

The nursery plot will give skills to pastoralists on tree planting.

Impact Analysis

Impact without Mitigation	
Severity of impact	+3
Spatial scope of impact	+2
Duration of impact	+4
Frequency of activity / duration of activity	+4
Frequency of impact	+4
Result	+72 low to medium

Improved well-being of women and children

In Amaya/Amaiya region, the burden of fetching water for domestic use and watering livestock at a household level is left to the women. This leaves them with very little time to engage in other development activities and compromises on their health and wellbeing.

Availability of water through the dam will free children to attend classes hence improving school attendance. Time saved by women can enable them attend to other engagements that could bring financial benefits to the family.

Impact Analysis

Impact without Mitigation	
Severity of impact	+5
Spatial scope of impact	+3
Duration of impact	+4
Frequency of activity / duration of activity	+4
Frequency of impact	+5
Result	+108 high

Poverty reduction and increased incomes

Availability of water for livestock and fodder will enhance the growth rate and fattening ability of livestock, making them fetch better prices in the market. This will in effect lead to improved living standards of the local community, hence alleviating poverty.

Impact Analysis

Impact without Mitigation	
Severity of impact	+3
Spatial scope of impact	+4
Duration of impact	+4
Frequency of activity / duration of activity	+4
Frequency of impact	+4
Result	+88 medium to high

Improved gender parity

Capacity development engagements will be as gender sensitive as possible and will ensure gender mainstreaming in the project activities. Equal access to and control of resources may result since women will gain power and improve their position in the community.

Impact Analysis

Impact without Mitigation	
Severity of impact	+3
Spatial scope of impact	+3
Duration of impact	+3
Frequency of activity / duration of activity	+4
Frequency of impact	+4
Result	+54 low to medium

Enhanced knowledge

The project will link up to other line ministries and organizations with expertise in health and hygiene. This will in particular contribute to increased knowledge of transmission and prevention of HIV/AIDs and water borne diseases such as malaria and typhoid.

Impact Analysis

Impact without Mitigation	
Severity of impact	+2
Spatial scope of impact	+3
Duration of impact	+4
Frequency of activity / duration of activity	+3
Frequency of impact	+4
Result	+63 low to medium

Decreased in waterborne diseases

Treated drinking water supply will lead to a decrease in waterborne diseases due to availability of clean water for drinking.

Impact Analysis

Impact without Mitigation	
Severity of impact	+3
Spatial scope of impact	+3
Duration of impact	+4
Frequency of activity / duration of activity	+4
Frequency of impact	+4
Result	+80 medium to high

Flood control

Flood control was one of the objectives of the proposed project. After the inception of the project, flood control will be achieved and the community will not suffer devastation and havoc they currently experience during floods.

Impact Analysis

Impact without Mitigation	
Severity of impact	+5
Spatial scope of impact	+4
Duration of impact	+4
Frequency of activity / duration of activity	+5
Frequency of impact	+5
Result	+130 very high

Minimization of possible conflicts

Implementation of the project will lead to decrease or elimination of any conflicts in the area arising from scarce water resources for the inhabitants, their livestock and wild animals. Construction of the dam will also ensure that all communities in the area have access to clean water all year round for domestic use and for their livestock. This will be a huge positive social impact for the community as there will be minimal hostility between them allowing the communities to flourish. This will be an impact that will be evident years after completion of the proposed project.

Impact Analysis

Impact without Mitigation	
Severity of impact	+5
Spatial scope of impact	+4
Duration of impact	+4
Frequency of activity / duration of activity	+5
Frequency of impact	+5
Result	+130 very high

Contribution to the flora, fauna and micro-climate

The availability of water at the area will support various projects that include tree nurseries and kitchen gardening. The dam water and the sustenance of dry season flows shall greatly enhance the micro-climate within the area. Flora and fauna species may flourish. Opportunities for agro-forestry and planting of indigenous varieties will arise.

Impact Analysis

Impact without Mitigation	
Severity of impact	+2
Spatial scope of impact	+3
Duration of impact	+4
Frequency of activity / duration of activity	+4
Frequency of impact	+4
Result	+72 low to medium

Hydropower generation

The Amaya/Amaiya dam may allow for generation of hydro power which will be useful for the local communities. The project area currently lacks sufficient electricity; with the Amaya/Amaiya dam the locals will have access to electricity as well as clean source of energy which in turn will improve their livelihood. This will also encourage industrialization in the area because with a source of energy companies can easily set up shops in the area.

Source of green energy

Impact Analysis

<i>Impact without Mitigation</i>	
Severity of impact	+2
Spatial scope of impact	+2
Duration of impact	+4
Frequency of activity / duration of activity	+4
Frequency of impact	+4
Result	+64 low to medium

Enhance security in the area

The proposed project will enhance security in that the area will be connected with street lights and security lights.

Impact Analysis

<i>Impact without Mitigation</i>	
Severity of impact	+2
Spatial scope of impact	+3
Duration of impact	+4
Frequency of activity / duration of activity	+4
Frequency of impact	+4
Result	+72 low to medium

Ensure growth and development of the area

For an area to develop and grow security and power supply play a key role, therefore the proposed project will be a great advantage in developing the area.

Impact Analysis

<i>Impact without Mitigation</i>	
Severity of impact	+2
Spatial scope of impact	+2
Duration of impact	+3
Frequency of activity / duration of activity	+4
Frequency of impact	+3
Result	+49 low

Improve personal grooming of the community around the electricity coverage area

The proposed project will improve personal grooming in that people will be able to iron their clothes without much of a hustle and taking hot showers.

Impact Analysis

Impact without Mitigation	
Severity of impact	+2
Spatial scope of impact	+3
Duration of impact	+3
Frequency of activity / duration of activity	+3
Frequency of impact	+3
Result	+48 low

Power connection for the nearby households

The proposed project will ensure that the households in the area are connected with electricity.

Impact Analysis

Impact without Mitigation	
Severity of impact	+2
Spatial scope of impact	+2
Duration of impact	+4
Frequency of activity / duration of activity	+4
Frequency of impact	+4
Result	+64 low to medium

Enable farmers to increase productivity and save time

This will be achieved through using new farming techniques and machines, e.g. milk cooling machines, milking machines, poultry incubators and animal feed crushing machines. Farmers now have farming machines that have eased their work, but most of the machinery requires electricity for them to operate therefore the proposed project will enable the farmers to practice current trends of farming.

Impact Analysis

Impact without Mitigation	
Severity of impact	+2
Spatial scope of impact	+3
Duration of impact	+4
Frequency of activity / duration of activity	+4
Frequency of impact	+4
Result	+72 low to medium

Enable the community to pump water from boreholes

Some of the community members have dug boreholes and, due to lack of electricity, they need to draw water manually which is not only dangerous but also very tiring. The proposed project will ensure that the water is pumped directly to their houses.

Impact Analysis

Impact without Mitigation	
Severity of impact	+3
Spatial scope of impact	+3
Duration of impact	+4
Frequency of activity / duration of activity	+4
Frequency of impact	+2
Result	+60 low to medium

Boost the residents' knowledge and awareness by listening and watching news

Watching television and listening to radio will boost the knowledge of the residents as well as enlighten them on current affairs.

Impact Analysis

Impact without Mitigation	
Severity of impact	+3
Spatial scope of impact	+2
Duration of impact	+2
Frequency of activity / duration of activity	+4
Frequency of impact	+3
Result	+49 low

7.2.4. Decommissioning phase

Decommissioning refers to the formal process of removing something from the operational status once the project cycle is complete or if it is in a dilapidated state or has operated at a gross loss over a long period of time.

The Amaya/Amaiya dam water development project can be decommissioned when the design period ends or due to one of the following reasons:

- ✓ The water source may become inadequate due to unexpected change in climate rendering the project inefficient
- ✓ Dilapidation of infrastructure overtime

Under these circumstances, the proponent will demolish all the structures remove the salvage materials and restore the sections affected to the original state.

These activities would present similar impacts to those during construction, but of less magnitude. On decommissioning of the project, the powerhouse facilities, irrigation pipes, domestic water treatment plant, water meters, equipment stores, equipment and machinery, and worker camps will need to be safely and securely removed and the areas stabilized to minimize risks of release to the environment of toxic or polluting materials.

Recyclable materials

The resultant waste should be sorted into re-recyclables and non-recyclables before disposal at the designated site in accordance to NEMA regulations on solid waste. The recyclables, e.g. pump sets, GI pipes, plastic materials could be reused in new projects or sold to recyclers.

Impact Analysis

Impact without Mitigation	
Severity of impact	+3
Spatial scope of impact	+2
Duration of impact	+2
Frequency of activity / duration of activity	+2
Frequency of impact	+2
Result	+28 low

Creation of jobs

For demolition to take place properly and in good time a source of labour is needed and several people will be involved. As a result several employment opportunities will be created for the demolition during the decommissioning phase of the proposed irrigation infrastructure.

Impact Analysis

Impact without Mitigation	
Severity of impact	+2
Spatial scope of impact	+2
Duration of impact	+2
Frequency of activity / duration of activity	+2
Frequency of impact	+3
Result	+30 low

Site restoration

Upon decommissioning of the proposed project, rehabilitation of the project sites will be carried out to restore the site to its original status or to a better state than it was originally. This will include replacement of topsoil and re-vegetation which will lead to improved visual quality of the area. Landscaping of the area may be done.

Impact Analysis

Impact without Mitigation	
Severity of impact	+4
Spatial scope of impact	+2
Duration of impact	+3
Frequency of activity / duration of activity	+3
Frequency of impact	+3
Result	+54 low to medium

7.3. Potential Negative Impacts

7.3.1. Pre-construction phase

Displacement of persons

Some benefiting and non-beneficiary people living adjacent to the proposed dam area will be displaced from their land/habitation due to the dam and reservoir construction and to give wayleaves for pipes and electricity pylons and power transmission wires.

Impact Analysis

Impact without Mitigation	
Severity of impact	-1
Spatial scope of impact	-3
Duration of impact	-2
Frequency of activity / duration of activity	-2
Frequency of impact	-3
Result	-30 low

Mitigation:

A Resettlement Action Plan study (RAP) has been carried out to identify, document and assess assets of Persons Affected by the Project (PAPs). The PAPs will have to be adequately compensated before commencement of the project.

Restriction of land use and land rights

Easement of the land where the dam, irrigation demonstration farms and power transmission transverse (the way leave) will result to a change of use of land and the changes is long term. This will affect the community land use rights and this is also long term.

Impact Analysis

Impact without Mitigation	
Severity of impact	-1
Spatial scope of impact	-2
Duration of impact	-2
Frequency of activity / duration of activity	-2
Frequency of impact	-2
Result	-20 low

Mitigation:

A RAP has been carried out to document the people affected by the project, so as to adequately compensate them.

Change in land ownership patterns from communally to individually owned land parcels

The proposed development project is likely to lead to changes in local land holding patterns as a result of the requirement that land must be fully and legally registered for any compensation to take place.

Impact Analysis

Impact without Mitigation	
Severity of impact	-1
Spatial scope of impact	-2
Duration of impact	-4
Frequency of activity / duration of activity	-1
Frequency of impact	-3
Result	-28 low

Traffic flows

The pre-construction phase will entail material haulage that will put varying numbers of heavy trucks on the main roads to the project area.

Impact Analysis

Impact without Mitigation	
Severity of impact	-1
Spatial scope of impact	-1
Duration of impact	-2
Frequency of activity / duration of activity	-1
Frequency of impact	-3
Result	-16 very low

Mitigation:

- The developer will plan vehicle routes to target low traffic hours
- Ensuring the visibility of personnel through their use of high visibility vests when working in or walking through heavy equipment operating areas, and training of workers to verify eye contact with equipment operators before approaching the operating vehicle;
- Ensuring moving equipment is outfitted with audible back-up alarms;
- Using inspected and well-maintained lifting devices that are appropriate for the load, such that there are no breakdowns in the middle of the road;
- Contractor shall provide temporary road signage during construction and ensure drivers observe speed limits and for safety of other road users.
- Establish and clearly mark entry and exit points; and sensitize the truck operators on the exit and entry points;
- There should be a person guiding traffic especially where there are diversions.

Artificial pricing of land

There could be also artificial pricing of land making land very expensive and many local people will be tempted to sell off their land and land ownership may not favor the poor who cannot afford it. Rich people could amass land at the expense of their poor neighbors. This may also lead to conflicts in families over land.

Impact Analysis

Impact without Mitigation	
Severity of impact	-2
Spatial scope of impact	-3
Duration of impact	-2
Frequency of activity / duration of activity	-2
Frequency of impact	-3
Result	-35 low

Mitigation:

During pre-construction stage, capacity building of the community should be done so that the community will not sell land carelessly due to the rue of money. The community should be guided on the reasonable value of their land and the amount that they can sell should be limited. There should be collaboration between the local government and the local leaders in the area to protect the community from exploitation. According to the land Act 2013; 39(a) The state shall recognize customary tenure in its own form to be at par (same level) with other tenure systems; (b) the state shall establish a land registry system for the registration of land rights under customary tenure. An important strategy defined under the Act is to issue certificates of Title of Customary ownership based on a customary land registry that confers rights equivalent to freehold tenure; and document customary land tenure rules applicable to specific communities at the district or sub-county levels. These strategies can be triggered to mitigate some of the issues identified above.

