ENVIRONMENTAL & SOCIAL IMPACT ASSESSMENT FOR PROPOSED BOREHOLE SOLARIZATION AT RAMADHAN, ISIOLO TOWN-ISIOLO COUNTY



CONSULTANCY SERVICES FOR ENVIRONMENTAL & SOCIAL IMPACT ASSESSMENT FOR THE PROPOSED INTERVENTIONS FOR ISIOLO, NANYUKI & MANDERA WATER SERVICE

JANUARY, 2025

INTERNAL QUALITY CONTROL

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CERTIFICATION

We hereby certify that the content of this Environmental and Social Impact Assessment Report for proposed borehole solarisation at Ramadhan, Isiolo Town in Isiolo County is factual and that the content conforms to the provisions of the Environmental Management and Coordination Act Cap. 387 and the Environmental (Impact Assessment and Audit) (Amendment) Regulations, 2003.

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TABLE OF CONTENT

INTERNAL QUALITY CONTROL 2
TABLE OF CONTENT 4
ABBREVIATIONS 8
0 EXECUTIVE SUMMARY 10
0.1 Introduction 10
0.2 Project Description 10
0.3 Project Methodology 12
0.4 Public Participation and Stakeholder Engagement 13
0.7 Potential Project Impacts and Proposed Mitigation Measures 13
1 INTRODUCTION 17
1.1 Project Background 17
1.2 Project Justification 19
1.3 Purpose of the Study 19
1.4 Objectives of the Study 20
1.5 Scope of the Study 21
1.6 Approach and Methodology 22
1.6.1 ESIA Process 22
1.6.2 Impact Assessment Framework 23
1.6.3 Stakeholder Engagement 24
1.7 Structure of the Summary Project Report (SPR) 24
2 PROJECT DESCRIPTION 26
2.1 Project Location 26
2.1.1 General Project Area 26
2.1.2 Description of the Proposed Project 27
2.2 Project Classification 28
2.3 Total Project Cost 28
3 POLICY, LEGAL AND REGULATORY FRAMEWORK 29
3.1 Introduction 29

3.1.1 The Constitution of Kenya 29
3.1.2 The Kenyan Vision 2030 29
3.1.3 National Policy on Water Resources Management and Development 29
3.1.4 Policy Guidelines on Environment and Development 30
3.1.5 Sustainable Development Goals 30
3.1.6 Sustainable Waste Management Policy 2021 31
3.1.7 Extended Producer Responsibility (EPR) (2021) 31
3.1.8 World Bank Operational Procedures 31
3.2 Water Regulatory Framework 32
3.2.1 Water Act, 2016 32
3.2.2 Water Quality Regulations, 2006, (Legal Notice No.121) 33
3.2.3 Water Resources Management Rules, 2007 33
3.2.4 Isiolo County Water and Sanitation Services Act, 2020 34
3.3 Environmental Policy and Regulatory Framework 34
3.3.1 National Environment Action Plan Framework 34
3.3.2 Environment Management & Coordination Act Cap 387 35
3.3.3 The Environmental (Impact Assessment and Audit) Regulations, 2003/Legal Notice 31 & 32 35
3.3.4 Environmental Management and Coordination (Conservation of Biological Diversity) Regulations 2006 36
3.3.5 Environmental Management and Coordination (Wetlands, Riverbanks, Lake Shores and Sea Shore Management) Regulations 2009 36
3.3.6 Environmental Management and Co-ordination (Controlled Substances) Regulations, 2007 36
3.3.7 Environmental Management and Co-ordination (Waste Management) Regulations, 2006 36
3.3.8 Environmental Management and Coordination (Fossil Fuel Emission Control) Regulations 2006 37
3.3.9 Environmental Management and Coordination (Noise and Excessive Vibration Pollution) Control Regulations, 2009 37
3.3.10 Isiolo County Climate Fund Act, 2018 38
4 BASELINE CONDITIONS 40
4.1 Physical Characteristics 40

4.2 Topography 41
4.2.1 Drainage and Land use 41
4.2.2 Geology 41
4.2.3 Climatic Conditions 42
4.2.4 Ecological characteristics 44
4.3 Socio-Economic Characteristics of Households 44
4.4 Socio Economic Profile of Residents in project Area 45
4.4.1 Household Survey 45
5 PUBLIC CONSULTATION AND STAKEHOLDER ENGAGEMENT 62
5.1 Introduction 62
5.2 Objectives of Stakeholder Engagement 62
5.3 Stakeholder Mapping 63
5.4 Stakeholder Analysis 65
5.5 Stakeholder Engagement Approach 71
5.6 Joint Public Baraza for Isiolo 71
5.7 Joint Focused Group Discussion for Isiolo Project 73
5.8 Site Specific Ramadhan Focus Group Discussion 74
Plate 4-1: Community Meetings at Ramadhan Site including a Gender Disaggregated Focused group discussion 75
5.8.1 Feedback from Public during the Baraza and FGDs 75
5.9 Key Informant Interview 76
6 IMPACT IDENTIFICATION, ANALYSIS 78
6.1 Potential Impacts and Mitigation Measures 78
6.1.1 Impact assessment scoring 78
6.1.2 Construction Phase 81
6.1.3 Positive Impacts During Construction 81
6.1.4 Negative Impacts During Construction 81
6.1.5 Operational Phase 88
6.1.6 Cumulative Impacts 94
6.1.7 Decommissioning Phase 95
7 ENVIRONMENTAL AND SOCIAL MANAGEMENT & MONITORING PLAN 96

7.1 Introduction 96
8 CONCLUSION AND RECOMMENDATION 110
APPENDIX A BILL OF QUANTITIES 113
B: Attendance List and Minutes of Meetings 115
APPENDIX C: BILL OF QUANTITIES 129

LIST OF FIGURES

Figure 2-1 : Map of Isiolo Town 26
Figure 2-2 : Photo of the project area 27
Figure 3-1 : Google Map extract showing the location of the project 40
Figure 3-2 : Average Rainfall in Isiolo Town 42
Figure 3-3 : Average Temperature Isiolo Town 43
Figure 3-4 Gender of respondents 46
Figure 3-5 Age of respondents 47
Figure 3-6 Formal education 48
Figure 4-7 : Household size 48
Figure 4-8 :Main source of income 49
Figure 3-9 Length of stay in an area 50
Figure 3-10 : House ownership 50
Figure 3-11 : Disease prevalence & the common diseases 52
Figure 3-12 : sources of health care for residents 52
Figure 3-13 : sources of drinking water for residents 53
Figure 3-14 : Time to water source & back during wet season 53
Figure 3-15 : Distance and Time taken to nearest water source & back during the dry season 54
Figure 3-16 : Amount of water used by a household per day 55
Figure 3-17 : Use of IWASCO water 55
Figure 3-18 : Cost of water 56
Figure 3-19 : satisfaction with current water supply 57

Figure 3-20 : Rain water harvesting 58
Figure 3-21 : Toilet facilities..... 58
Figure 3-22 : Social groups membership..... 59
Figure 3-23 : Mitigating Environmental problems..... 61
Figure 3-24 : Project Awareness 61

ABBREVIATIONS

ACC	Assistant County Commissioner
ASAL	Arid and Semi-Arid Lands
CECM	County Executive Committee Member
CBO	Community Based Organization
CSR	Corporate Social Responsibility
CC	County Commissioner
CP-ESMMP	Construction Phase-Environmental & Social Management and Monitoring Plan
DOSHS	Directorate of Safety and Health Services
DWC	Double Wall Corrugated
EMCA	Environmental Management Coordination Act
EHS	Environmental Health and Safety
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
GDP	Gross Domestic Product
HIV/AIDS	Human Immunodeficiency Virus/ Acquired Immunodeficiency Virus
IWASCO	Isiolo Water & Sanitation Company
KMD	Kenya Meteorological Department (KMD and
LPG	Liquefied Petroleum Gas
MCA	Member of County Assembly

MD	Managing Director
MP	Member of Parliament
MoWSI	Ministry of Water, Sanitation & Irrigation
NEMA	National Environment and Management Authority
NEAP	National Environmental Action Plan
NGO	Non-Governmental Organization
O & M	Operation and Maintenance
OSHA	Occupational Safety and Health Act
PAPs	Project Affected Persons
PPE	Personal Protective Equipment
RC	Reinforced Concrete
RCC	Roller Concrete Compacted
SGR	Standard Gauge Railway
SOPs	Standard Operating Procedures
SSHP	Site Safety Health Procedures
STIs	Sexually Transmitted Diseases
ToR	Terms of Reference
WASREB	Water Services Regulatory Board
WHO	World Health Organization
WRA	Water Resources Authority
WRUA	Water Resources Users Association
WTP	Water Treatment Plant

0 EXECUTIVE SUMMARY

0.1 Introduction

This Environmental Social Impact Assessment Report is prepared in line with the Terms of Reference (TOR) for Consultancy Services for undertaking Environmental and Social Impact Assessment for the proposed interventions for Isiolo, Nanyuki and Mandera Water Service Providers (WSP). It is also prepared as per the Environmental Management Coordination Act CAP 387 provisions for submission to National Environment Management Authority so as to obtain an EIA license before the project commences. The key objective of the assignment is to undertake Environmental and Social Impact Assessment (ESIA) that will identify key environmental and social issues that could emanate from the proposed project and develop appropriate mitigation measures. This will support approval of the proposed intervention by the National Environmental Management Authority (NEMA).