Devegetation due to access road construction

To create access roads, vegetation in the project area will be cleared. This may lead to loss of indigenous plants, threatened and vulnerable species.

Impact Analysis

Impact without Mitigation	
Severity of impact	-2
Spatial scope of impact	-2
Duration of impact	-2
Frequency of activity / duration of activity	-2
Frequency of impact	-3
Result	-30 low

Mitigation:

- There should be minimal disturbance especially of indigenous vegetation and agro forestry should be encouraged after commencement of the project. Any endangered

species can be identified in the area during this time and attention drawn to them.

- While opening new areas for access, the top soil shall be stockpiled and preserved for future restoration use;
- The developer will utilize existing transport corridors whenever possible;
- Seeds should be collected from seeding plants, for planting in alternate areas including upstream of the project / in the project catchment area.

Noise and vibration generation from mobilization of equipment

Before construction work commences, heavy trucks moving equipment and materials in preparation for the construction will generate a considerable amount of noise and vibration within the area. This will lead to varying degrees of disturbance to the people and wildlife.

Impact Analysis

Impact without Mitigation	
Severity of impact	-4
Spatial scope of impact	-3
Duration of impact	-3
Frequency of activity / duration of activity	-4
Frequency of impact	-4
Result	-80 medium to high

Mitigation:

- Sound-control devices on equipment should be maintained in good condition. Regular servicing of equipment and machinery shall be emphasized.
- Appropriate and sufficient PPE for noise protection shall be provided to all workers and visitors to highly active sites;
- Movement of the heavy machinery should be limited only to day time, e.g. 6 am to 7 pm;
- The contractor shall be required to obtain a license in case there is emission of noise beyond the permissible noise levels.
- Adhere to the acceptable speed limits;
- Selecting equipment with lower sound power levels and installing suitable mufflers on engine exhausts;
- The developer will limit the hours of operation for specific pieces of equipment and operations;
- Re-locating noise sources to less sensitive areas to take advantage of distance and shielding will be employed in as far as applicable;

After the application of the above mitigations, the impact magnitude from the mobilization of equipment is expected to be bearable. The proponent should also develop a mechanism to

record and respond to any issues that the community may raise.

7.3.2. Construction phase

Loss of land and need for resettlement

The project is composed of the dam area, the reservoir and irrigation area. The People Affected by the Project will have to cede their land for development. Both permanent and semi-permanent houses have been found in the area. Some PAPs have not built on their land but their land will have to be ceded for development.

Impact Analysis

Impact without Mitigation	
Severity of impact	-3
Spatial scope of impact	-3
Duration of impact	-5
Frequency of activity / duration of activity	-5
Frequency of impact	-5
Result	-110 high

Mitigation:

- Before the project commences, the PAPs should be fully compensated for the loss of their land and assets.
- Where Resettlement is needed, the County Governments of Laikipia, Baringo and Samburu should take lead in acquisition of land for Resettlement.

Loss of biodiversity

The proposed project will involve clearing of vegetation cover especially in the dam site. The dam will be created across a natural water way that supports pastures especially grass, there are few scattered indigenous trees in and around the water way. This makes the surrounding environment fragile and susceptible to soil erosion.

Impact Analysis

Impact without Mitigation	
Severity of impact	-3
Spatial scope of impact	-2
Duration of impact	-3
Frequency of activity / duration of activity	-2
Frequency of impact	-3
Result	-40 low

Mitigation:

- Only minimal bush clearing should be allowed;
- Excavations of the site will be confined only the necessary areas.
- Excavated earth will be disposed away from locations of the site not susceptible to surface runoff of storm water;
- The earth removed for external disposal will require to be deposited on sites without the risk of being washed down during rains and where it will not compromise other land use activities in those areas; and
- Re-plant indigenous trees on the area that will be cleared to reduce soil erosion.

Contamination of groundwaters

Waste storage areas for the construction crew may leak nutrients and biological pollutants into ground water resources. Other sources of pollution maybe spoil storage areas on site for contaminated soils. Storage areas for fuels may also lead to leaching of vast amounts of toxic heavy metals to below ground water resources.

Impact Analysis

Impact without Mitigation	
Severity of impact	-2
Spatial scope of impact	-2
Duration of impact	-2
Frequency of activity / duration of activity	-2
Frequency of impact	-3
Result	-30 low

Mitigation:

- Waste collection points for workers at the construction site will be located out of the high water-table sections of the area;
- All waste areas will be banded during temporary storage to prevent pollutant leaching to below ground water resources;
- All effluent and wastewater shall be assessed to comply with national discharge standards before discharge into the environment;
- The wastewater containing oil will be collected in the catch pit and treated in the oil separator as required before discharge.

The camp buildings should be equipped with a domestic sewage purification system.

Land submergence

This is to create a dam in the area. This may lead to displacement of some people, loss of aesthetic value of land and loss of rights to use the land.

Impact Analysis

Impact without Mitigation	
Severity of impact	-2
Spatial scope of impact	-2
Duration of impact	-4
Frequency of activity / duration of activity	-4
Frequency of impact	-2
Result	-24 very low

Mitigation:

The impacts of submerging a part of the land may be addressed through:

- Compensating the affected persons / community for the submerged land;
- Supporting tree planting in beneficiaries' farms;
- Planting water friendly trees;
- Sensitizing farmers on soil, land, waters and trees conservation;
- Enhance agro-forestry campaigns in the area;
- Identifying and supporting alternative activities such as bee keeping in the area.

Air emissions and air quality**Gaseous emissions**

Emissions associated with combustion of fuel from the construction vehicles and equipment. These emissions may be in the form of oxides of nitrogen as well as volatile organic carbons. Similar to other combustion processes, emissions from vehicles include CO, NO_x, SO₂, and VOCs. Emissions from the construction vehicles should comply with national or international standards.

Impact Analysis

Impact without Mitigation	
Severity of impact	-3
Spatial scope of impact	-3
Duration of impact	-2
Frequency of activity / duration of activity	-4
Frequency of impact	-3
Result	-56 low to medium

Mitigation:

- Regardless of the size or type of vehicle, operators should implement the manufacturer recommended engine maintenance plans;
- Drivers should be instructed on the benefits of driving practices that reduce both the risk of accidents and fuel consumption, including measured acceleration and driving within safe speed limits;
- Contractors should consider additional ways to reduce potential impacts including implementing a regular vehicle maintenance and repair plan.
- Recruit staff from the surrounding communities to decrease the travelling distance thus reducing emissions from vehicular traffic.
- Ensure that all vehicles involved in the transport of construction material and staff, and machinery involved in the construction is properly maintained and serviced.
- Machines must not be left idling for unnecessary periods of time; this will save fuel and reduce emissions.

Dust pollution

The most common pollutant involved in fugitive emissions is dust. This is released during certain operations, such as transport and open storage of solid materials, and from exposed soil surfaces, including unpaved roads.

Impact Analysis

<i>Impact without Mitigation</i>	
Severity of impact	-4
Spatial scope of impact	-3
Duration of impact	-2
Frequency of activity / duration of activity	-4
Frequency of impact	-4
Result	-72 low to medium

Mitigation:

- Use of dust control methods, such as covers, water suppression, or increased moisture content for open materials storage piles, or controls;
- Ensure that all material (sand and aggregate) stockpiled on the site to be used in construction activities are regularly sprayed to reduce the effects of wind whipping.
- Ensure that all trucks carrying aggregate and sand are covered during delivery to the site.
- Care must be taken in the unloading construction materials (aggregate, sand and cement) to prevent spillage. If a spill occurs, this should be cleaned up as soon as possible thereafter.

- Extra care must be taken to reduce dust in periods when wind speed is greatest, and the rainfall amounts are lowest. This will involve extra wetting of the construction area to suppress dust particles.
- Retain a buffer area of trees and other vegetation generally around the perimeter of the dam site which will serve as a natural windbreak which may reduce the level of dispersion of dust particles generated during this phase of the development.
- All raw materials must be sourced as close as possible to the construction site thus reducing the emissions from vehicular traffic.
- All waste must be transported off-site for processing, not burnt or stored for any longer than is absolutely necessary.

Soil erosion

The activities involved in the construction phase of the development had a major negative short-term impact on soil. This is due to the removal of vegetation from the dam area which will leave considerable areas of soil exposed to the elements, which may result in soil erosion. Heavy machinery will be traversing the site due to the construction activities this may lead to soil compaction and erosion of the soil.

Impact Analysis

Impact without Mitigation	
Severity of impact	-2
Spatial scope of impact	-2
Duration of impact	-2
Frequency of activity / duration of activity	-2
Frequency of impact	-2
Result	-24 low

Mitigation:

- Only remove vegetation from areas for the dam construction;
- Install appropriate drainage systems to direct water away from slopes;
- Avoid as far as possible the traversing of bare soil by vehicles to reduce soil compaction;
- Designate a main access route for heavy machinery;
- Avoid site Preparation in period when wind velocities are highest.

Noise and vibration

The site preparation and construction phases of the development may likely have the most negative impact to the ambient noise and vibration in the development area. Several measures may be undertaken by the Contractors to reduce the impact of noise on the existing and

potential residents as well as the workers involved in the project. This is temporary, however, and the aim at this point is to make the increase in noise as small as possible until this phase is complete. The cumulative impact of the construction activities occurring simultaneously may increase the noise and vibration levels in the area significantly.

Impact Analysis

Impact without Mitigation	
Severity of impact	-4
Spatial scope of impact	-3
Duration of impact	-3
Frequency of activity / duration of activity	-3
Frequency of impact	-5
Result	-80 medium to high

Mitigation:

- Access roads should be demarcated that are exclusively used for the transportation of workers, goods and materials. These roads should be sited in such a way that the noise from this movement affects as few of the existing residents as possible.
- Where possible silenced machinery and instruments should be employed to reduce the impact of noise on the existing residents and workers.
- Machinery, vehicles and instruments that emit high levels of noise should be used on a phased basis to reduce the overall impact. These pieces of equipment such as drills, graders and cement mixers should also be used when the least number of residents can be expected to be affected, for example during periods where most residents are at work or school.
- Ensure that construction activities for the development of the project are staggered to decrease the levels of noise and vibration in the area;
- Construction hours should be limited to the hours of 8:00 a.m. and 6:00 p.m. daily.
- The delivery of raw materials must be limited to 8:00 a.m. and 6:00 p.m. daily.

Occupational health and safety concerns

Construction and operation activities of project that involve handling of heavy equipment, working at an elevated height, working near waters, working with fuels and other hazardous material may cause injuries to project workers, leading to loss of limbs, and in the worst case scenario, death. Workers will be exposed to diseases arising from poor sanitation which may lead to a loss of valuable work-days due to ill health.

Impact Analysis

Impact without Mitigation	
Severity of impact	-4
Spatial scope of impact	-3
Duration of impact	-3
Frequency of activity / duration of activity	-5
Frequency of impact	-2
Result	-70 low to medium

Mitigation:

- Contractor shall develop and implement occupational health and safety management plans.
- Every construction tool, equipment and machines shall be well set and adequately maintained.
- The construction area shall be kept free from objects such as sharps and trippings such as hanging ropes which can cause accidents ranging from minor cuts to deaths during construction.
- The sites shall be adequately protected or fenced off from unauthorized intrusions and warning signs; barricades should be properly displayed and strictly adhered to;
- Provision of safe working area with adequate and well-equipped First Aid kits should always be maintained on site at all times during the whole period of construction;
- In addition to the aforesaid provisions, the Client shall ensure that the contractor adheres to the rules set by the authorities for the protection of his workmen such provision of insurance and protective gear;
- Adequate washing facilities should be provided for the workers' hygiene and protection;
- The capacity of the workers on safety concerns should be built by way of awareness and sensitization sessions for the workers on safe working practices which should be held prior to the commencement of the construction phase;
- In addition to the above, since the site will be under the responsibility of the Contractor, it is important that the Project engages contractors who are fully conversant with occupational health and safety matters at the workplace. As regards compliance by the contractor, the Client on his part should ensure that all the mitigation measures are strictly enforced through his Site representative and this assurance should be firmly embodied in a signed Contract document;
- The contractor should carry out baseline health screening of workers before employment and biannual health check-ups for workers.
- Surfaces, structures and installations should be easy to clean and maintain, and not allow for accumulation of hazardous microorganisms. Therefore, surfaces in food preparation areas will be maintained with a highest level of cleanliness to prevent food

poisoning due to ingestion of contaminated food stuffs. Where the alternate is taken of food provision services by the community, they will be trained to provide these services in a hygienic manner.

- Information and education on the operation and management of the facility, including all the environmental aspects should be offered to all the concerned for purposes of Project responsibility, sustainability in terms of water quality and yields as well as safety;
- Passages to emergency exits should be unobstructed at all times. Exits should be clearly marked especially with reflective tapes. The number and capacity of emergency exits should be sufficient for safe and orderly evacuation of the greatest number of people present at any time, and there should be a minimum of two exits from any work area;
- Only highly skilled and experienced workers with valid permits will be allowed to operate heavy machinery (cranes, excavators, graders) and heavy trucks (Tipper trucks) and the conditions of the permits should be enforced;
- Equipping the fuel storage areas/re-fueling places with fire detectors, alarm systems, and fire –fighting equipment. The equipment will be maintained in good working order and be readily accessible;
- Provision of manual fire-fighting equipment (fire extinguishers) that is easily accessible and simple to use. Trainings where necessary will be undertaken to ensure adequacy in the usage of the equipment
- Contractor should develop and implement an emergency preparedness and response plan.
- Fire and emergency alarm systems that are both audible and visible will be installed in areas with a high likelihood of fire (enclosed spaces, near generator, fuel storage) and purchase of emergency and first aid equipment;
- Carry out period emergency response drills to assess workers response to emergency and adequacy of the emergency equipment
- Conduct daily tool box meetings before start of each work shift.
- Recruit qualified and experienced personnel to manage the health and safety work.
- Rift Valley Water Service Board and project contractor to ensure that hazardous areas are secured and provide all workers with personal protective equipment;
- Public Health Officer to sensitize the migrant workers on risky sexual behavior; and the communities well.

Construction spoil

There will be excavation of the ground to pave way for pipelines. If this material is not well disposed, it can pave way to having vermin such as rats and mice, the spoil can be carried by rainwater during floods polluting water bodies and the spoil makes an area lose the aesthetic value.

Impact Analysis

Impact without Mitigation	
Severity of impact	-3
Spatial scope of impact	-3
Duration of impact	-3
Frequency of activity / duration of activity	-3
Frequency of impact	-4
Result	-63 low to medium

Mitigation:

- The spoil will be collected at a central location on the site and will be stored temporarily until removal to an appropriately permitted disposal site.
- Dumping within the surrounding area should be prohibited.
- The spoil from the site should be segregated by the contractor and disposed off in the recommended manner into different waste streams (including general and hazardous waste).
- Re-use of excavated materials in the works as far as possible should be done to ensure that no permanent spoil dumps are created;
- The spoil material can be used in other areas for purposes such as road construction and land rehabilitation;
- Spoil location should not be in land that is very close to human habitation or land that could be used for productive purposes;
- The contractor should put in place water contamination, soil erosion and siltation management procedures in all the spoil locations.

Soil waste generation

During construction works, a lot of solid waste or spoil will be generated. Solid wastes include tree stumps, soil spoils, papers used for packing, plastics, cuttings and trimmings of materials among others. To preserve the aesthetic value of the land, proper disposal of the wastes is important. Dumping around the site will interfere with the aesthetic status and movement of animals. Improper waste disposal could lead to pest-breeding sites, pollution of physical environment including water resource and invasion of scavengers.

Impact Analysis

Impact without Mitigation	
Severity of impact	-2
Spatial scope of impact	-3
Duration of impact	-3
Frequency of activity / duration of activity	-4
Frequency of impact	-3
Result	-56 low to medium

Mitigation:

- Identification of the waste types,
- Segregation into the various categories and establish suitable mechanisms of collection, storage, transfer and final disposal.
- All construction debris and solid waste generated by the workforce must be taken out of the site and disposed of in a sensible manner, at a specified and approved dump site.
- Any soil potentially contaminated by chemicals, oils, fuels to be collected and disposed of by a NEMA authorized waste handler.

Contractor's camp sanitation

Improper handling of human wastes at the camp can have far reaching health implications on the workers and the host population. This is an impact that can be experienced far from the camp site.

Impact Analysis

Impact without Mitigation	
Severity of impact	-3
Spatial scope of impact	-3
Duration of impact	-3
Frequency of activity / duration of activity	-3
Frequency of impact	-4
Result	-63 low to medium

Mitigation:

- Provision shall be made for employee facilities including shelter, toilets and washing facilities.
- Toilet facilities supplied by the contractor for the workers shall occur at a minimum ratio of 1 toilet per 15 workers.
- The exact location of the toilets shall be approved by the Public Health Department

prior to establishment.

- Sanitation facilities shall be located within 100m from any point of work, but not closer than 50m to any water body.
- All temporary/portable toilets shall be secured to the ground to prevent them toppling due to wind or any other cause.
- Only approved portable toilets should be used.
- These facilities shall be maintained in a hygienic state and serviced regularly. Toilet paper shall be provided.
- The contractor shall ensure that no spillage occurs when the toilets are cleaned or emptied and that the contents are removed from site to an approved disposal site.
- Discharge of waste from toilets into the environment and burying of waste is strictly prohibited.
- Wash areas shall be placed and constructed in such a manner so as to ensure that the surrounding areas, which include groundwater, are not polluted.
- The contractor should develop campsite environmental management plan

Sedimentation

Construction activities will involve massive earth moving within the Amaya/Amaiya River and sections of the adjoining riverbanks and lands. This loosening of the soil creates a situation where any heavy rains will freely wash down the silt into the downstream areas. The silt so washed down may lead to anoxic conditions in the lower water levels with potential risks to the associated aquatic life.

Impact Analysis

Impact without Mitigation	
Severity of impact	-2
Spatial scope of impact	-3
Duration of impact	-2
Frequency of activity / duration of activity	-4
Frequency of impact	-4
Result	-56 low to medium

Mitigation:

- Construction activities should take place during the dry conditions. Topsoil removed will need to be transported away from the site to a location not vulnerable to storm water surface flow.
- Provide a soil trap downstream the dam site to intercept excessive silt during the construction.

Increased water usage

Due to increased water demand during the construction phase, the following impact is foreseen and mitigation measures are recommended:

Impact Analysis

Impact without Mitigation	
Severity of impact	-1
Spatial scope of impact	-3
Duration of impact	-4
Frequency of activity / duration of activity	-3
Frequency of impact	-3
Result	-48 low

Water conservation measures to be put in place by the contractor include:

- Use of water efficient machines and technologies;
- Sensitization of staff on the need to conserve water during construction;
- Ensure the pipes in use are adequate and in good condition to avoid wastage and leakage;
- Rainwater harvesting.

Influence on hydrological regime

Construction of the dam will change the hydrological regime of River Amaya/Amaiya such as fluvial morphology, river level, surface width and flow rate. Water depth upstream the dam will be increased, water flow rate in the reservoir decreased gradually from the tail area to the upstream. This may reduce flooding during heavy downpour but also reduce water levels downstream during the dry conditions.

Impact Analysis

Impact without Mitigation	
Severity of impact	-2
Spatial scope of impact	-1
Duration of impact	-2
Frequency of activity / duration of activity	-2
Frequency of impact	-2
Result	-20 very low

Mitigation:

- Environmental flows of River Amaya/Amaiya will be maintained;
- Before dam submergence, the Contractor should obtain the necessary statutory

permits from the relevant Agencies and Government Departments;

- Provide a write up on the hydrological regime upstream of the dam-and the extent of inundation.

Contamination of groundwaters

Waste storage areas for the construction crew may leak nutrients and biological pollutants into ground water resources. Other sources of pollution maybe spoil storage areas on site for contaminated soils. Storage areas for fuels may also lead to leaching of vast amounts of toxic heavy metals to below ground water resources.

Impact Analysis

Impact without Mitigation	
Severity of impact	-2
Spatial scope of impact	-3
Duration of impact	-2
Frequency of activity / duration of activity	-3
Frequency of impact	-3
Result	-42 low

Mitigation:

- Waste collection points for workers at the construction site will be located out of the high water table sections of the area;
- All waste areas will be banded during temporary storage to prevent pollutant leaching to below ground water resources;
- All effluent and wastewater shall be assessed to comply with national discharge standards before discharge into the environment;
- The wastewater containing oil will be collected in the catch pit and treated in the oil separator as required before discharge.
- The camp buildings should be equipped with a domestic sewage purification device.

Disruption of cultural norms and practices

There is also a possibility of disruption of cultural norms of the residents Amaya triangle. The society may mix with people of different cultures and this can be manifested through changes in dressing, diet and behavior.

Impact Analysis

Impact without Mitigation	
Severity of impact	-2
Spatial scope of impact	-2

Impact without Mitigation	
Duration of impact	-4
Frequency of activity / duration of activity	-1
Frequency of impact	-2
Result	-24 very low

Mitigation:

- Capacity building of shall be done to strengthen the community in order to deal with their ability to deal with the social impacts that will result from the population influx;
- Cultural norms relating to gender will be respected and considered in all aspects of project implementation including the guidelines, which will be adopted for use in the project area.

Social ills

Increase moral decadence due to an influx of people from different cultures and increased incomes. This could make the youth more promiscuous and also play truant in school.

Impact Analysis

Impact without Mitigation	
Severity of impact	-2
Spatial scope of impact	-3
Duration of impact	-4
Frequency of activity / duration of activity	-1
Frequency of impact	-1
Result	-18 very low

Mitigation:

- Guidance and counseling services for community members;
- Empowerment of boy and girl child;
- Sensitization of workers by the contractor in collaboration with other stakeholders such as the ministry responsible for Public Health;
- Provision of social facilities such as HIV testing center.

Loss of aesthetic quality / land use

Changes in aesthetics (landscape/visual beauty) are another potential direct effect from the irrigation and hydropower development. There is growing evidence that people increasingly value aesthetics in their daily life and environment. Recreation use of land will be substituted to farming activities due to presence of water for irrigation. Ground disturbance and vegetation removal may produce contrasts of watercolor, form and soil texture. Such disturbances could

occur as a result of excavation for foundations and ancillary structures; trenching to bury pipes; grading and surfacing of the roads; clearing and leveling staging areas; stockpiling soil and spoils (if not removed); and soil scars and exposed slope faces resulting from excavation, leveling, and equipment movement. It is anticipated that the project will change the visual quality of the Amaya/Amaiya River.

Impact Analysis

Impact without Mitigation	
Severity of impact	-2
Spatial scope of impact	-3
Duration of impact	-3
Frequency of activity / duration of activity	-1
Frequency of impact	-3
Result	-32 low

Mitigation:

- The contractor in consultation with the Client and other stakeholders will follow the Environmental Management Plans to restore the landscape as near as possible to its natural state prior to project implementation;
- Maintenance of native tall trees around newly excavated areas shall be done to maintain the visual aspect of the area and to prevent visual intrusion;
- Excavation areas will be properly cordoned off to limit access to all none- construction crew to prevent accidents and exposure to construction site conditions;
- All cleared areas and pits will be backfilled and trees, grass planted at the end of construction of the irrigation, power and associated facilities to avoid further land degradation;
- Erosion control measures shall be implemented by the contractor to prevent siltation of the river which could affect its visual beauty;
- The contractor shall ensure that recreational activities close to construction sites are not interfered with.

Occupational health and safety of the workers

During the construction period, increasing number of workers population influx mobility, will affect environmental health. This poses a risk of exposure to intestinal, respiratory and contagious diseases like Tuberculosis. It is important to ensure that health and sanitation issues are properly addressed by the contractor.

Impact Analysis

Impact without Mitigation	
Severity of impact	-3
Spatial scope of impact	-2
Duration of impact	-2
Frequency of activity / duration of activity	-4
Frequency of impact	-3
Result	-49 low

Mitigation:

- Health screening and profiling of workers before recruitment and periodical checks/screening should be conducted to monitor occurrence and prevalence of diseases;
- The contractor shall provide a safe, accessible and clean drinking water source to all workers;
- The contractor shall develop and implement an HIV/AIDS and STDs prevention and awareness plan for the workers and surrounding communities to the project area;
- The contractor shall construct usable and accessible sanitary facilities and changing room for workers and ensure proper maintenance;
- The contractor shall support and participate in health and sanitation campaigns conducted within the project area and the surrounding communities.

Loss of historical sites and relics

During the socio-economic and environmental baseline no traditional relics such as earthen vessels and stone ware products have been identified. However, several areas were cited as being of cultural significance e.g. communal burial sites. These areas are known to the community.

Impact Analysis

Impact without Mitigation	
Severity of impact	-2
Spatial scope of impact	-3
Duration of impact	-4
Frequency of activity / duration of activity	-1
Frequency of impact	-2
Result	-27 low

Mitigation:

- The culturally important sites in the areas such as circumcision grounds will be left

intact as much as possible or the community elders allowed to guide on the way forward.

7.3.3. Operation phase

These are impacts anticipated during the operation of the Amaya/Amayi dam water project. They include impacts on flora and fauna, river ecology and hydrology.

Devegetation

Large trees, shrubs, herbs and bushy areas will be cleared to pave way for dam construction and power generation infrastructure.

Impact Analysis

Impact without Mitigation	
Severity of impact	-3
Spatial scope of impact	-3
Duration of impact	-3
Frequency of activity / duration of activity	-4
Frequency of impact	-2
Result	-54 low to medium

Mitigation:

- Selective felling of trees with particular attention to indigenous trees;
- Promotion of agroforestry practices;
- Establishment of woodlots and on farm tree growing;
- Creating synergies with farmers, government and non-government groups to enhance tree planting activities.

Increased water demand

Impact Analysis

Impact without Mitigation	
Severity of impact	-2
Spatial scope of impact	-2
Duration of impact	-3
Frequency of activity / duration of activity	-2
Frequency of impact	-2
Result	-28 low

Possible measures to address issues of increased water capture by the proposed water project will include:

- Putting in place water conservation measures and sensitize the water users on conservation issues;
- The design of the project should include rationing of water resources

De-oxygenation and sediment flush from the powerhouse

During operation, water drawn from the dam may become de-oxygenated, and discharge of such water downstream may negatively impact the aquatic fauna in the river. The impact may be felt more on the macro-invertebrates at the riverbanks downstream of the powerhouse. The discharged deoxygenated water from the powerhouse may also contain sediments sucked in at the intake.