The proposed project is located in Isiolo Town, an urban centre that is experiencing rapid population increase due to immigration from its own rural areas and also its neighbouring counties. The town is located in the Isiolo sub county which is predominantly semi-arid. This implies that water supply is limited and the situation is exacerbated by the rapid population increase. Residents are faced with water inadequacies including frequent intermittencies and high-water prices. It is against this background that the proponent has proposed to develop a water supply project, a borehole solarization project, so as to address the challenge of inadequate water supply in the area.

0.2 Project Description

The project proponent, IWASCO is a utility company responsible for providing water supply and sanitation services in Isiolo County. Its primary mandate includes ensuring reliable water supply to residents and managing wastewater and sewerage systems within its jurisdiction. The project will be implemented through the Conditional

Liquidity Support Grant (CLSG) program Under this program, IWASCO has been selected to implement 3 interventions including: drilling and equipping of 5 boreholes, solarization of 7 no boreholes, purchase and installation of 1,610DN 15mm consumer meters. One of the boreholes where solarization will be done is Ramadhan Borehole. This is an existing borehole which is currently serving a section of residents in Ramadhan sub location. The borehole is powered by the national grid. As a result, the operational and maintenance cost of borehole is significantly high. In the event that there is power outage for a long period of time, resident have to bear the cost of water intermittences. It is against this background that IWASCO has proposed solarization of this borehole. The Ramadhan borehole site is located within a 4 acre land which already has a borehole and a 10,000 litres plastic water tank installed. The area is covered by overgrown grass and a single tree. *Lantana camara* is also dominant in the site.

Borehole solarization will entail construction of solar panel frames and ground mount points for control room housing the, batteries, inverters, electrical cables and conduits. Installations/ electrical works to include solar panels, batteries, inverters, circuit breakers etc. The solar component has the following specifications: The proposed solar system will be installed with 1 No. Sunverter SV3/2.2T with a capacity 2.2kw controller, 10No. 440W Dayliff solar modules, 2no. PV Disconnect Switch 1000V/40A, 1 No. ground mount which will be 4meters in length, 260m assorted ground cables, and 1 No. lightning arrestor of 5 meters will be provided.

Objectives of the ESIA

The specific objectives of the ESIA study include:

- To establish the baseline conditions in the project area so as to determine the likely impacts of the project on existing resources and infrastructures
- To identify both positive and negative environmental impacts associated with the project and provide for mitigation measures of the negative impacts.

- ❖ Evaluating the significance and magnitude of identified impacts to determine their potential importance and consequences.
- ❖ Developing appropriate mitigation measures and management strategies to avoid, minimize, or offset adverse impacts on the environment and affected communities.
- ❖ Preparation of an Environmental and Social Management Plan (ESMP) and an Environmental and Social Monitoring Plan (ESMoP).
- ❖ Providing recommendations to enhance the project design and planning to maximize positive impacts and reduce negative impacts on the environment and communities.
- ❖ Creation of awareness about the project and obtain opinions and concerns regarding the proposed project
- ❖ Providing decision-makers with comprehensive information and analysis to support informed decision-making regarding project approval, modification, or rejection.

0.3 Project Methodology

The ESIA team conducted Project Screening and Scoping that identified all the environmental impacts associated with the proposed project. A Stakeholder Engagement Plan was developed as per the mapped stakeholders.

0.4 Household surveys

The household survey was done through questionnaire administration targeting project beneficiaries in the identified borehole sites. The consultant used a sample of 5% of the targeted population around Ramadhan neighbourhood.

One public meetings was also held to create awareness about the project and obtain their views. The views of the public and secondary stakeholders are summarized in Chapter 5 of this report.

0.5 Public Participation and Stakeholder Engagement

The assessment involved mapping and identification of key stakeholders in water supply and generally water resource management. The aim was to inform them of the proposed project, seek their opinion and expertise and develop an environmental management plan based on this input. The key stakeholders engaged include: Department of Water, Environment & Natural Resources; National Government Administration; State Department of Gender & Social Services; State Department of Early Learning & Basic Education; National Government Administration Office-Isiolo. Public consultation involved conducting community meeting at different project sites. Additionally, it involved household data collection to establish individual concerns and opinions with regard to the project. The outcome of these meetings and household survey is annexed to this report.

0.7 Potential Project Impacts and Proposed Mitigation Measures

Construction Phase	Positive Impacts	Negative Impacts
	• Job opportunities for the local community especially the youth • Skill transfer to the local communities • Promotes local businesses through sourcing of construction Materials locally and other enterprises such as hotels • Improvement of infrastructure around the site (through negotiated CSR) e.g. security lighting • Improved livelihoods in the area as money generated from increased businesses in the area	• Increased movement of construction vehicles leading to traffic congestion, affecting the daily commutes of residents and learners in the nearby school • Noise and vibration from vehicles delivering materials, welding and other metal works • Improper disposal or management of construction waste could lead to littering and an unsightly environment. • The project may pose a risk to the community and nearby learners through traffic

		incidences or accidents from falling objects • There may be increased risk of HIV/AIDS transmission particularly due to influx of migrant workers who may engage in casual sexual relationships due to their temporary stay • Workers' influx due to availability of casual employment which may create pressure on services or cultural conflicts • Increased risk of child labour on site due to high number of non-school going children. • Children may be indirectly involved through sale of food and provision of support services • Construction sites pose a risk of sexual exploitation and abuse from rogue workers.
Mitigation Measures	• The contractor should develop and enforce a traffic control plan (speed limit, 'no' hooting areas) • Designate a traffic marshal to manage traffic during material delivery Limit noisy activities to daytime hours and ensure machinery is well-maintained to reduce noise levels. • Use noise barriers or acoustic screens where possible • Inform local residents and the nearby school management in advance about the construction schedule and potential interruptions-14days notice is recommended	

	• Establish a communication channel for residents and the school to express concerns or complaints, and ensure prompt responses. • Provide workers with proper protective equipment (PPE) and ensure adherence to safety protocols. • Maintain a clean and orderly construction site by regularly collecting and properly disposing of construction waste. •	
Operation Phase	Positive Impacts	Negative Impacts
	Direct Impacts i. Regular supply of quality water to residents of Ramadhan in Isiolo Town ii. Improved access to portable water iii. Reduction of operation & maintenance costs as a result of solarisation iv. Increased revenue to IWASCO *Cumulative Impacts* v. Reduced cases of water borne diseases among the locals vi. Establishment/Improvement of livelihoods vii. Improved local economic development	*Direct Impacts* • Risk of disrupted services during low sunshine months • Waste Management: At the end of their life cycle, solar panels generate electronic waste (e-waste). If not properly recycled, this waste can contribute to environmental pollution Cumulative Impacts • Continuous extraction of ground water may lead to lowered water tables, impacting local ecosystems and vegetation. •
Mitigation Measures	• Regular testing and monitoring of water quality by IWASCO and WRA to ensure it meets safety standards • Regular testing of water to maintain the water quality that is fit for human consumption. • Implementation of institutional /community awareness programs on water hygiene and safe usage practices. • Implementing sustainable groundwater management practices to prevent depletion, such as recharge projects or water conservation measures. • Promoting integrated water resources management that includes rainwater harvesting, groundwater recharge, and use of alternative water sources.	

	• Provide storage structures to provide water during the low sunshine hours such as maintaining the existing Kenya Power and Electricity Company Supply. • For solar panels generating e waste, use panels with longevity reducing the frequency of replacement and disposal; using panels with modular design that can be easily disassembled to allow for the recovery of valuable materials and components; and use of Recyclable Materials: Prioritize the use of materials that are easier to recycle, such as certain metals and plastics, to ensure a higher recovery rate. • Buy panels from manufacturer who have a "Take-Back Program" where they take back and recycle their products at the end of their life cycle. • To avoid birds deaths the solar panels can have anti-Reflective Coatings to reduce glare that may confuse birds making them mistake the panels for water bodies (a phenomenon known as the "lake effect"); textured Surface or patterned surfaces on solar panels can help break up reflections that might otherwise attract birds.
Recommendations	• Ensure public participation in all project stages particularly the residents of Ramadhan • IWASCO should involve all relevant stakeholders from the planning, design, construction to commissioning of the solar Infrastructure. • Engage the local leaders to create a 'buy in' and project support to ensure sustainability

0.8 Environment and Social Management Plan

The ESMP provides a summary of mitigation actions to be implemented during the construction and operation of this proposed project to solarize Ramadhan borehole. To ensure successful implementation, IWASCO will ensure that the ESMP is adhered to through communicating the ESMP to the contractor and other stakeholders and monitoring compliance. This will be done through the environment department. The contractor will be required to execute the ESMP, conduct regular monitoring, and report on compliance with mitigation measures on a weekly basis. Both the IWASCO and contractor will need to engage with local communities, including feedback mechanisms to address concerns related to the project.