Impact Analysis

Impact without Mitigation	
Severity of impact	-3
Spatial scope of impact	-1
Duration of impact	-1
Frequency of activity / duration of activity	-2
Frequency of impact	-3
Result	-25 low

To reduce the negative impacts on macro-benthos and fish will involve:

- Develop and implement a schedule for flushing the sediment during Operation and maintenance.
- Enhancing the habitat by tree planting to increase shelter cover, shade and drift food;
- Maintaining sediment transport in as far as applicable a natural state to prevent sudden flushes that could shock ecosystems.

Water pollution from the irrigation demonstration farm activities

Water pollution may arise from the irrigation activities in the demonstration farms such as use of agrochemicals and also due to increase in population leading to a strain in water treatment infrastructure.

Impact Analysis

Impact without Mitigation	
Severity of impact	-2
Spatial scope of impact	-3
Duration of impact	-4
Frequency of activity / duration of activity	-3
Frequency of impact	-3
Result	-54 low to medium

To reduce the negative impacts on macro-benthos and fish will involve:

- Construction of sewer systems and soak pits to manage domestic waste water;
- Tail water management to reduce the discharge of pollutants such as suspended sediment and farm chemicals into the existing streams, springs and rivers;
- Sensitize farmers on smart agriculture practices such as riverbank conservation and soil conservation;
- Educate farmers on pesticide contamination dangers and conservation of water bodies;
- Manage fertilizer programs so as to minimize nutrients available for detachment and transport.

Decrease in terrestrial and aquatic fauna

During the operation phase de-vegetation will reduce the habitats available for land animals such as monkeys, lizards, mongooses, squirrels, wild pigs and many other small vertebrates and invertebrates. There will also be diverting of river channel through spillways, impoundment of water into dam, and controlled release of water to suit operational requirements. The damming of the river water will change flow characteristics from free-flow to static waters.

Impact Analysis

Impact without Mitigation	
Severity of impact	-3
Spatial scope of impact	-3
Duration of impact	-4
Frequency of activity / duration of activity	-2
Frequency of impact	-3
Result	-50 low

Mitigation:

- Reduce the biomass that will be cleared as a vegetation;
- Implement 'nuisance' plant/invasive species monitoring programs for the reservoir; and involve the local community in addressing it.
- Develop a catchment management program to prevent further sediment loading from upstream reach;
- The weir should have an overhead flow, allowing for continuous flow of water, except at a reduced speed, though not slow enough to induce stratification;
- The design should adopt methods of gradual diversion of river flow to ensure adequate environmental flow to sustain the survival of aquatic invertebrates and river-edge organisms;
- Design to have short periods of impoundment.

Pests and diseases

Introduction of demonstration irrigation enterprises will lead to growing of high value crops that intensely use agrochemicals. New crops introduced in the area may lead to upsurge of new pests and diseases which may be difficult to control for lack of natural enemies.

Impact Analysis

Impact without Mitigation	
Severity of impact	-2
Spatial scope of impact	-3
Duration of impact	-2
Frequency of activity / duration of activity	-4
Frequency of impact	-2
Result	-42 low

Mitigation:

- Integrated pest management;
- Training and awareness programs;
- Intensified extension services.

Risk of fire outbreak

Fire outbreak in the hydropower station or in the machinery being used is always a risk. This is because there are flammable substances in use. Depending on the severity, fire can cause loss of life, disability or property damage. Thus, precautions are necessary.

Impact Analysis

Impact without Mitigation	
Severity of impact	-4
Spatial scope of impact	-1
Duration of impact	-1
Frequency of activity / duration of activity	-1
Frequency of impact	-2
Result	-18 very low

Mitigation:

- Labeling of all inflammable materials and storing them appropriately;
- Provision of adequate fire-fighting equipment capable of fighting all classes of fire;
- Put up 'NO SMOKING' signs in areas where flammable substances are stored;
- Train workers on the use of fire-fighting equipment;

- Display a list of emergency contact numbers prominently;
- Prohibit cooking on site;
- Provide a fire assembly point in the contractor's camp.

Influx of migrants

The establishment of temporary construction camps for the project workforce will increase the influx of migrants to Amaya/Amayi and the neighboring areas. It is also anticipated that the promise of employment will draw residents from the neighboring areas in search of work. The influx could result in secondary effects such as increased strain on social infrastructure such as schools and hospitals; there will also be a rise in petty crimes.

Impact Analysis

Impact without Mitigation	
Severity of impact	-3
Spatial scope of impact	-3
Duration of impact	-4
Frequency of activity / duration of activity	-4
Frequency of impact	-5
Result	-90 medium to high

Mitigation:

- The contractor shall engage in social cooperate responsibility (SCR) activities such as construction of hospitals, schools, cattle dips, roads etc. to mitigate the effects of influx of immigrants in the project area;
- Project should set up internal controls and security systems for its materials and worker's personal items;
- Issues of security should be handled hand in hand with the local administration authorities to ensure that suspicious people are dealt with lawfully to avoid disrupting project activities.
- Workers will be encouraged to abide by the set out company code of conduct while on duty to prevent risky interactions with community members;
- Workers will be transported to and from the construction site to limit unnecessary encounters with community members;
- The contractor will provide a communication forum with the local leaders, with women and youth groups to monitor any changes in social structure and population.

Increase in transmissible diseases

During operation stage, large projects like the proposed project attract migrant workers leading to increase in transmissible diseases. These men and women away from their partners can get into sexual liaisons with people from the host community exposing them and the community to HIV/AIDS. Communicable diseases such as tuberculosis can also flourish due to concentration of people in the same area.

Impact Analysis

Impact without Mitigation	
Severity of impact	-2
Spatial scope of impact	-3
Duration of impact	-4
Frequency of activity / duration of activity	-4
Frequency of impact	-4
Result	-72 low to medium

Mitigation:

- Maximize hiring skilled and unskilled workers from the host community.
- Workers housing will be planned and located strategically so that access by community members is limited to official reasons only, like delivery of goods/services. This will prevent social visits by residents to workers camp and potential engagement in disagreeable behavior;
- The contractor shall develop an HIV/AIDS prevention and awareness plan and continuously sensitize workers and community members on HIV/AIDS and STDs prevention and the dangers of unsafe sexual relations;
- Deliberate effort shall be made by the contractor to curb defilement and sexual abuse of school going children and minors; such action will include sensitization on the violence against children act and setting in place the recommended mechanisms.
- Observe good hygiene conditions at workplace and camps.
- Have voluntary counselling and testing (VCT) services on site and encourage workers to undergo the same.
- Provision of protective devices such as condoms.

Social tensions and conflicts

These arise mainly due to:

- ✓ Acts of omission or commission by project Proponent or Contractor for example delay in honoring agreements.
- ✓ Employment opportunities.
- ✓ Misunderstanding amongst stakeholders.

Impact Analysis

Impact without Mitigation	
Severity of impact	-2
Spatial scope of impact	-3
Duration of impact	-4
Frequency of activity / duration of activity	-2
Frequency of impact	-3
Result	-45 low

Mitigation:

- Immediate action undertaken as soon as possible and within 24 hours of receipt of a complaint;
- Investigations completed within the number of days agreed upon by the proponent and the contractors;
- All incidents or complaints about either environmental or social issues will be managed in accordance to the existing procedure in line with the legal framework;
- All incidents and complaints will be recorded in the contractors incident reporting system;
- Additional environmental awareness training of the workforce with respect to procedures to be followed for environmental incidents or complaints;
- Sensitize workforce on cultural sensitivities;
- Employ a community liaison officer.

Increased spread of water borne diseases

Improved access of water may lead to misuse leaving pools of stagnant water. This may act as breeding sites for mosquito larvae and thus contributing to outbreak of malaria. Water-borne diseases like cholera, bilharzia, typhoid and dysentery could also increase if there is poor management of the dam water and if the community members drink untreated water. The impact of disease spread will be long term for as long as the dam contains water which could be habitat for disease vectors.

Impact Analysis

Impact without Mitigation	
Severity of impact	-2
Spatial scope of impact	-3
Duration of impact	-4
Frequency of activity / duration of activity	-3
Frequency of impact	-3
Result	-54 low to medium

Mitigation:

- The Ministry of Health should carry out frequent survey of health records in Health Care Facilities (HCFs) to ascertain the spread of malaria. This data should then be used to develop a malaria prevention program within villages that could include use of long-lasting insecticide treated nets, indoor residual Spraying among others.
- Capacity building is required to equip communities with appropriate technology to handle water. These should include training on hygiene standards both at water sources and within homesteads.
- Fence the dam in order to restrict access of animals and human beings
- Restrict direct fetching of water from the dam through the provision of a water point at a reasonable distance from the storage structure.

Possible water users' conflicts

This could arise at a small scale only if the dam water supply to the various members of the community is not well regulated. Competition for water sources by the community members could result into conflicts which could even interfere with the sustainability of the project. The conflicts can be inform of competition during the watering of livestock, fetching domestic water and abstraction of irrigation water to be used at the demonstration plots.

Impact Analysis

Impact without Mitigation	
Severity of impact	-2
Spatial scope of impact	-3
Duration of impact	-4
Frequency of activity / duration of activity	-2
Frequency of impact	-3
Result	-45 low

Mitigation:

- Formation of a Water Users Association (WUA) with a well-drawn constitution and By-laws that will guide on water usage and resolve conflicts in the project area;
- Formation of a community peace committee
- CRVWWDA should promote efficient water use and management in the demonstration plots and for kitchen gardening; and
- Water Users Association should be capacity built to resolve water use conflicts among all water users.

Possible land use conflicts

Communities may conflict over land boundaries and water distribution.

Impact Analysis

Impact without Mitigation	
Severity of impact	-2
Spatial scope of impact	-2
Duration of impact	-4
Frequency of activity / duration of activity	-2
Frequency of impact	-3
Result	-40 low

Mitigation:

- Having clear demarcations of land for use by individuals or groups;
- Involving the traditional leaders in discussions and the actual demarcation of land and its allocation through a transparent mechanism;
- Using traditional mechanisms of dispute resolution;
- Having peace initiatives within the community;
- Setting up an irrigation water users association with a constitution to guide its operation.

Security

Security risks may also arise due to the uncontrolled access of visitors on site.

Impact Analysis

Impact without Mitigation	
Severity of impact	-2
Spatial scope of impact	-3
Duration of impact	-4
Frequency of activity / duration of activity	-2
Frequency of impact	-3
Result	-45 low

Mitigation:

- The contractor shall set up a competent security and safety management team on site to oversee issues of security.
- The contractor shall develop a procedure for visitors' access to site.
- The contractor shall ensure that all access point are well secured and ensure security personnel are deployed at all project installations.

Accidents and deaths

The dam is a large water body and there is potential that accidental drowning of people and animals can occur.

Impact Analysis

Impact without Mitigation	
Severity of impact	-5
Spatial scope of impact	-3
Duration of impact	-4
Frequency of activity / duration of activity	-1
Frequency of impact	-2
Result	-36 low

Mitigation:

- Fence the area surrounding the reservoir to restrict access of livestock, wild life and human beings
- The cattle trough and the community water point should be located far away from the reservoir.
- Community sensitization of the dangers the dam can pose.

Hydropower generation

Corona effect

Impact Analysis

Impact without Mitigation	
Severity of impact	-3
Spatial scope of impact	-2
Duration of impact	-4
Frequency of activity / duration of activity	-4
Frequency of impact	-3
Result	-63 low to medium

Mitigation:

- Use of technological measures during installations to abate against corona effect during operation. Technological measures to implement during construction include; observation of the recommended distance between conductors; use of electrical dampers to reduce vibration among other measures.

Electromagnetic interference with radio telecommunications systems

Impact Analysis

Impact without Mitigation	
Severity of impact	-3
Spatial scope of impact	-2
Duration of impact	-3
Frequency of activity / duration of activity	-4
Frequency of impact	-3
Result	-56 low to medium

Mitigation:

- Transmission line rights-of-way and conductor bundles are should be created to ensure radio reception at the outside limits remains normal.

Risk of fire**Impact Analysis**

Impact without Mitigation	
Severity of impact	-5
Spatial scope of impact	-3
Duration of impact	-1
Frequency of activity / duration of activity	-1
Frequency of impact	-2
Result	-27 low

Mitigation:

- Provide fire safety system i.e. training, fire fighting equipment etc.
- No burning activities to be allowed close to or within the site.

Death of resident birds**Impact Analysis**

Impact without Mitigation	
Severity of impact	-5
Spatial scope of impact	-3
Duration of impact	-4
Frequency of activity / duration of activity	-3
Frequency of impact	-3
Result	-72 low to medium

Mitigation:

- Build raptors platforms on top of pylons for roosting and nesting and introduce bird feeding programs.

7.3.4. Decommissioning phase

When the project design life comes to an end or is put out of service, the negative impacts listed below are expected.