1 INTRODUCTION

1.1 Project Background

The proponent, IWASCO, has proposed to undertake solarization of Ramadhan borehole situated in Isiolo County. The is situated in the eastern part of Kenya and covers an area of approximately 25,336 square kilometres. About 65% of Isiolo County is very arid, 30% arid, and 5% semi-arid [1]. The climate is characterized by high temperatures and low rainfall, typically ranging from 150mm to 650mm annually. The current state of water supply in Isiolo County is a complex issue characterized by significant challenges related to infrastructure, resource management, and environmental conditions. The primary surface water source in the county is the Ewaso Ng'iro River, which is a crucial water source for both domestic and agricultural use. However, its flow is highly seasonal and unreliable, often drying up during drought periods. There are a few small dams and water pans that capture and store rainwater. These structures are critical for providing water during dry periods, but they are often poorly maintained and suffer from evaporation losses.

Groundwater is a major source of water in Isiolo. The county has several boreholes and wells, but many of them are not operational due to technical failures, poor maintenance, or salinity issues. High fluoride levels in some areas also limit the usability of groundwater. The ground water is distributed unevenly, and in some areas, the aquifers are not adequately replenished, leading to depletion. In view of this, improved water access in Isiolo calls for increased investment in groundwater through drilling of boreholes, rehabilitation of existing wells, instituting sustainable maintenance strategies and increasing the capacity of the water treatment plant to address water quality challenges. It against this background that Isiolo Water and Sewerage Company (IWASCO) has proposed to drill and equip 5 boreholes within Isiolo town.

The proposed project is a component of the Conditional Liquidity Support Grant (CLSG) program whose objective is to improve water supply and sanitation services in select north eastern and coastal region and improve the financial performance of WSPs affected by the COVID-19 pandemic. The program is being implemented by Ministry of Water, Sanitation and Irrigation (MoWS&I) through the Water Sector Trust Fund. Under this program, IWASCO has been selected to implement 3 interventions including: drilling and equipping of 5 boreholes, solarisation of 7no boreholes, purchase and installation of 1,610DN 15mm consumer meters.

One of the boreholes where solarization will be done is Ramadhan Borehole. This is an existing borehole which is currently serving a section of residents in Ramadhan sub location. The borehole is powered by a diesel generator. As a result, the operational and maintenance cost of borehole is significantly high. In the event that the diesel is unavailable, resident suffer from water intermittences. It is against this background that IWASCO has proposed solarization of this borehole. The Ramadhan borehole site is located within a 4 acre land which already has a borehole and a 10,000 litres plastic water tank installed. The area is covered by overgrown grass and a single tree.

The project is expected to contribute towards increased water access in line with the 2010 Kenyan Constitution which entitles citizens a right to "reasonable standards of sanitation" and "clean and safe water in adequate quantities". The constitution under Article 21 further places an obligation on the government to take steps to progressively realize this right. Additionally, Kenya's Vision 2030 for water and sanitation seeks to ensure that improved water access to all. The goal of the Third Medium Term Plan is to improve access to water and sanitation, have an innovative self-financing mechanism for the sector, and adequate investment planning to move the water sector into the path of Vision 2030. The economic, social, and political pillars of the vision 2030 are further anchored on infrastructure as one of the key foundation for the Vision 2030.

Therefore, water facilities are a critical impetus to achieving the development initiative Water Sector Trust Fund, has engaged an individual consultant to undertake an Environmental and Social Impact Assessment for the proposed intervention to aid in the Implementation of the project.

1.2 Project Justification

The proposed project will allow for increased water access through diversification of water sources. It will provide an alternative water source that can supplement existing water supply from Ewaso Nyiro river which is not reliable particularly during the dry season. This will improve water security for residents, businesses, and institutions in Isiolo Town.

Rapid urbanization and population growth in Isiolo implies increased strain on existing water resources which may lead waterborne diseases such as Cholera and typhoid which are the most prevalent in this county. The project will increase the existing water supply and hence mitigate against an upsurge of waterborne diseases

With changing climate patterns leading to increased drought occurrences in many regions, including Isiolo, the proposed boreholes can serve as a climate-resilient solution by providing a sustainable water supply that is less vulnerable to climate variability.

1.3 Purpose of the Study

The implementation this project provides multiple benefits to both the targeted community and the country as well. These benefits include increased water supply, reduction of operational and maintenance cost, enhanced public health and economic development. More specifically, solarisation of Ramadhan borehole will help in improving accessibility to clean water for the residents, ensuring consistent water supply to the residents. However, it is notable that the construction and operation processes may generate negative environmental and social impacts. Such negative effects if not properly managed may obscure the realization of benefits anticipated from the

proposed development. It is therefore paramount that a comprehensive assessment of possible negative impacts is undertaken to identify mitigation measures and safeguards that need to be instituted during the project period.

In an attempt to ensure that development provides optimal benefits without creating a significant social and environmental burden, the Government of Kenya has put in place wide range of policy, institutional, and legislative framework to address major causes of environmental degradation and negative impacts on ecosystems deriving from development programs. It is now accepted that development projects must be economically viable, socially acceptable and environmentally sound. It is an obligation of the Kenya Government to conduct an Environmental and Social Impact Assessment (ESIA) on development projects such as the proposed one. The ESIA assesses the impacts of a proposed project before commencement of implementation. In addition to helping formulate environmental management framework, ESIA provides for public participation in the decision-making process within the proposed project.

1.4 Objectives of the Study

The specific objectives of the ESIA study include:

- ✓ To establish the baseline conditions in the project area so as to determine the likely impacts of the project on existing resources and infrastructures
- ✓ Ensuring compliance with relevant environmental and social regulations, policies, and standards at local, national and international level
- ✓ To identify both positive and negative environmental impacts associated with the project and provide for mitigation measures of the negative impacts.
- ✓ Identification and analysis of stakeholders relevant to the project at both national and local levels for purposes of stakeholder consultation
- ✓ Evaluating the significance and magnitude of identified impacts to determine their potential importance and consequences.

- ✓ Developing appropriate mitigation measures and management strategies to avoid, minimize, or offset adverse impacts on the environment and affected communities.
- ✓ Preparation of an Environmental and Social Management Plan (ESMP) and an Environmental and Social Monitoring Plan (ESMoP) including proposed work programs, budget estimates, schedules, staffing and training requirements, and other necessary support services to implement the mitigating measures.
- ✓ Providing recommendations to enhance the project design and planning to maximize positive impacts and reduce negative impacts on the environment and communities.
- ✓ Creation of awareness about the project and obtain opinions and concerns regarding the proposed project i.e. location, design, operation and management through public participation and consultation meetings as per Part II Section 17 of the Environmental (Impact assessment and Audit) Regulations, 2003
- ✓ Providing decision-makers with comprehensive information and analysis to support informed decision-making regarding project approval, modification, or rejection.

1.5 Scope of the Study

In accordance with the ToR[2], the scope of the assignment entails:

a) Detailed description of the proposed project

b) Assessment of the baseline conditions in the project area

c) Stakeholder engagement

d) Analysis and Assessment of Potential impacts and recommendations for mitigation and potential development needs

[2] Ministry of Water, Sanitation and Irrigation (MoWS&I) TOR for conducting ESIA

e) Cumulative impact assessment

f) Development of an environmental and social management and monitoring plan.

1.6 Approach and Methodology

The ESIA study utilized a systematic approach to identify the environmental and social impacts of a project, and describing the mitigation, management and monitoring measures that will be implemented to address these impacts. The approach also entailed stakeholder engagement. Ultimately, the study allows relevant organizations to make informed decisions about development proposals, and potentially affected stakeholders to participate in the process.

1.6.1 ESIA Process

1.6.1.1 Screening

It comprises of the initial identification of potential interactions between the Project and physical, ecological and human receptors indicating the level of impact assessment required. It also involves examination of relevant national and international legislative requirements and an illustration of the potential interactions of project activities with the physical, ecological and human receptors.