- ✓ Shortage of water due to closure
- ✓ Soil erosion will occur as a result of opening up previously firm ground to remove buried pipelines;
- ✓ Generation of waste material comprising concrete rubble, steel and disused pipes and fittings;
- ✓ Visual/aesthetic impacts are anticipated as a result of draining the dam reservoir and demolition of other concrete installations;
- ✓ Loss of livelihood and the income earning capacity
- ✓ Dust and exhaust emissions
- ✓ Occupational hazards
- ✓ Noise and vibration on structure demolition
- ✓ Damages to access roads from vehicles with heavy loading.
- ✓ Aesthetic impacts on debris amassing and denudation of the structure environment.

Mitigation measures:

- The Water Users Association and water management committee should prepare the communities for a transition strategy when de-commissioning is foreseen
- Develop alternative water sources.
- Soil conservation works should be maintained until the site stabilizes;
- Landscaping should be done to rehabilitate the open trenches;
- Visual/aesthetic impact as a result of decommissioning should be mitigated by planting grass and other native vegetation in the restored trenches;
- Waste from decommissioning of the pipeline and concrete structures should be carted away and disposed off in a manner that is acceptable under EMCA;
- Fence off all unsafe and potentially dangerous areas.

7.4. Summary of impacts

Table 7-4: Summary of impacts during construction and operation phases

No	Potential impact	Effects (positive/negative)	Mitigation required (yes/no)
Construction phase			
1	Industrialization	Positive	No
2	Employment opportunities to local community	Positive	No
3	Injection of money into the local economy	Positive	No
4	Creation of market for construction material	Positive	No
5	Increase/Artificial land prices	Positive/Negative	Yes/No
6	Loss of biodiversity	Negative	Yes
7	Pollution: air, noise, soil, groundwater	Negative	Yes
8	Soil erosion	Negative	Yes
9.	Occupational health & safety concerns	Negative	Yes
10	Solid waste generation	Negative	Yes
11	Fire risk	Negative	Yes
12	Increase in transmissible diseases	Negative	Yes
Operation phase			
13	Decrease in possible conflicts	Positive	No
14	Improved food security	Positive	No
15	Flood control	Positive	No
16	Local capacity building	Positive	No
17	Spread in water borne diseases	Negative	Yes
18	Water use conflicts	Negative	Yes
19	Soil erosion & vegetation degradation	Negative	Yes
20	Accidents & deaths	Negative	Yes

The following Table summarizes the impacts and associated mitigation measures during the decommissioning phase.

Table 7-5: Impacts and mitigation measures during decommissioning phase

Environmental / Social impact	Mitigation measure
Accumulation of solid	Collection and sorting of waste after demolition for waste disposal or recycling to ensure NEMA waste management regulation and procedures are followed as required
Aesthetic beauty and possible Soil erosion	Restoration of the affected site through landscaping and planting vegetation cover
Possible loss of income by farmers downstream	Sensitize the community on imminent occurrence so that they can absorb the psychological shock without devastating consequences

CHAPTER 8. ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

8.1. Introduction

The purpose of the following Environmental and Social Management Plan (ESMP) for the project is to initiate a mechanism for implementing mitigation measures for the potential negative environmental impacts and monitor the efficiency of these mitigation measures based on relevant environmental indicators. Mitigation measures have been proposed in Chapter 7 above and the proponent will monitor how well the mitigation measures have been implemented and if they were working in redressing identified impacts. The ESMP identifies certain roles and responsibilities for different stakeholders for implementation, supervision and monitoring. The objectives of the ESMP are:

- i. To provide evidence of practical and achievable plans for the management of the proposed project.
- ii. To provide the Proponent (CRVWDA) and the relevant Lead Agencies with a framework to confirm compliance with relevant laws and regulations.
- iii. To provide community with evidence of the management of the project in an environmentally acceptable manner.

Each of identified impacts, criteria, and parameters to be monitored will be based on the thresholds/standards governing the activity which may include but not limited to:

- ✓ Water Quality Regulations, 2006 (Legal Notice 121)
- ✓ Waste Management Regulations, 2006 (Legal Notice 121)
- ✓ Occupational Safety and Health Act (OSHA) 2007
- ✓ Environmental Management and Coordination Act, 1999
- ✓ Environmental (Impact Assessment and Audit) Regulations, 2003

8.2. Environmental and Social Management Plan (ESMP) Principles

This project is geared towards enhancing benefits and improves livelihoods to the people living within beneficiary area. The project, however, should also observe environmental conservation requirements in accordance to the established laws and regulations. To realize this goal, acceptability by a majority of the beneficiaries and minimal effects to the physical and biological environment will require to be integrated in the project through constant consultations, evaluations and review of the project concepts and objectives.

It is recommended that guiding principles specific to this project and the regulations governing water resources management be developed that will allow integration of environmental management considerations in the construction, maintenance of the system components and public other utilities. 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 (mainly seasonal rivers and streams);
- (ii) Enhancing integration of environmental, social and economic functions in the project implementation;
- (iii) Minimizing conflicts of any land and/or property that may get affected by the project in accordance with the laid down guidelines.

The contractors and other players in the project activities are prevailed upon to implement the ESMP through a sustained supervision and continuous consultations. Conversely, environmental monitoring provides feedback about the actual environmental impacts of a project. Monitoring results help judge the success of mitigation measures in protecting the environment. They are also used to ensure compliance with environmental standards, and to facilitate any needed project design or operational changes. This ESMP is prepared for the three project stages where potential significant negative impacts manifest. These are:

- ✓ Construction Phase ESMP
- ✓ Operation Phase ESMP
- ✓ Decommissioning Phase ESMP.

Table 8-1: ESMP for Amaya/Amaiya dam water supply project

Potential Impact	Proposed Mitigation Measure	Responsibility	Means of monitoring	Frequency of Monitoring	Cost
CONSTRUCTION PHASE					
Loss of use of land and need for resettlement	<ul style="list-style-type: none"> i. Recommendations of the Resettlement Action Plan (RAP) should be effected before commencement of the project ii. Designs and plans should be approved 	CRVWWDA	<ul style="list-style-type: none"> - List of the People Affected by the Project - Compensation evidence 	Before construction	As indicated in RAP
Loss of biodiversity	<ul style="list-style-type: none"> i. Re-vegetate exposed areas on the site so as to mitigate further erosion of soil ii. Excavated earth will be held away from locations of the site not susceptible to surface runoff of storm water; iii. Only minimal bush clearing should be allowed; iv. Excavations of the site will be confined only within the sections upon which the dam construction is taking place; v. The earth removed for external disposal will require to be deposited on sites without the risk of being washed down during rains and where it will not compromise other land use activities in those areas. 	CRVWWDA and Contractor	<ul style="list-style-type: none"> - Changes in natural vegetation in the project area - Tree planting program in place - Monitoring of vegetation health adjacent to the construction site will be undertaken during and after construction. 	Monthly	4,000,000 One off
Air emissions/ Air pollution	<ul style="list-style-type: none"> i. Pave the main access road to the project area. ii. Sprinkle water on exposed dusty surfaces to reduce dust generation. iii. Trucks hauling soil should be covered with tarpaulins. iv. Checking, repairing and fixing the engines of vehicles and heavy machineries. All machineries and equipment should be maintained in good working order to ensure minimum emissions including carbon monoxide, oxides of nitrogen and sulfur, as well as suspended particles. v. Affixing filters on the exhausts. vi. Utilizing masks for workers who are directly in the location where dust is dispersed. 	Contractor	<ul style="list-style-type: none"> - Visual inspection of stockpiles - Levels of emissions - PPE available - Maintenance records 	Daily	1,500,000 One off

Potential Impact	Proposed Mitigation Measure	Responsibility	Means of monitoring	Frequency of Monitoring	Cost
	<ul style="list-style-type: none"> vii. Creating an alarm system for cases the air pollution exceeds the standard limits. viii. Supervision by a representative from NEMA on the implementation of the above-mentioned mitigation measures. ix. Staff training before the commencement of construction activities. 				
Soil Erosion	<ul style="list-style-type: none"> i. Compaction of all loose material ii. Diversion of runoff flows from construction sites. iii. Run-off from rainfall is a water source that can be stored and used for construction activities (especially in initial distance in downstream). iv. Regular visits lead to the identifying of areas that have problems regarding erosion and thus are given priority, so that corrective plans are implemented. v. Soil excavation and embankment must be made for the immediate project area and unessential activities should be refrained from. vi. In order to compensate the damages incurred, due to the accelerated erosion, arising from construction activities, a control of natural erosion during the construction period must be taken under consideration. vii. Vegetation clearance of more than the required width should be refrained from and this requires the surveillance of the environmental expert. viii. Improvement of riverbed such as building some short barriers to trap sediments. 	Contractor	<ul style="list-style-type: none"> - Number of visits to the eroded sites - Visual inspection 	Weekly	No additional cost to the Bill of Quantities

Potential Impact	Proposed Mitigation Measure	Responsibility	Means of monitoring	Frequency of Monitoring	Cost
Noise & vibrations	<ul style="list-style-type: none"> i. Measuring the intensity of noise by utilizing the noise meter. In the case that, the level measured is higher than the permissible amount, all the methods to conserve the health of workers must be utilized to lessen the level of noise and decrease it to the standard level and shortening the period of noise generated should be taken under consideration. ii. Lubricating and maintenance regular repair of equipment and machinery. iii. Insulating engines which create noise. iv. Eliminating worn out machinery. v. Elevating the speed of work, so as to shorten the construction period as much as possible. vi. Selecting an appropriate period for construction activities and refraining from it being synchronous with sensitive period for wildlife, such as their pregnancy and giving birth duration. vii. The Contractor should adopt the best practicable means of minimizing noise. viii. For any particular job, the quietest available machinery should be used. ix. All equipment should be maintained in good mechanical order and fitted with the appropriate silencers, mufflers, or acoustic covers where applicable. x. Stationary noise sources should be sited as far away as possible from noise-sensitive areas, and where necessary acoustic barriers should be used to shield them. xi. Pneumatic drills and other noisy appliances should not be used after normal working hours. xii. Workers should be given noise protection equipment such as 	Contractor	<ul style="list-style-type: none"> - Inspection reports - Ears muffs available - Switch off plant machinery when not in use 	Daily	No additional cost to the Bill of Quantities

Potential Impact	Proposed Mitigation Measure	Responsibility	Means of monitoring	Frequency of Monitoring	Cost
	<p>earmuffs and be taught how to use them and supervised to ensure such safety procedures are being adhered to.</p> <p>xiii. The public should be informed that short periods of noise may be inevitable but prior warning of when noisy activities are to take place and the days and times noise of when they could be expected should be widely publicized before the activity takes place.</p> <p>xiv. Fixing engines and exhausts of heavy machineries.</p> <p>xv. Use of portable acoustic barriers to shield compressors and other noisy equipment where necessary.</p> <p>xvi. Observe and practice the recommended noise regulations.</p> <p>xvii. Supervision of a representative from NEMA on the implementation of the above mentioned mitigation measures.</p> <p>xviii. Staff training before the commencement of construction activities.</p>				
Occupational health & safety concerns	<p>i. Workers shall be provided with appropriate personal protective equipment, such as coveralls, boots, mittens, gloves, dust and fume masks, all of which must be regularly replaced.</p> <p>ii. The abstract of the Occupational Safety & Health Act 2007 must be displayed at prominent places within the site.</p> <p>iii. Well stocked first aid box which is easily available and accessible should be provided within the construction site as well as at least an ambulance.</p> <p>iv. Ensure the working hours are controlled and that employees are not allowed to extend the working hours beyond an acceptable limit for purposes of gaining extra pay.</p> <p>v. Ensure that all site personnel are provided with an adequate supply of safe drinking water, which should be at accessible points at all times.</p> <p>vi. Provide conveniently accessible, clean, orderly, adequate and</p>	Contractor	<p>- Inspect all workers to ensure that they have their PPE on</p> <p>- Frequency of incidents/accidents and fatalities</p> <p>- The demand for protective devices</p>	Monthly	No additional cost to the Bill of Quantities

Potential Impact	Proposed Mitigation Measure	Responsibility	Means of monitoring	Frequency of Monitoring	Cost
	<p>suitable washing facilities within the site.</p> <p>vii. Staff training and sensitization on use of PPE and adhering to the OSHA 2007 throughout the construction phase.</p>				
Construction waste	<p>i. All solid waste will be collected at a central location on the site and will be stored temporarily until removal to an appropriately permitted disposal site.</p> <p>ii. Dumping within the surrounding area is prohibited. Where potentially hazardous substances are being disposed of, a chain of custody document should be kept with the environmental register as proof of final disposal.</p> <p>iii. Waste generated at the site should be segregated by the contractor and disposed off in the recommended manner into different waste streams (including general and hazardous waste). Wherever possible recycling should be carried out.</p>	Contractor	<ul style="list-style-type: none"> - Chain of custody records for hazardous substances - Visual inspection - Recycling 	Daily	No additional cost to the Bill of Quantities
Solid waste generation	<p>i. All construction debris and solid waste generated by the workforce must be taken out of the site and disposed of in a sensible manner, at a specified and approved dump site.</p> <p>ii. Any soil potentially contaminated by chemicals, oils, fuels to be collected and disposed of by a NEMA authorized waste handler.</p>	Contractor	<p>The following waste streams should be measured and reported:</p> <ul style="list-style-type: none"> - Waste generation - Waste reuse - Waste recycling - Waste disposal 	Weekly	No additional cost to the Bill of Quantities
Fire risk	<p>i. Labeling of all inflammable materials and store them appropriately;</p> <p>ii. Provision of adequate fire-fighting equipment capable of fighting all classes of fire;</p> <p>iii. Put up NO SMOKING Signs in areas where flammable substance are stored;</p> <p>iv. Train workers on the use of fire-fighting equipment;</p> <p>v. Display a list of emergency contact numbers prominently;</p>	Contractor	<ul style="list-style-type: none"> - Fire drills - Number of firefighting equipment 	Monthly	No additional cost to the Bill of Quantities