1.6.1.2 Scoping

This stage outlines the perceived required scope of the ESIA to be undertaken, taking into consideration the nature of the Project, the results of the screening and applicable requirements. This stage included:

a) **Issues Identification**- a process of systematic identification of potential interactions between Project activities or events and known receptors

b) **Desk-Based Studies**- a review of existing environmental and social information, and gap analysis to identify additional baseline information required for the impact assessment.

c) **Identifying receptors-** Identification of potential physical, ecological, and human receptors that may be affected by the Project

d) **Analysis of Alternatives**- undertaking an analysis of technically and financially feasible alternatives for the proposed project sites.

1.6.1.3 Baseline Field Surveys and Studies

Field Studies included:

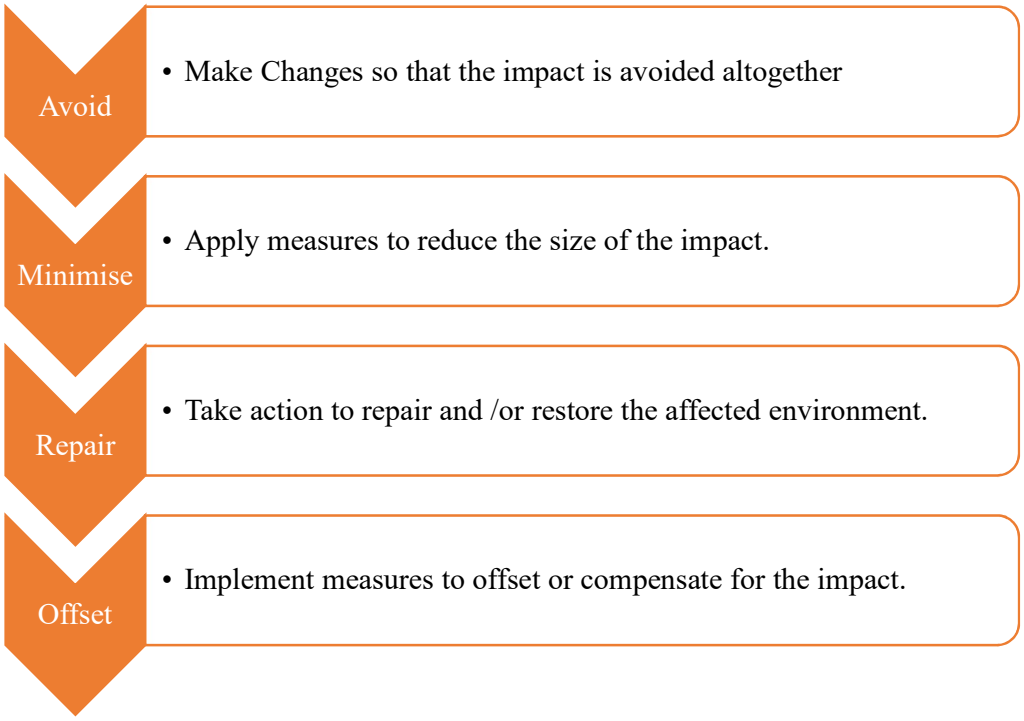
- **Baseline Survey:** The Consultant undertook a household survey within the project area to understand the existing socio-economic conditions. The information was used in assessing the socio economic implications of the proposed project.

1.6.2 Impact Assessment Framework

The process of assessing the potential project impacts is centred on the following aspects:

- Prediction-What will happen to the environment because of this project?
- Evaluation-Will it have a beneficial or adverse effect? How big is the change expected to be? How important will it be to the affected receptors?
- Mitigation: If the impact is of concern, can anything be done to avoid, minimise, or offset the impact or to enhance potential benefits?
- Residual Impact: After mitigation, is the impact still of concern?

The hierarchy as illustrated in the chart below will inform the mitigation measures:



Environmental and Social Management and Monitoring Plans (ESMMPs) are developed to capture all mitigation and management measures, and environmental and social commitments made within the ESIA Report. Adherence to these plans will be a condition of any Project construction and operation contracts awarded.

1.6.3 Stakeholder Engagement

The ESIA team mapped out the relevant stakeholders who are likely to be affected by the proposed project either directly or indirectly. A stakeholder analysis was conducted to determine their level of power and interest in order to know the best approach for engaging them and the significance of their input to the project. The outcome of this engagement is analysed in the Public Participation Chapter of this report.

1.7 Structure of the Summary Project Report (SPR)

Environmental and social impact assessment will include:

Executive summary: This section presents a summary of the entire report.

Chapter 1: Introduction: This chapter gives description of the Project Background, Justification of the Project, Study Methodology and Field Findings, and Scope and Content of the project.

Chapter 2: Project description: This chapter gives a description of the status of the project in the project cycle, specifically during construction, operation and decommissioning.

Chapter 3: Environmental setting: This chapter gives description of the environmental setting of proposed project and surrounding areas, e.g., climate, soils, geology, vegetation, fauna, land use, human populations, socio-economics, cultural heritage.

Chapter 4: Stakeholder Engagement: This chapter gives description of the objectives, methods used and summary of results of the public consultation activities undertaken during the ESIA.

Chapter 5: Assessment of environmental impacts and mitigation measures: This chapter presents the analysis of beneficial and adverse impacts of the project on the biophysical and human (social, cultural and economic) environments. The analysis covers anticipated impacts during the construction, operation phases and decommissioning phases and describes the enhancement and mitigation measures proposed to enhance benefits.

Chapter 6: Environmental and social management and monitoring Plans: This chapter presents the proposed Environmental and Social Management and Monitoring Plans prepared for the project.

Chapter 7: Conclusion and recommendations: The conclusion briefly presents the environmental and social acceptability of the project, taking into account the impacts, measures and recommendations identified during the assessment process.

Appendices: This section presents attached documents such as Minutes and supplementary reports.

2 PROJECT DESCRIPTION

2.1 Project Location

2.1.1 General Project Area

The Ramadhan Borehole Site-

The proposed works entail solarization of an existing borehole. The site is located at coordinates 0.364075 latitude and 37.602089 longitude within the Ramadhan Primary School.

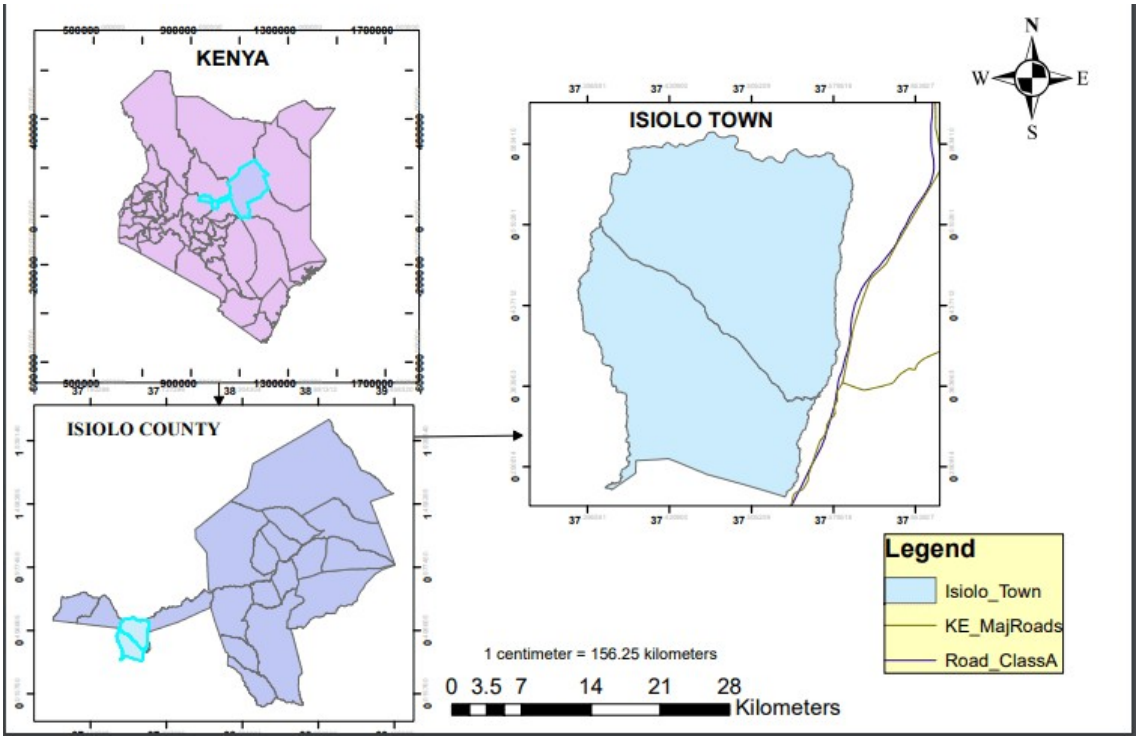


Figure 2-1: Map of Isiolo Town

The Ramadhan borehole site has an operational borehole with a pump currently served by Kenya Power and Lighting company power supply. The borehole will undergo solarization as part of the project. It features a permanent pump house. The area is securely fenced. It is connected to electricity. The vegetation in the area is one mature tree and overgrown grass. Other than the Ramadhan Primary school where the borehole is located, the area is largely residential.



Figure 2-2: Photo of the project area

2.1.2 Description of the Proposed Project

The proposed project will entail solarisation of the borehole for purposes of pumping water. The proposed works will include:

PLANNING PHASE

Permitting and Approvals:

As part of the project planning phase, the proponent will obtain necessary permits and approvals from NEMA for the Summary Project Report (to get an ESIA license for the proposed solarization) and WRA permit. This report has been developed for submission to NEMA. Once it is reviewed, a determination will be made with regard to issuance of EIA license.

CONSTRUCTION PHASE

Solar Instillation

Borehole solarization will entail construction of solar panel frames and ground mount points for control room housing the, batteries, inverters, electrical cables and conduits. Installations/ electrical works – to include solar panels, batteries, inverters, circuit breakers etc. The solar component has the following specifications: The proposed solar system will be installed with 1 No. Sunverter SV3/2.2T with a capacity 2.2kw controller, 10No. 440W Dayliff solar modules, 2no. PV Disconnect Switch 1000V/40A,

1 No. ground mount which will be 4meters in length, 260m assorted ground cables, and 1 No. lightning arrestor of 5 meters will be provided.

Pump Installation and Testing:

A submersible pump (Pump type: GRUNDFOS) is already installed in the borehole with a motor with a capacity of 2.2Kw and a yield of 7.8m^3/HR . After solarisation, pump testing will be conducted to assess the yield and sustainability of the solar system.

Water Quality Testing:

Water samples will continue to be collected and tested for various parameters to ensure the water meets the required quality standards for human consumption. This will be done in IWASCO water treatment plant which has a licensed laboratory. Testing will continuously be done for chemical, physical and bacteriological analysis .

2.2 Project Classification

According to the Environmental Management and Coordination Act, No. 8 of 1999, projects should be classified as either Low Risk Project, Medium Risk Project or a High Risk Project. An analysis of the proposed borehole solarisation as per the Second Schedule of the EMCA Act shows that the project will be classified as a Low Risk Project ref. Legal Notice 31 (3a) Community water projects such as boreholes, water pans sand dams, sub-surface dams. This requires a Summary project report to be submitted.

2.3 Total Project Cost

The total project cost is for the proposed project is estimated at One Million thirty seven thousand and six hundred and twenty shillings Kenya shillings only (Ksh 1,037,620.00).

3 POLICY, LEGAL AND REGULATORY FRAMEWORK

3.1 Introduction

3.1.1 The Constitution of Kenya

The Constitution is the supreme law of the Republic and binds all persons and all State organs at all levels of government. In relation to the environment, article 42 of chapter one, *The Bill of Rights*, confers to every person the right to a clean and healthy environment, which includes the right to have the environment protected for the benefit of present and future generations through legislative measures, particularly those anticipated in Article 69, and to have obligations relating to the environment fulfilled under Article 70. In addition, Article 21 entrenches water as a constitutional right by establishing a right to "clean and safe water in adequate quantities". This article places an obligation on the government to take steps to progressively realize this right.

3.1.2 The Kenyan Vision 2030

The Kenya Vision 2030 is a policy document outlining Kenya's development programme covering the period between the years 2008 to the year 2030. The objective of Vision 2030 is to help transform Kenya into a newly industrializing, middle-income country providing a high quality of life to all its citizens in a clean and secure environment by 2030. Additionally, the Kenya Vision 2030 also has environmental goals outlined under the social pillar. According to the pillar, Kenya aims to be a clean, safe and sustainable environment by 2030. The country aims to achieve this goal by for example, improving pollution and waste management strategies. By commissioning an environmental impact assessment study for the project, the proponent has displayed his desire to support the Kenya Vision 2030. Further, the development blue print seeks to ensure that improved water and sanitation is available and accessible to all. The main goal is to **improve access to water** and sanitation, have an **innovative self-financing mechanism for the sector**, and adequate investment planning to move the water sector into the path of Vision 2030. The economic, social, and political pillars of the vision 2030 are further anchored on infrastructure as one of the key foundations for the Vision 2030.

3.1.3 National Policy on Water Resources Management and Development

The National Water Policy of April 1999, known as Sessional Paper No. 1 of 1999, advocates for decentralizing operational activities from the central government to various sectors, including local authorities, the private sector, and encouraging community involvement. This decentralization aims to enhance efficiency in delivering water services. The policy addresses issues such as water supply, sanitation facilities

development, institutional framework, and financing within the water sector. Its overarching goal is to establish a rational and efficient framework to meet water needs for national economic development, poverty alleviation, environmental protection, and the social well being of citizens through sustainable water resource management.

This approach encourages Isiolo county government to play active roles in improving water service delivery efficiency. By implementing sustainable water resource management practices and ensuring adequate infrastructure development, Isiolo can meet its water supply needs effectively. *The policy also underscores the significance of institutional frameworks and financing mechanisms tailored to local contexts, which IWASCO can utilize to enhance their operational capabilities and ensure equitable access to clean water for all residents. This Conditional Liquidity Support Grant (CLSG) program provides an opportunity for water infrastructure development through an innovative funding mechanism.*

3.1.4 Policy Guidelines on Environment and Development

Among the key objectives of the Policy Paper on Environment and Development (Sessional Paper No.6 of 1999) are: -

a) To ensure that from the onset, all development policies, programmes and projectstake environmental considerations into account,

b) To ensure that an independent environmental impact assessment (EIA) report is prepared for any industrial venture or other development before implementation,

c) To come up with effluent treatment standards this will conform to acceptable healthstandards.

Under this paper, broad categories of development issues were covered that require sustainable approach these issues include the waste management and human settlement sectors. The policy recommended the need for enhanced re-use/recycling of residues including wastewater, non-waste technologies, increased public awareness raising and appreciation of clean environment. *The proponent, IWASCO is therefore obligated to provide waste water management system to those who will be connected to the proposed water supply network.*

3.1.5 Sustainable Development Goals

Goal number eleven of the global sustainable development goals focuses on making cities inclusive, safe, resilient and sustainable. Some of the goal's targets which are

relevant to the project include: to ensure access for all to; adequate, safe and affordable housing and basic services and upgrade slums by 2030 and to enhance inclusive and sustainable urbanization and capacity for sustainable human settlement planning in all countries by 2030. *The proposed project will contribute to this goal directly through increased access to water supply among urban residents of Isiolo which will consequently lead to sustainable urbanization.*

3.1.6 Sustainable Waste Management Policy 2021

The National Sustainable Waste Management Policy outlines the benefits of managing waste as a resource in Kenya, including economic, social, and environmental advantages. The policy recognizes that sustainable waste management is critical to delivering on Kenya's constitutional right to a clean and healthy environment, achieving sustainable development goals. Kenya's Sustainable Waste Management Policy aims to address the growing challenges of waste management in the country by promoting environmentally sound waste handling, reduction, recycling, and disposal*. During construction all wastes generated will be hoarded together and disposed in NEMA designated areas.*

3.1.7 Extended Producer Responsibility (EPR) (2021)

Extended Producer Responsibility (EPR) Regulations in Kenya are designed to hold producers accountable for the entire life cycle of their products, including post-consumer waste management. These regulations form part of the broader Sustainable Waste Management framework and aim to reduce the environmental impact of products, especially those that are non-biodegradable or hard to dispose of, such as plastics, electronics, and packaging materials. Extended Producer Responsibility (EPR *During the project cycle, any materials sourced should be the ones with a long lifespan and where possible the ones that have a return process provision.*

3.1.8 World Bank Operational Procedures

The following safeguards may be triggered in the course of project implementation

Environmental and Social Assessment:

- OP 4.01 Environmental Assessment: This project falls within the category of projects requiring environmental impact assessment. This implies that the project requires the assessment of potential environmental impacts and mitigation measures before approval. This includes evaluating groundwater quality, availability, and impacts on local ecosystems.

Biodiversity Conservation:

- OP 4.04 Natural Habitats: Ensures that projects avoid or minimize impacts on critical habitats and endangered species. The safeguard will not be triggered as there is no significant vegetation/habitat clearance that is anticipated

Indigenous Peoples:

Water Resource Management:

- OP 4.07 Water Resources: Focuses on sustainable water resource management, including assessing the long-term availability and quality of water. The project should therefore allow for monitoring groundwater levels, recharge rates, and potential impacts on local water sources.

3.2 Water Regulatory Framework

3.2.1 Water Act, 2016

The Water Act 2016 provides for the management, conservation, use and control of water resources and for the acquisition and regulation of rights to use water. Under this provision, the responsibility to regulate access, use and control of water resources is vested with the Water Resource Authority (WRA). Further it provides for the inclusion of communities living along the water resources in development projects. The Water Resource User Association (WRUA) are for consideration of project impacts on the community.