Potential Impact	Proposed Mitigation Measure	Responsibility	Means of monitoring	Frequency of Monitoring	Cost
	<ul style="list-style-type: none"> vi. Prohibit cooking on site; vii. Provide a fire assembly point in the contractor's camp; 				
Increase in transmissible diseases	<ul style="list-style-type: none"> i. Observe good hygiene conditions at workplace and camps. ii. Sensitize the migrant workers on risky sexual behaviour. iii. Have VCT services on site and encourage workers to undergo the same. iv. Provision of protective devices such as condoms. v. Maximize hiring skilled and unskilled workers from the host community. 	Contractor	<ul style="list-style-type: none"> -Health records -Number of illness recorded -Distribution of contraceptives i.e. condoms 	Monthly	6,000,000 annually
Social tensions and conflict	<ul style="list-style-type: none"> i. Immediate action undertaken as soon as possible and within 24 hours of receipt of a complaint; ii. Investigations completed within seven days of receipt of complaint; iii. All corrective actions implemented by due date iv. All incidents or complaints about either environmental or social issues will be managed in accordance to the existing procedure in line with the legal framework; v. All incidents and complaints will be recorded in the contractors incident reporting system; vi. Additional environmental awareness training of the workforce with respect to procedures to be followed for environmental incidents or complaints; vii. Sensitize workforce on cultural sensitivities; viii. Employ a community liaison officer. 	Contractor	-Incidents reports	Weekly	2,000,000 annually
Sedimentation	<ul style="list-style-type: none"> i. Construction activities should take place during the dry conditions. ii. Top soil removed will need to be transported away from the site to a location not vulnerable to storm water surface flow. iii. Provide a soil trap downstream the dam site to intercept excessive silt during the construction. 	Contractor	- Visual inspection	Monthly	No additional cost to the Bill of Quantities

Potential Impact	Proposed Mitigation Measure	Responsibility	Means of monitoring	Frequency of Monitoring	Cost
OPERATIONAL PHASE					
Spread of water borne diseases	<ul style="list-style-type: none"> i. A regular creation of fluctuation on the dam water surface, so as to prevent the spawning of carrier insects. ii. Prevention of the growth of reeds and the presence of a red rush and vegetation on the banks of the dam. iii. Establishing health centers with the construction of the initial temporary camps and constructional workshops. iv. Public awareness campaigns and civic education on hygiene standards both at water sources and within homesteads. v. Monitoring of health and disease indices. vi. The Ministry of Health should carry out frequent survey of health records in Health Care Facilities (HCFs) to ascertain the spread of malaria. This data should then be used to develop a malaria prevention program within villages that could include use of long lasting insecticide treated nets, indoor residual Spraying among others. vii. Fence the dam in order to restrict access of animals and human beings viii. Restrict direct fetching of water from the dam through the provision of a water point at a reasonable distance from the storage structure. 	<ul style="list-style-type: none"> - CRVWWDA - MOH 	- Health records	Monthly	
Water use conflicts	<ul style="list-style-type: none"> i. The project's Water Users Association (WUA) will be required to formulate strict By-laws that will guide on water usage and resolve possible conflicts in the project area; ii. DRSLP should promote the use of best irrigation practices and technologies aimed at efficient water use and management in the demonstration plots and for kitchen gardening; and iii. DRSLP should empower WUA to control water usage and resolve possible water use conflicts among all water users. 	<ul style="list-style-type: none"> CRVWWDA WUA 	- WUA by-laws	As they arise	200,000 annually

Potential Impact	Proposed Mitigation Measure	Responsibility	Means of monitoring	Frequency of Monitoring	Cost
Accidents and deaths	<ul style="list-style-type: none"> i. Fence the area surrounding the reservoir to restrict access of livestock, wild life and human beings ii. The cattle trough and the community water point should be located away from the reservoir. 	CRVWWDA County Government	- Dam reservoir inspection records	Bi-annually	No additional cost to the BoQ
DECOMMISSIONING PHASE					
Water shortage	<ul style="list-style-type: none"> i. The water management committee (WMC) to prepare communities for a transition strategy when de-commissioning is foreseen ii. Develop alternative water sources 	CRVWWDA WMC	- Water provision records	Weekly	No additional cost to the BoQ

Table 8-2: ESMP for the possible hydropower component

Potential Impact	Proposed Mitigation Measure	Responsibility	Means of monitoring	Frequency of Monitoring	Cost
Death of resident birds	<ul style="list-style-type: none"> i. To minimize collision, undertake wire-marking to alert birds to the presence of power line, allowing them time to avoid the collision. ii. Build raptors platforms on top of pylons for roosting and nesting 	CRVWWDA Contractor	Routine Maintenance Inspection Records.	Continuous	50,000
Risk of fire	<ul style="list-style-type: none"> i. Establishing a network of fuel breaks of less flammable materials or cleared land to slow progress of fires and allow firefighting access. ii. Provision of fire safety system that includes training, firefighting equipment; regular maintenance of machinery, vehicles and equipment iii. No burning activities to be allowed close to or within the site 	CRVWWDA Contractor	Routine maintenance	Throughout the construction phase	50,000
Occupational health and safety risks	<ul style="list-style-type: none"> i. All construction workers should be advised of the dangers associated with construction work; ii. Workers should be provided with suitable footwear, hard hats, protective glasses and generally with safety equipment where 	CRVWWDA Contractor	Routine monitoring	Throughout the construction phase	50,000

Potential Impact	Proposed Mitigation Measure	Responsibility	Means of monitoring	Frequency of Monitoring	Cost
	<p>appropriate;</p> <p>iii. Train all workers on Safety Health and Environment (SHE) with an aim of improving awareness;</p> <p>iv. Install safety signage along the work areas.</p>				
Electromagnetic interference with radio and tel/con systems	<p>i. Ensure controlled access to the electricity power lines</p> <p>ii. Enforce way leave requirements for power lines</p>	CRVWWDA Contractor	Routine maintenance	Continuous	50,000
Corona effect	<p>i. Use technological measures during installation to abate against corona effect during operation which include;</p> <p>ii. Observation of the recommended distance between conductors;</p> <p>iii. Use of electrical dampers to reduce vibration among other measures.</p>	CRVWWDA Contractor	Routine inspection and Maintenance	Routinely	

CHAPTER 9. CONCLUSIONS AND RECOMMENDATIONS

9.1. Conclusions

This ESIA Study has been prepared to provide information and expert opinion to NEMA to establish whether activities of the proposed Amaya/Amaiya River Dam Water Development Project are likely to have significant adverse environmental and social impacts.

In view of the field surveys and public participation findings, it can be concluded that the Amaya/Amaiya River Dam Water Development Project is important to the national development and realization of vision 2030 and its importance to the local community cannot be overemphasized. The proposed development has potential to contribute to the rise in economic status of the area resident and to improve the environment and give rise to microhabitats that are environmentally sound.

From expert opinion of the consultants, Amaya/Amaiya dam water supply development project is feasible because it has many social and environmental benefits to the community. The following highlights are true about the project:

- ✓ *Project harmony and Support of Government Policies (Agriculture and Environment):*
The proposed project is in line with the government's big Four Agenda, Kenyan constitution 2010 and policies touching on water and sanitation, green energy sources, employment creation, income generation and rural development. Private sector participation from the area will also be enormous since most NGOs working in the area pointed out that water scarcity had been a main cause of conflicts in the area in the past. The project will also enhance environmental conservation and convert idle land into a useful resource. The project proponent should ensure adherence to the environmental laws and regulations from the onset of the project.
- ✓ *Compliance with the existing Legislation, Conventions, Treaties, Covenants and Standards:* This project is not in contravention of any of the existing laws and standards. Further to this, the project proponent will ensure that the relevant laws and standards are upheld throughout the project cycle.
- ✓ *Project impacts Reversibility/Irreversibility:* The project is likely to do more good than harm when well executed with an elected project team. Being a transboundary project, during ESIA, key leaders in the area were consulted for their views and inputs. It's the consultants considered opinion that political good will and capacity building of the community is vital during all the phases of the project so as to enhance project sustainability. The foreseen environmental impacts can be prevented or reversed by use of environmental conservation measures and the mitigation measures proposed in the project study report.
- ✓ *Geographical Extent of the Impacts:* The foreseen negative impacts on the environment and community are subtle when compared with the positive impacts of the

Amaya/Amayiya dam water supply. The impacts are also not expansive and but mainly localized to the area. Soil erosion and gulley formation are already a major and prevalent problem in the area. Since the proposed project will harness flood waters, this is likely to control flooding and gulley erosion. Incorporation of tree planting will lead to improvement of the vegetation cover. Pollution, devegetation and land degradation impacts that may occur can be effectively alleviated if all the proposed mitigation measures are put in place. Conflicts over natural resources may be controlled through setting of monitoring and distribution committees for water and fodder.

- ✓ *Project sensitization and acceptability:* After project sensitization, the local communities and their leadership have promised to support the project. The beneficiary communities accept the project and the local leaders and politicians in all the 3 counties are looking forward to a speedy completion of the study so that the project can be licensed. The local people and the political and religious leaders are receptive to the project terming it as a “game changer” to the community”. During Community Public Participation and Interviews from local levels to the government offices, all the stakeholders and community are receptive of the project and promised total support. The project will reduce water scarcity, reduce possible resource conflicts, alleviate poverty and open up the area for development.
- ✓ *Occupational health hazards during construction and project operational phase:* This could include accidents and any injuries to human health. Such impacts are significant and irreversible, and it is therefore critical that the project proponent puts in place all the proposed mitigation measures on occupational health and safety during construction while during operation, the community members should be capacity built on occupational health and safety. The dam area should also be fenced to protect the people from accidents such as falls and drowning.

Local institutions such as health centers and schools will be able to operate sustainably when water becomes available, and will be able to serve higher population of service seekers. This can help to create awareness of diseases such as HIV/AIDS, whose awareness among people is currently low. Increased sedentary lifestyle will be an outcome which will trigger high increased enrolment in school by children of all sexes. This will increase the number of literate people and enhance their ability to engage in activities that can change their lifestyles. Also, increased permanent settlement will lead to increased toilet cover in the area thereby reducing open defecation.

Foreseen Project Benefits include but are not limited to:

- ✓ *Reduction of water borne diseases incidences:* Access to treated water will reduce incidences of diseases that are caused by use of untreated water, hence raising health standards in the area.
- ✓ *Improvement of food security and livelihoods:* The project will play a critical role in provision of domestic water thus alleviating water scarcity and allowing women to

participate in other activities. Currently women fetch water from as far as 15km away. Provision of water for livestock and irrigation will enhance food security in household, reduce hunger and enhance peace in the area by solving any water related conflicts in the area. Decimation of livestock by drought will be minimized. Local people who are currently net food buyers will be able to retain money locally once they start diversifying into other income generating activities which will be supported through provision of water from the dam. Livelihoods will be diversified and new jobs will be triggered by irrigated farming, hence easing unemployment in the area.

- ✓ Improvement of school attendance: School performance will improve when water becomes available and children no longer spend many hours outside class room fetching water. With provision of water for irrigation, men will be attracted to horticulture farming and this will curtail idleness and engagement in cattle rustling activities in neighboring communities.
- ✓ Conservation of vegetation: Destruction of vegetation through charcoal burning will cease/reduce once people get alternative sources of livelihoods.
- ✓ Water harvesting: Water harvesting will become possible when roofing changes.
- ✓ Agroforestry: Agroforestry enterprises will improve the tree cover in the area improving the microhabitat
- ✓ Fodder farming: Availability of water will enable communities to produce fodder for livestock.
- ✓ Maximization of land and water resources efficient use: Water availability will lead to maximization of land and water resources use.
- ✓ Green energy sources: Introduction of green sources of energy through the hydropower component will ensure sources of electricity and power.

The consultants wish to state that most adverse impacts associated with the project can be readily managed to acceptable levels with implementation of the recommended mitigation measures for the Project such that the overall benefits from the Project will greatly outweigh the adverse impacts. The project will benefit the people of Amaya/Amaiya region through domestic and livestock water provision, the irrigation demonstration farms will serve as capacity building centers for agricultural training and information dissemination. The project will be instrumental in enhancing peace and stability in the area through reduction of possible conflicts over water resources.

The consultants recommend trainings on fodder growing and processing to entice the community to reduce herds of animals and adopt a more sedentary lifestyle with minimized stocks. If the attached comprehensive ESMP, is adhered to, the project will realize more gains than losses to the community. Therefore, this ESIA Study Report should be approved and the proposed project licensed by NEMA.