Part II section 18 of this act provides for the national monitoring and information systems on water resources. Sub-section 3 of this allows the water management authority to demand from any person or institution, specified information samples or raw material on water resources. Under these rules, specific records may require to be kept by a site operator and the information made available to the authorities as and when required.

Section 73 of the act allows a person with a license to supply water to make regulations for purposes of protecting against degradation of water resources. Section 75 allows the licensee to construct and maintain drains, sewers and other works for intercepting, treating or disposing of any foul water arising or flowing upon land for preventing pollution of water within their jurisdiction. In Kenya, water is regarded as a national resource and is therefore owned by the state for and on behalf of the people (Section 3).

Section 36 requires applications for permit made in case of proposed diversion, abstraction, obstruction, storage or use of water from a water body.

IWASCO is required to obtain a permit for purposes of abstracting underground water. It is also a requirement to regularly undertake sample testing to determine the quality of water. These records should be availed to WRA upon request. IWASCO is also required to design regulations for purposes of mitigating degradation of the well.

3.2.2 Water Quality Regulations, 2006, (Legal Notice No.121)

Water Quality Regulations apply to water used for domestic, industrial, agricultural and recreational purposes; water used for fisheries and wildlife purposes; and water used for any other purposes.

No person is allowed to abstract water from a natural water body for domestic purposes unless such water meets the standards set out in the First Schedule.

These regulations provide for the protection of lakes, rivers, streams springs, wells and other sources. The overriding objective of the regulations is to protect human health and the environment. Proper enforcement of the regulations can lead to marked reduction in water-borne diseases. The regulations provide guidelines and standards for the discharge of poisons, toxins, radioactive and other pollutants into the aquatic environment. Standards have also been set for discharge of effluent into the sewer and aquatic environment. The National Environment Management Authority regulates discharge into the aquatic environment.

Persons (real or legal) discharging effluent into the environment are required to submit quarterly discharge monitoring records to NEMA.

IWASCO is obligated to undertake water quality assessment prior to operationalization of the borehole.

3.2.3 Water Resources Management Rules, 2007

The project will be required to submit authorization to the Water Resources Authority within 12 months of the commencement of the rules as stated in Part II Section 17 (1). Failure to submit the documents may be used as a basis for revocation, variation or cancellation of the permit or authorization.

Part VII Section 97 of the Rules states that the Authority shall, where applicable, require an applicant to show evidence of compliance with the provisions of EMCA. Section 99 states the need for controlling and measuring devises for accurate measurement of the water abstracted.

The WRA Rules, 2007, Part VIII Section 104, states that the Authority shall be paid for water abstracted by any person in possession of a valid water permit or supposed to have a valid water permit.

IWASCO shall submit an ESIA license to WRA for authorization of the proposed works.

3.2.4 Isiolo County Water and Sanitation Services Act, 2020

The Isiolo Water and Sanitation Services Act of 2020 is a pivotal legislative framework aimed at governing water resources management and sanitation services within Isiolo County. Central to this Act is the establishment of a Water Directorate, tasked with regulating and overseeing the provision and management of water supply services throughout the county. This Directorate plays a crucial role in ensuring compliance with water management regulations, coordinating water resource development efforts, and maintaining equitable allocation among residential, industrial, and agricultural users.

The Act also introduces water tariff regulations, which define the pricing structure for water services to cover operational costs and promote conservation. Furthermore, it addresses sanitation services, encompassing wastewater management and infrastructure development to enhance public health standards. Emphasizing community participation and stakeholder engagement, the Act seeks to foster partnerships with local communities, NGOs, and the private sector to improve water service delivery and sustainability. Enforcement mechanisms ensure adherence to regulations, underscoring the Act's commitment to sustainable water resource management and sanitation improvements in Isiolo County.

IWASCO will endeavour to comply with the Act with regard to the tariff system, conservation of water and community and stakeholder engagement in the development of this proposed project. This ESIA provides an opportunity for this broad engagement. The outcome of which is recorded in the public participation chapter

3.3 Environmental Policy and Regulatory Framework

3.3.1 National Environment Action Plan Framework

The National Environmental Action Plan Framework is the second national environmental policy after the 1994 National Environmental Action Plan (NEAP). The development of NEAP is provided for by EMC (amendment) Act 2015 which requires preparation of Environmental Action Plan at different levels; County and national levels. The framework recognizes the intertwined linkages between economic growth and environment in Kenya. It highlights priority themes and activities for the country towards achieving sustainable environment.

3.3.2 Environment Management & Coordination Act Cap 387

This Act of Parliament, EMCA 1999 and the subsequent amendments, is the parent Act of Parliament that provides for the establishment of appropriate legal and institutional framework for the management of the environment and for matters connected therewith and incidental thereto.

EMCA, in its 13 interrelated parts, provides regulatory provisions for all levels of environmental conservation and management. The first one part provides legislative guidelines on administrative and planning components of environmental management. They include; (I); General principles (II); Administration (III); Environmental planning (IV); Protection and Conservation of the Environment. Parts five to seven focus on on-field management of the environment as an integral component of actual or proposed projects. (V), Environmental impact assessments (EIA), audits and monitoring (VI); Environmental audit and monitoring (VII); Environmental quality standards. The last five parts of the Act regulate on enforcement of provisions outlined in the Act and recognition of international agreements along which the EMC (amendment) Act 2015 has been established. They are; (VIII); Environmental Restoration orders, Environmental Easements (IX); Inspection, analysis and records (IX); Inspection Analysis and Records (X); International Treaties, Conventions and Agreements (XI) National Environment Tribunal (XII); Environmental Offenses (XIII).

All the chapters 1 to 13 apply to the proposed project at one stage or the other and therefore the project proponent is required to understand and conform with the Act accordingly. One such area is Environmental and Socio Impact Assessment. This is expressly stated in section 58(2) of the Act.

3.3.3 The Environmental (Impact Assessment and Audit) Regulations, 2003/Legal Notice 31 & 32

This is a supplementary legislation to the EMC (amendment) Act. It gives additional punch by providing guidelines for conducting Environmental Impact Assessments and Audits. It offers guidance on the fundamental aspects on which emphasis must be laid during field study and outlines the nature and structure of Environmental Impact Assessments and Audit reports. The legislation further explains the legal consequences of partial or non-compliance to the provisions of the Act.

The Legal Notice 31 &32 categorizes the proposed project as a medium risk one that requires a Comprehensive Project Report (CPR). This implies undertaking a detailed assessment of site conditions, public participation and broad stakeholder engagement.

3.3.4 Environmental Management and Coordination (Conservation of Biological Diversity) Regulations 2006

These regulations are described in Legal Notice No. 160 of the Kenya Gazette Supplement No. 84 of December 2006. These Regulations apply to conservation of biodiversity that includes Conservation of threatened species, inventory and monitoring of biological diversity and protection of environmentally significant areas, access to genetic resources, benefit sharing and offenses and penalties. This legislation takes cognizance of the need to promote the integrity of biodiversity to promote their integrity. Most of the biological diversity is highly threatened by development in the current world and there is an apparent need to enhance their integrity. Section IV, prohibits any activity, which may have adverse effects on the ecosystem.

The proposed sites are not within any sensitive ecosystem. The vegetation on site is well documented. Any clearance that must be done will require a permit.

3.3.5 Environmental Management and Coordination (Wetlands, Riverbanks, Lake Shores and Sea Shore Management) Regulations 2009

These regulations provide for the protection, management of wetlands, riverbanks and lake shores, seashore management.

3.3.6 Environmental Management and Co-ordination (Controlled Substances) Regulations, 2007

These Regulations aim to regulate the production, trade and use of controlled substances and products; provide for a system of data collection to facilitate compliance with relevant reporting requirements under the Montreal Protocol on Substances that Deplete the Ozone Layer; promote the use of ozone friendly substances, products, equipment and technology; and ensure the elimination of substances and products that deplete the ozone layer.

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

Regulations guiding waste management are described in Legal Notice No. 121 of the Kenya Gazette Supplement No. 69 of September 2006. They offer legal provisions on handling of a variety of wastes emanating from various projects and activities. The waste categories covered by the regulations include:

- Industrial waste
- Hazardous and toxic wastes
- Pesticides and toxic substances
- Biomedical wastes

- Radio-active substances

These Regulations outline requirements for handling, storing, transporting, and treatment / disposal of all waste categories as provided therein. Part V section 34 requires that pesticides or toxic substances be disposed at designated site or plant approved by the authority.

The contractor & IWASCO will engage a licensed waste collector to handle waste generated during construction and operation respectively

3.3.8 Environmental Management and Coordination (Fossil Fuel Emission Control) Regulations 2006

These regulations are described in Legal Notice No. 131 of the Kenya Gazette Supplement No. 74 of October 2006 and will apply to all internal combustion engine emission standards, emission inspections, the power of emission inspectors, fuel catalysts, licensing to treat fuel, cost of clearing pollution and partnerships to control fossil fuel emissions.

3.3.9 Environmental Management and Coordination (Noise and Excessive Vibration Pollution) Control Regulations, 2009

This is covered under the legal notice number 61. These Regulations under part II section 3 prohibit making or causing any loud, unreasonable, unnecessary or unusual noise, which annoys, disturbs, injures or endangers the comfort, repose, health or safety of others and the environment.

Section 4 prohibits excessive vibrations and excessive vibrations which annoy, disturb, injure or endanger the comfort, repose, health or safety of others and the environment; or excessive vibrations which exceed 0.5 centimetres per second beyond any source property boundary or30 meters from any moving source;

Operations of machines that produce excessive noise are also prohibited under section 11 including; Operating or repair of any machinery, motor vehicle, construction equipment or other equipment, pump, fan, air-conditioning apparatus or similar mechanical device; or engaging in any commercial or industrial activity, which is likely to emit noise or excessive vibrations that exceed the levels prescribed in the First Schedule (See annex) to these Regulations.

The legal notice also prohibit construction at night except for the purposes specified in sub-Regulation (2) which include roads and other public utilities. Section 15 calls for an Environmental Impact Assessment to be carried out by any person intending to carryout construction, demolition, mining or quarrying work to do an Environmental Impact Assessment studies to identify natural resources, land uses or activities which may be

affected by noise or excessive vibrations from the construction, demolition, mining or quarrying;

Determine the measures that are needed in the plans and specifications to minimize or eliminate adverse construction, demolition, mining or quarrying noise or vibration impacts; and incorporate the needed abatement measures in the plans and specifications.

3.3.10 Isiolo County Climate Fund Act, 2018

The Isiolo Climate Fund Act of 2018 signifies a pivotal step taken by the County Assembly of Isiolo to confront the challenges posed by climate change within their jurisdiction. This legislation establishes the Isiolo Climate Change Fund with the primary goal of financing, facilitating, and coordinating projects aimed at both adapting to and mitigating the effects of climate change. By earmarking financial resources specifically for climate-related initiatives, the fund aims to support activities such as resilient infrastructure development, drought-resistant agriculture, and renewable energy projects. Moreover, the Act seeks to streamline the implementation of these projects by fostering collaboration among government bodies, non-governmental organizations, and local communities. It also emphasizes the importance of effective financial coordination to optimize resource allocation and avoid duplication of efforts. With provisions for governance structures and accountability mechanisms, the Act ensures transparency in fund management and monitors the impact of funded projects.

The Isiolo Climate Fund Act of 2018 holds significant implications for water supply and sanitation within Isiolo County, particularly in the context of climate change adaptation and mitigation. As climate change intensifies, the availability and quality of water resources become increasingly uncertain, affecting both rural and urban communities. The establishment of the Isiolo Climate Change Fund provides a structured mechanism to address these challenges.

Firstly, the fund can support projects aimed at improving water supply infrastructure to ensure reliable access to clean water. This includes initiatives such as drilling boreholes, constructing water storage facilities, and implementing water treatment technologies that are resilient to climate variability. Secondly, the Act facilitates investments in sanitation infrastructure to enhance public health and hygiene standards. Improved sanitation facilities, including eco-friendly toilets and wastewater treatment systems, can mitigate environmental pollution and reduce health risks exacerbated by climate impacts. Furthermore, the Act encourages the adoption of sustainable water management practices. This may involve promoting water conservation techniques,

such as rainwater harvesting and efficient irrigation methods, to optimize water use in agriculture and household consumption.

By coordinating financing and fostering collaboration among stakeholders, including government agencies, NGOs, and local communities, the Isiolo Climate Fund ensures that water supply and sanitation projects are implemented effectively. The Act's governance structures and accountability mechanisms also ensure transparent management of funds and evaluation of project outcomes, thereby enhancing the resilience of Isiolo County's water resources to climate change impacts. In essence, the Isiolo Climate Fund Act of 2018 not only aims to finance and facilitate climate change adaptation and mitigation projects broadly but also specifically addresses critical issues related to water supply and sanitation.

IWASCO can leverage on this fund particularly the component of solarization.

4 BASELINE CONDITIONS

4.1 Physical Characteristics

Location and Coordinates

The Ramadhan borehole is strategically positioned at coordinates 0.336295 latitude and 37.585622 longitude. It is located within Isiolo Sub-county, specifically in the Ramadhan area. Administratively, the borehole falls under Wabera Ward and Ramadhan Sub-location and it is along Wabera road in Isiolo. The borehole falls within Ramadhan Primary school compound.

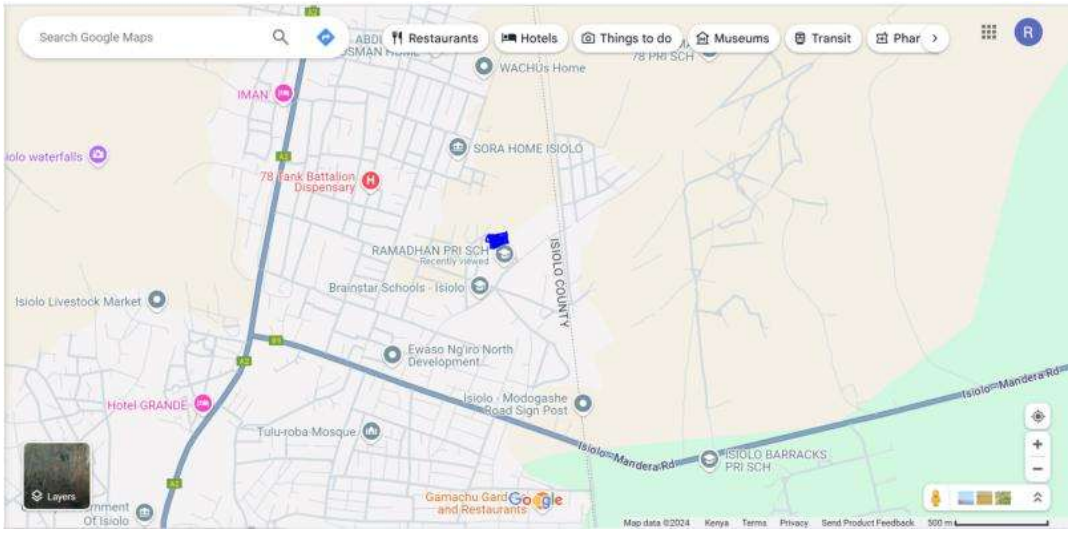


Figure 4-1: Google Map extract showing the location of the project

Land and Ownership

The Ramadhan Borehole site is located in a 4 acre land belonging to Ramadhan Primary School. The borehole uses KPLC power to pump the water which has led to high bills to IWASCO forcing them to periodically ration the water.

The key feature of the site is the one elevated plastic water tank one with a capacity 10,000 Litres (10m^3) and an equipped pump house.

Current Site Conditions

The vegetation at the Ramadhan Borehole site is mainly overgrown herbs and grass and one tree.

Infrastructure

The Ramadhan Borehole site is well-equipped with essential utilities, including a secured pump house . The area has connection to the local electricity grid.

4.2 Topography

The proposed site has a relatively flat terrain similar to the greater Isiolo Town.

4.2.1 Drainage and Land use

The site is not drained by any river stream or wetland. The project is consistent with the existing land uses since it is a service infrastructure which aims to provide an alternative power source for an existing borehole.

4.2.2 Geology

According to the geological survey, the geology of the area is composed of trachyte, basalt and pyroclastics Trachyte is a fine grained and generally light-coloured volcanic rock that usually has a rough surface to the touch. It is an extrusive rock, belonging to the alkali series of intermediate volcanic rocks. The major mineral component of trachyte is alkali feldspar (e.g. orthoclase), and it generally contains no quartz. Trachyte often displays trachytic texture, where acicular to tabular feldspar phenocrysts align in one direction, suggestive of flow prior to cooling. Trachyte lava is of moderate viscosity and forms thick lava flows and domes. Basalt is a common rose-coloured volcanic rock composed of calcic plagioclase (usually labradorite), clinopyroxene (augite) and iron ore (titaniferous magnetite). Basalt may also contain olivine, quartz, hornblende, nepheline, orthopyroxene, etc. Basalt is a volcanic equivalent of gabbro. Basalt is usually black or dark grey and relatively featureless. It is composed of mineral grains which are mostly indistinguishable to the naked eye. Basalt may also contain volcanic glass. Basalt may contain phenocrysts (larger crystals within fine-grained ground mass) and vesicules (holes that were filled by volcanic gases). Pyroclasts (or "tephra') are any volcanic

fragment that was hurled through the air by volcanic activity. A pyroclastic deposit is the resulting layer or pile of material that has fallen to the ground by one or many pyroclastic eruptions. A pyroclastic rock is the hardened, solidified, or compressed version of an originally loose pyroclastic deposit.