9.2. Recommendations

- ✓ NEMA should license the project since it is ecologically, economically and socially sound;
- ✓ Resettlement Action Plan: Z& A consultants recommend that the recommendations of Resettlement Action Plan report should be implemented before mobilization of contractor to site. If there is any additional land requirements by the contractor not covered under the RAP, consultations should be made with appropriate PAPs and stakeholders and implemented before actual construction begins;
- ✓ Water Abstraction permits should be sourced from WRA before the commencement of works.
- ✓ Project Designs should be approved by the relevant authorities before construction works commences and construction works should be in line with relevant regulations, policies and laws;
- ✓ Environmental audits should be undertaken and submitted to NEMA regularly once the project is operational to ensure compliance with
- ✓ Downstream ecology should be protected by ensuring the Amaya/Amaiya River flows are regulated throughout the operation period and continuous monitoring should be emphasised.
- ✓ During the dry season, more water should be released from the dam into the river.
- ✓ Adherence to ESMP: In addressing the environmental issues, the contractor and/or RVSWB must follow the mitigation guidelines provided under ESMP. This will ensure the safety of operators and the neighbouring communities.
- ✓ Annual Environmental and Occupational Safety and Health Audits: CRVWWDA should undertake separate Environmental Audit (EA) and Annual Occupational Safety and Health audits of the project, twelve (12) months after completion as required by the NEMA Regulations;
- ✓ Watershed Management for the Amaya/Amaiya upstream areas should be prioritized focusing on agroforestry and riparian areas rehabilitation with indigenous species and sensitization of the local communities on the same.

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APPENDIX I: HOUSEHOLD QUESTIONNAIREQuestionnaire for Environmental and Socio-economic Survey

The Rift Valley Water Service Board has contracted JV BETA STUDIO S.r.l and Z & A Consulting Engineers International Ltd. to carry out an Environmental and Social Impact Assessment Study for the Proposed Amaya Dam and Water Supply Project. This Questionnaire should be administered to consenting adults preferably household heads.

	Date		Start time:		Questionnaire number:		
			End time:		Enumerator Name:		Initials:
					Supervisor Name:		Sign:
A: LOCATION							
A1	County Name		A2) Sub County	A3) Ward	A4) Village name	A5) Catchment area	A6) Command area
B BIODATA/ DEMOGRAPHIC CHARACTERISTICS							
B1	Respondent Details	Name:		Telephone contact	ID No.	Relation to HH head	
B2	Sex (circle)	F	M		B3) AGE at last birthday (write figure)		
B4	Household Members	Adults	No:		Age(s) of adults (write figure(s))		
		Children	No:		Age(s) of children (write figure(s))		
B5	Can you read and write?	1) yes			2) No		
B6	What kind of education do you have (write figure of correct response in box provided across the page)			1) lower primary 2) Upper primary 3) Lower Secondary			
	What kind of education does your spouse have			4) Upper secondary 5) University 6) Technical / vocational College 7) Teacher training school 8) No formal school			
	What kind of education do your children have			9) non formal literacy classes 10) Apprenticeship 11) Other (specify)			
B7	What do you do/ how are you occupied? Circle not more than 2 correct responses:						
	1) Pastoralist 2) Crop farming 3) Mixed farming 5) Bee keeping 6) Hunting 7) Charcoal burning 8) Businessman/Trading 9) Teaching 10) Student 11) Police 12) Casual farm labour 13) Casual domestic Labour 14) Bodaboda 15) carpentry 16) tailoring 17) construction, 18) hairdressing, 19) health worker, 20) kiosk, 21) security guard 22) welding 23) Others (specify)						
C: FOOD SOURCES AND FOOD SECURITY							
C1	What does your household feed on daily?	1) Milk 2) Meat 3) Millet 4) Sorghum 5) Cassava 6) Beans 7) Pigeon Peas 8) Rice 9) Bananas 10) Vegetables 11) Sweet potatoes 12) Wild food 13) Others					
C2	Where do you get the food from?	1) Grow it ourselves 2) Buy 3) Provide labour for food 4) Exchange for other items 5) Borrow 6) Hunting/ wild food from forest & unoccupied land 7) Given by relatives/ friends/neighbours 8) Food aid from Gov. or NGOs 9) Other, specify					

C3	Who ensures there is food for the household?	1)Self (2)Husband 3) Wife (4)Mother (5) Father (6) Sister (7) Brother (8) Son (9) Daughter (10) Other (specify)	
C4	How many meals do you have a day?	(1)One (2) Two (3) Three (4) Four (5) Other, specify	
C5	Do you often have surplus food?	1) Always 2) Frequently 3) Sometimes 4) Once a while (5) Never	If 5, skip to C7
C6	What do you do with surplus food?	1) Sell 2) Store 3) Share with relatives 4) Pay for labour 5) Exchange for other commodities 6) Other, specify	
C7	Does your HH ever go hungry at any time of the year?	(1) Yes (2)Frequently (3) Sometimes (4) No (5) Never (6)Other, specify	If 5 is yes, skip to C11
C8	If yes, during what season (specify months) 1,2,3,4,5,6,7,8,9,10,11, 12		
C9	What do you do to get food during the scarcity months?		
C10	What 3 foods do you eat mainly during the hungry months?		
C11	What methods if any do you have for processing and preserving food?	1) Drying in garden 2) drying on racks 3) Threshing and winnowing 4) Milling 5) fermenting 6)Use chemical preservatives 7) Ash 8) Other (specify)	
C12	Are these learned at home, or elsewhere?	1) Home	2) Elsewhere (specify).
C13	Who is involved in livelihood activities for supporting the family?	1. Husband 2.Wife 3. Both wife and husband 4. Children 5. All-husband, wife and children	
14.	Who makes decision on how household income is allocated for use?	1. Husband 2. Wife 3,.Wife and husband	
D: HOUSING			
D1	How long has your household inhabited this dwelling	1) Less than 6 months 2)6-12 months 3)1-5 years 4)5-10 years 5) 10+years	
D2	Who owns the house you live in?	1)Self 2) Husband 3) Wife 4) Jointly owned (5) Rented (6) A relative (7) Friend (8) Other (specify)	
D3	Observe and write response in box provided to indicate what materials the walls, roof and floor of the Main House are made of	i) Walls	1) Iron sheets 2) Bamboo 3) Unburnt Bricks 4) Burnt bricks 5) corrugated Iron sheets 9) Earth/clay 10) Grass thatch / leaves 11) Hardened dung 12) Mud and acacia trees 13) Stone 14) Other (specify)
		ii) Roof	
		iii) Floor	
D4	Comment on the general condition of the house/ household	1) Very bad 2) bad 3) neither bad nor good 4) Good 5) Very Good	
D5	Other than habitation what else do you use the house for	1) Storage 2) share with animals 3) Other (specify)	

E ENERGY SOURCES AND USES			
E1	What sources of fuel / energy do you use for the following; (Write the response figures in the box provided)	For Cooking	1) Firewood 2) Charcoal 3) Paraffin/ kerosene 4) Charcoal briquettes 5) Electricity 6) Biogas 7) Grass / Crop residue 8) Gas/LPG 9) Solar 10) Batteries / dry cells 11) Cow dung 12) Plastic bags 13) Pressure lamp 14) Candles 15) Nothing 16) Biogas 17) Other (specify)
		For Lighting	
		For Electronic gadgets / sound	
E2	Do you have electricity in your homestead?	1) Yes	2) No.
F: HEALTH:			
F1	Has anyone in your homestead been ill, had an accident in the past 1 Month? (circle response)	1) Yes	2) No
F2	If yes, what kind of illness / accident was this? (Write figure(s) in box across)	1) Malaria 2) Diarrhoea 3) Flue / cough 4) Intestinal worms 5) Pneumonia 6) Skin disease 7) Cholera 8) Eye infection 9) Kwashiorkor 10) Typhoid 11) Dysentery 12) Bilharzia 13) Amoeba 14) Jiggers 15) Dehydration 16) Farm accident patient 17) Motorcycle accident patient 18) Motor vehicle accident patient 19) Other (specify)	
F3	What were the (3) most common illnesses, health issue in your Household this year? (Write figure(s) in box across)		
F4	What were the (3) common water borne diseases experienced in the household over the last one year?		
F5	Which of these long-term illnesses/ conditions do members of your household have (3)? (Write figure(s) in box across)	1) Diabetes 2) Hypertension 3) HIV/AIDS 4) TB 5) Cancer 6) Tuberculosis 7) Mental illness 8) Epilepsy 9) Blindness 10) Hearing Disability 11) Speech impairment 12) Paralysis 13) None 14) Other (Specify)	
F6	What kind of health facility do you and your family use?	1) Government hospital / health centre 2) FBO Hospital 3) NGO Hospital 4) Private hospital 5) Private clinic 6) Pharmacy 7) Drug shop 8) Herbalist 9) Do not use any 10) Other (specify)	
F7	Who attends to you at this health centre / facility?	1) Doctor 2) Nurse 3) Clinical Officer 4) Nursing Aid 5) Pharmacists 6) Traditional Birth Attendants 7) Herbalist 8) Other, specify	
F8	Do you have health insurance?	1) Yes	2) No
F9	How far is the nearest health centre in Kilometres? (write figure)		
F10	What time does it take to reach the nearest health facility in minutes?	1) Below 15 minutes 2) 15-30 minutes 3) 30-1 hour 4) 1-2 hours 5) More than 2 hours	
F11	How satisfied are you with the services offered at the health facility?	1) Very satisfied 2) Satisfied 3) Indifferent 4) Not satisfied 5) Very dissatisfied	
F12	If not satisfied, what are the reasons for being dissatisfied?	1) Services are very expensive 2) No drugs 3) Doctors/nurses are not friendly 4) Delays in being attended to 5) Facility is dirty 6) Its very far 7) Other (specify)	
F13	Are you aware of any HIV /AIDS awareness campaign in your Community?	1) Yes	2) No
F14	What is the medium of HIV/AIDS campaign	1) Posters/public notice 2) Radio 3) Baraza 4) Seminars 5) Newspaper 6) Clinics 7) Drama 8) Other (specify)	

F15	Are you clearly knowledgeable of the HIV/AIDS means of contraction and effects?	1) Yes	2) No		
F16	Is every child of 5 and below in your HH immunized fully?	1) Yes	2) No		
F17	If no, what is the reason they are not immunized?	1) Not interested 2) Did not know 3) Far off health facility 4) Afraid of immunizing 5) Other, specify			
F18	Do members of your household have access to mosquito nets?	1) Yes	2) No (skip to F20)		
F19	If yes, who sleeps under the mosquito net?	1) ALL HH members 2) Children below 5 years 3) Pregnant mothers 4) Visitors 5) Other (Specify)			
F20	What other actions do you take to control mosquitoes and prevent malaria?				
F21	What other important disease carrying vectors do you have in your area?				
G: WATER ACCESS; FACILITIES and SANITATION					
G1	What is your main source of drinking water? (write figure in box provided)	1) Pump/borehole 2) Protected well 3) Unprotected well 4) Stream/ river 5) Protected spring 6) Unprotected spring 7) Stagnant pond 8) Public tap 9) Tap outside the house 10) Tap inside house 11) Rain water harvesting 12) Water vendor 13) Other, specify			
G2	Which is your preferred water source?				
G3	What is your main source of water for domestic animals?				
G4	What are the current uses of water during wet season	1) Drinking and Cooking 2) Bathing / Personal Hygiene 3) Washing Clothes/ Utensils/Floor 4) Cleaning Toilet 5) Livestock needs 6) Growing Crops 7)Others(specify)			
G5	What are current uses of water during dry season				
G6	How far is the nearest source of water for drinking? (Write in Km)				
G7	Time taken to water source and back during wet season?	1) 0 – 15 min 2) 16 – 30 min 3) 31 – 45 min 4) 46 – 60 min 5) more than 60 minutes 6) Other (specify)			
G8	Time taken to water source and back during dry season?				
G9	Do you use the same sources of water for drinking and for other household needs?	1) Yes (If yes skip to G10)	2) No		
G10	If no, what is the main source of water for other household needs?	1) Pump/borehole 2) Protected well 3) Unprotected well 4) The river 5) Protected spring 6) Unprotected spring 7) Stagnant pond 8) Public tap 9) Tap outside the house 10) Tap inside house 11) Rain water harvesting 12) Other, specify			
G11	How many litres of water do you use per day?				
G12	Do you pay for the water you consume/use?	1) Yes	2) No (skip to G 13)		
G13	How much do you pay for water per day?				
G14	How satisfied are you with the current water supply in your area?	Highly Satisfied	5	F21) Explain response in the opposite box	5
		Satisfied	4		4

	(Circle response figure G14 then explain in next box provided)	Neutral	3		3
		Not Satisfied	2		2
		Very Dissatisfied	1		1
G15	Would you want the current water supply changed?			1) yes	2) No
G16	Would you be willing to pay for improved water services?			1) yes	2) No (skip to G17)
G17	If Yes how much would you be willing to pay per day?				
G18	If no, why are you unwilling to pay for the improved water services?				
G19	In what container(s) do you store water for drinking?	1) Open traditional Water pots 2) Closed traditional water pots 3) Open plastic container 4) Closed plastic container 5) Open metal container 6) Closed metal container 7) Other, specify			
G20	Who is responsible for fetching water in your HH?	1) Boy child 2) Girl child 3) Boy youth 4) Girl youth 5) Adult men 6) Adult women 7) Hired help 8) Other Specify			
G21	Do you harvest rain water for use by your HH	1) Yes	2) No		
G22	If Yes, how is water harvested	1) In tanks, 2) Household containers (Jerry cans, basins, pots and pans) 3) shallow hand dug holes 4) Other specify			
H	SANITATION FACILITIES AND SERVICES				
H1	When do you wash your hands?	1) Before eating 2) After eating 3) after working outside 4) after using the toilet 5) before handling infants 6) after handling infants			
H2	Does the household have a latrine / other toilet facility?	1) Yes	2) No		
H3	Specify the kind of latrine / toilet facility present	1) urinal with stones		2) pit latrine with wall and roof	
		3) pit with raised slab		4) Pit with wooden floor	
		5) Pit latrine without a raised slab		6) Ventilated improved pit (VIP) latrine.	
		7) Flush toilet private (Go to H4)		8) Grass thatched enclosure (Go to H4)	
		9) Flush toilet public (Go to H4)		10) Other (specify)	
H4	Does your latrine have a cover	1) Yes 2) No			
H5	Assess the status of the latrine/toilet	1) Very dirty 2) Dirty 3) Fairly clean 4) Clean 5) Very clean			
H6	What is the distance of water storage from the latrine /toilet in metres?				
H7	Do you have a Hand wash facility next to the latrine/toilet?	1) Yes	2) No		
H8	Does your household have a bathroom / Bath shelter?	1) Yes	2) No		
H9	Do you have a drying rack?	1) Yes	2) No		
H10	What sanitation challenges do you face in your household?				
H11	What are your suggestions for improving sanitation in the area?				
H12	Who are the main water and sewerage service providers in the area?				
I: HOUSEHOLD INCOME					
I1	How much do you earn from agricultural activities per year?				
	1. Farm produce sold	Quantity	Income in KES/year		
	2. Cattle				
	3. Goats				
	4. Sheep				

	5. Maize		
	6. Beans		
	7. Sorghum		
	8. Honey		
	9. Milk		
	10. Charcoal		
	11. Other Specify.....		
	12. Other Specify.....		
I2	How much do you earn from non-agricultural activities per year?		
	1. Activity	Income in KES /month	
	2. Civil servant		
	3. Teacher		
	4. Crafts-making		
	5. Religious leader		
	6. Shop		
	7. Bodaboda transport		
	8. Tailoring		
	9. Casual work		
	10. Other, specify.....		
	11. Other, specify.....		
	12. Other, specify.....		
I3	Other Sources of income		Income in KES/month
	1. Pension		
	2. Remittances		
	3. Others, specify.....		
J: HOUSEHOLD EXPENDITURE			
J1	How much do you spend on the following per month (KES)		
	Food		
	Clothing		
	School expenses, uniforms, books		
	Travel and transport		
	Agricultural inputs, including animal care		
	Medical expenses (hospital visits, drugs)		
	Water		
	Savings		
	Communication		
	Recreational and culture		
	Fuel (kerosene, firewood, gas, charcoal, etc)		
	Miscellaneous goods and services		
	Other unclassified expenses		

K. USE OF FARM INPUTS		
K1	Do you use any type of farm inputs	1. Yes 2. No
K2	If yes, which ones?	1. Certified seeds 2. Fertilizer 3. Pesticides 4. Animal manure
L. SOURCE OF FARM LABOUR		
L1	How many members of your household provide labour in the farm?	_____no.
L2	Do you employ casual labour?	1. Yes 2. No.
L3	If yes, how many?	_____no.
M. FARM TOOLS		
M1	Which farm tools do you have?	1. Jembe/hoe, 2. Panga 3. Sprayer 4. Plough 5. Others, specify
M2	How many of each farm tools do you have?	1.No. of jembe/hoe, _____2. No. of panga _____3. No. of sprayers_____ 4. No. of plough_____ 5. Others, specify _____no._____
N. SOURCES OF FARMING CAPITAL		
N1	Do you have access to agricultural credit?	1. Yes 2. No
N2	If yes, where do you source farming capital?	1. Friends 2. Groups 3. Banks Micro-credit institutions 4. Marketing Cooperatives
O. MARKETING		
O1	Where do you source your seed?	1. Stockist 2. Cooperative 3. Own seed 4. Others (specify)
O2	Where do you source your pesticides?	1. I do not use 2. Directly from stockists 3. Cooperative 4. Others (specify) -----
O3	Do you usually have surplus produce for sale	1. Yes 2. No
O4	Where/ to whom do you sell your produce?	1. Co-operative society 2. Local markets 3. Regional/urban markets 4. brokers/ middlemen 5. Big agro-processing companies (specify) 6. Others (specify)
O5	Do you have any challenges in marketing?	1. Yes 2. No
O6	If yes (above), list the challenges in order of priority?	1. 2. 3. 4.
P. SOCIAL CAPITAL AND CULTURAL VALUES		
P1	Which social support groups or organizations are you a member?	1. None 2. Women group 3. Cultural groups 4. Men's group 5. Farmers cooperative 6. Youth group
P2	Which type of support do you get from groups/organizations?	1. Credit 2. Extension services 3. Marketing
P3	Which services have you ever sought to support farming activities?	1. Credit 2. Extension services 3. Marketing 4. None
P4	Name the non-government organizations (NGOs) working in the area	1.....2.....

		3.....4.....
P5	Which cultural heritage/sites exist in the area?	1. Caves 2. Shrines 3. Ritual grounds 4. Graves
P6	Which cultural ceremonies are conducted by entire community?	1. Circumcision 2. Age-grade transition 3.
P7	Are there recreational facilities in your area?	1. Yes 2. No.
P8	If yes, name these recreational facilities	1.....2.....3.....
Q: ENVIRONMENT		
Q1	What are some of the major environmental problems in the area?	1)Soil erosion 2)(Reduction in agriculture production 3)Climate change 4)Famine/drought 5)Loss of soil fertility 6)Flooding 7)Invasive species 8)Siltation 9)Over use of agrochemicals 10)Landslides and earthquakes 11) Other(specify)
Q2	What in your opinion can be done to Mitigate these environmental problems?	1)Public education 2)Re-forestation 3)Control of soil erosion 4)Terracing 5)Heavy penalty on polluters 6)Don't know 7)Nothing 8) God's intervention 9)Other(specify)
Q3	How do you dispose solid wastes from your homestead?	1)Compost pit 2)Burning 3)Open land 4)Other(specify)
Q4	How do you dispose waste water from your homestead?	1)Sewer system 2)Open ditches 3)Open land 4)Other (specify)
Q5	Main sources of information on environmental issues:	1) Meeting/training 2)Radio 3) TV 4)Educational Institutions 5) Internet 6) None 7)Others (specify)
Q6	Common tree species on your land	
Q7	How are these trees used?	1)Fruit/food 2)Sale of timber 3)Fetch firewood 4)Ornamental value 5)Medicinal value 6)Craft 7) Making household vessels 8) Others(specify)
Q8	What are the common animals in the area	
Q9	What is the value / use of these animals	
Q8	What are the common animals in the area	
Q9	What is the value / use of these animals	
Q10	What are the notable sensitive habitats within this area?	1)Forests 2)Wetlands 3)Cultural sites 4)Dams 5)Sloppy lands 6) None 7) Others(specify)
Q11	What Sustainable Land Management practices are employed in the area?	1) Zero Tillage 2)Crop rotation 3)Agroforestry 4)Minimum tillage 5)Afforestation 6)Soil conservation 7)Creation of buffer zones in the riparian areas 8) Organic farming 9) Leaving fallow areas 10) Nothing 11) Other (Specify)
Q12	Which of these do you practice?	
R: LAND TENURE AND OWNERSHIP		

R1	What type of land tenure system are you under	1) Private land (freehold) 2) Private Land (leasehold) 3) Trust land 4) Government Land (define)	
R2	Which category do you fall under	1) Land owner 2) Tenant 3) Squatter 4) Other (specify)	
R3	What are the current land uses on site?	1) Residential 2) Cash crop farming 3) Subsistence farming 4) Business premises 5) Pasture/ fodder/ grazing grounds 6) Graves/ burial site 7) other (specify)	
S: CONFLICTS ON LAND USE			
S1	What are the 3 most important resources for you on communally owned / common lands?	1) Forests 2) Wild life 3) Honey 4) Water points 5) Firewood 6) Timber 7) Wild food sources 8) Sand 9) Stone 10) Other (specify)	
S2	Do you have wildlife in your area	1)Yes	2)No
S3	If yes, which animals?	1)Elephants 2) Giraffes 3) Buffaloes 4) Rhinos 5) Leopards 6) Lions 7) Gazelles 8) Zebras 9) Warthogs 10) Waterbucks 11) Mongoose 12) Foxes 13) Monkeys 14) State any others	
S4	Do you have animal migratory corridors in your area	1)Yes	2)No
S5	If yes, which animals usually pass through those corridors?	1)Elephants 2) Giraffes 3) Buffaloes 4) Rhinos 5) Leopards 6) Lions 7) Gazelles 8) Zebras 9) Warthogs 10) Waterbucks 11) Mongoose 12) Foxes 13) Monkeys 14) State any others	
S6	Do you know of any human wildlife conflicts that have occurred in your area ?	1) Yes	2) No
S7	If yes, what is the main source of conflicts?	1) Wildlife attacking man 2) Predating on domestic animals 3) Damage to crops 4) Human death caused by wildlife	
S8	Has the conflict been addressed and/or resolved?	1) Yes	2) No
S9	What conflict resolution mechanisms are available to use?	1)Family 2) LC courts 3) Clan / Elders 4) Sub county chief 5) Courts of law 6) Don't know 7) Other (specify)	
S10	Which are the most commonly used conflict resolution mechanisms regarding human wildlife conflicts?		
T: PROJECT AWARENESS, COMMUNITY WILLINGNESS TO PARTICIPATE AND PROJECT BENEFITS			
T1	Are you aware of the proposed project on River Amaya?	1)Yes	2)No (Skip to K3)
T2	If yes, how did you get that information?	1) Local gov. / authority. 2)Traders 3) Radio, 4) TV, 5) newspaper 6) Extension workers 7) Local government officials 8) Local politicians 9) Local church 10) Village Baraza 11) Friends/relatives 12) Local Committees (specify) 13) Other(specify)	
T3	If no, how could information reach you better?		
T4	Would you like to have such a Project in this area?	1)Yes	2)No
T5	Why?		
T6	If the proposed reservoir, pipelines, canals pass through your land, are you willing to cede the land?	1)Yes	2)No
T7	If No, why?		

T8	What do you propose to be the main use of the water from the project?	Rank in order of priority) 1. 2. 3. 4
T9	In your opinion how such a project should be financed?	1) By donors 2)By govt. 3) Donors and Gov. 4) By Farmers 5) Farmers and Gov 6) Donors / Gov. /Farmers 7) Don't know. 8) Other (specify)
T10	Would you be willing to contribute toward the project cost	1)Yes 2)No (skip to K 12)
T11	If YES, How?	1)In cash 2) In kind 3) Both Cash and kind 4) Other (specify)
T12	If NO, why?	
		1)Yes 2)No
T13	What are the environmental benefits anticipated due to the proposed project?	1) Reduce water loss 2) Control flooding 3) Maximise use of land 6) Control soil erosion 7) Carry out afforestation 8) Increase tree diversity 9) Agroforestry 10) Grow fodder for animals 11) Rain water harvesting 12) mitigate charcoal burning as a source of income 14) Healing of gulleys 15) Reduction of land degradation 15) Control overgrazing 16) Encourage zero grazing 17) Reduce dust pollution18) Mitigate climate change 19) Improve water use efficiency 20)Any other (specify)
T14	What are some of the Environmental problems you anticipate due to the proposed project?	1)Overuse of agrochemicals 2) Soil erosion 3) Leaching 4) Formation of a hardpan 5) flooding 6) Introduction of new pests and diseases 7) Human wildlife conflicts 8) Devegetation 9) Loss of indigenous crops 10) Water pollution 11) waste disposal 12) Water borne diseases 13) Siltation of water bodies 14) Drying up of Amaya River 15) Contamination of ground water16) Noise 17) Loss of aesthetic land value 18) Loss of aquatic and terrestrial fauna, 19) Water logging 20) Any other (Specify)
T15	How can you mitigate the anticipated environmental problems emanating from the proposed project?	
T16	If you could grow anything you wanted, what crops would you grow?	
M17	What do you see as the possible effects of an irrigation scheme to your farming?	1)Food security 2)All year cultivation 3) Improved farming 4) Increased production 5)New crops introduced 6) Better income 7)Reduce time wastage 8) Increased costs 9) Pests 10) Surplus without markets 11) Loss of control 12) Increased workload 13) Other (specify)
T18	What other services do you think the community would expect as part of an irrigation scheme?	1)Catchment conservation 2)Erosion control 3)Fishing 4) Jobs 5) Processing 6) Water for livestock 7) Markets / Marketing 8) Roads 9) Hydropower 10) Other (specify)

APPENDIX II: WATER ANALYSIS CERTIFICATES

APPENDIX III: MEETING ATTENDANCE SHEETS