4.2.3 Climatic Conditions

(i)Rainfall

The area experiences a semi-arid climate, with an average annual rainfall ranging between 300 and 500 millimeters. The primary sources of precipitation are the short rains from October to December and the long rains from March to May. The town's rainfall pattern is characterized by low and erratic precipitation. The dry season, extending from June to September, experiences minimal rainfall, contributing to water scarcity and challenging agricultural practices.

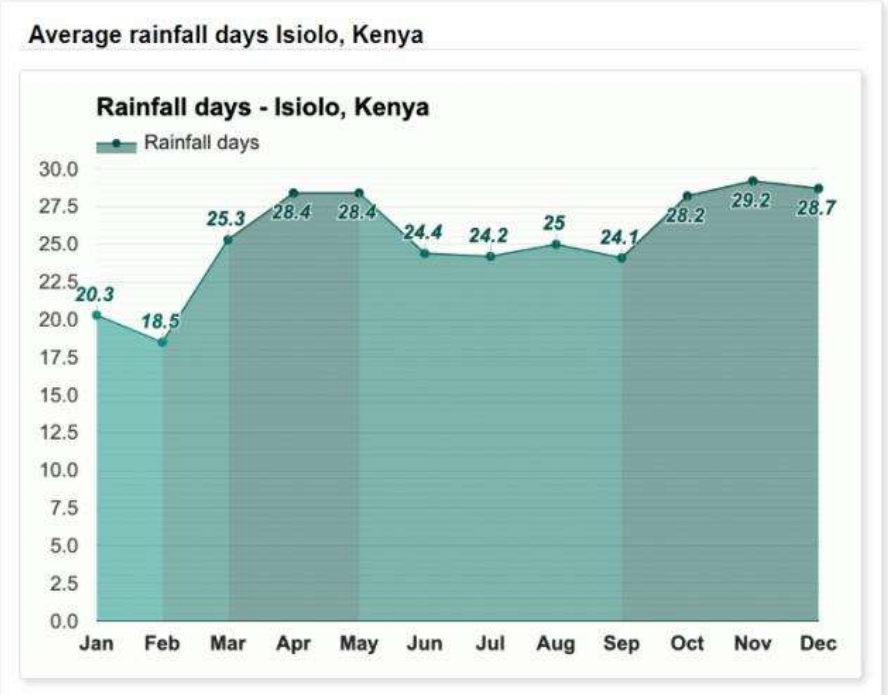


Figure 4-2: Average Rainfall in Isiolo Town

Kenya Meteorological Department, Isiolo Town, 2024

(ii)Temperature

Isiolo Town generally has high temperatures, especially during the dry season. The average annual temperature ranges from 20°C to 32°C. Daytime temperatures can exceed 35°C during the hottest months, contributing to the arid conditions of the region. Night time temperatures tend to be cooler, with lows ranging from 10°C to 20°C. It records more than nine hours of sunshine per day and has a huge potential for harvesting and utilization of solar energy.

With more than nine hours of sunshine per day, the town has abundant solar energy potential. Solar energy can be harnessed through photovoltaic panels to generate electricity. Solar-powered water pumping systems can be installed to extract groundwater for irrigation and domestic use. IWASCO is seeking to utilize this resource to minimize maintenance cost.

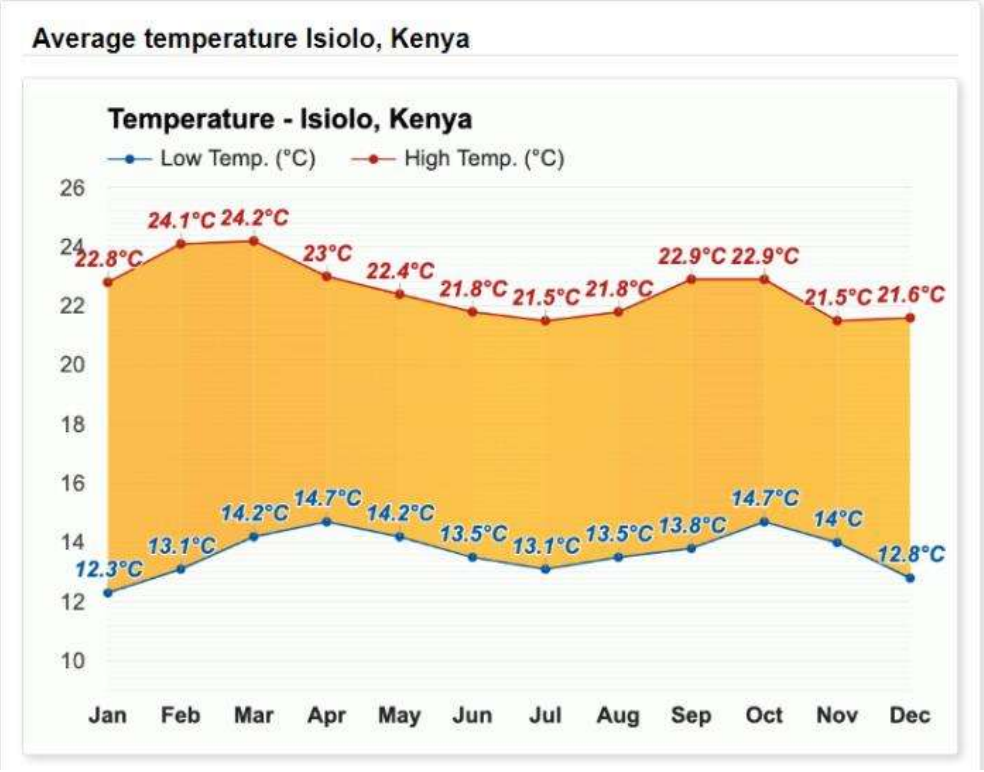


Figure 4-3: Average Temperature Isiolo Town

Kenya Meteorological Department Isiolo Town, 2024

4.2.4 Ecological characteristics

Flora

The vegetation at the Ramadhan Borehole site is mainly overgrown grass and shrubs. Only one tree is found within the project fenced. Within the borehole area, there is *Lantana camara* encroaching on the area and this needs to be cleared.

Fauna

The project area is within a typical urban residential area with no wildlife habitat. It is not a wildlife corridor.

4.3 Socio-Economic Characteristics of Households

Population

According to the 2019 Population and Housing Census, Isiolo County had a population of 268,002. The county's average growth rate from 2009 to 2019 stood at approximately 2.8%, exceeding the national average of 2.2%. This growth can be attributed to demographic shifts including in-migration, rising fertility rates, low mortality rates, and increased life expectancy. By 2027, the projected population is expected to exceed the current KNBS estimate of 345,871. The population is predominantly composed of Cushite communities such as the Oromo, Boran, and Sakuye, as well as the Turkana, Samburu, Meru, Somali, and other groups migrating from various regions within the country. The majority of these communities, approximately 59%, live in rural areas.

As the population grows, particularly in Isiolo town, due to in-migration, there is a higher demand for clean water. This places strain on existing water supply infrastructure and resources.

Table 4-1: **Population Distribution in Isiolo County**

Sub County	Male	Female	Intersex	Total
Garbatulla	54661	45068	0	99,729
Isiolo	60414	60647	0	121,061
Merti	24435	22768	9	47,212
Total	139510	128483	9	268002

Source: KNBS, 2019

4.4 Socio Economic Profile of Residents in project Area

4.4.1 Household Survey

The household survey was done through administration of questionnaires targeting project beneficiaries who are connected to IWASCO water or fetch water from the identified borehole sites. The consultant used a sample of 5% of the targeted population (40 households). According to Cochran (1977), for household surveys a sample size of 5% is satisfactory provided it is truly representative of the whole. Kothari (2004) argues that if the sample is random and large enough approximately 5% of the total population can still provide reliable estimates and valid inferences about the population parameters. It is therefore notable that the most critical factor in sampling is not the size but the study design. In this assessment, the consultant adopted a multi - level sampling design which entailed clustering the project area based on the proposed project sites (villages). Random sampling within these clusters was then used to select the respondents. The benefiting households with Ramadhan borehole connection are 700 covering Ramadhan A and Ramadhan B villages. The area is an upcoming residential area with no clear boundaries but efforts were made to include both villages by having an enumerator team per village. A household survey was undertaken targeting 35 but reaching out to 40 respondents.

(i). Demographic Factors

Gender

The sample size for this survey was 40 respondents from the Ramadhan area. Out of the total sample size, (58%) were male, while (42%) were female. This gender breakdown provides insights into the representation and participation of both men and women in the Ramadhan village. The Ramadhan borehole solarization Project should ensure that its interventions and benefits are accessible and inclusive to all community members, regardless of gender.

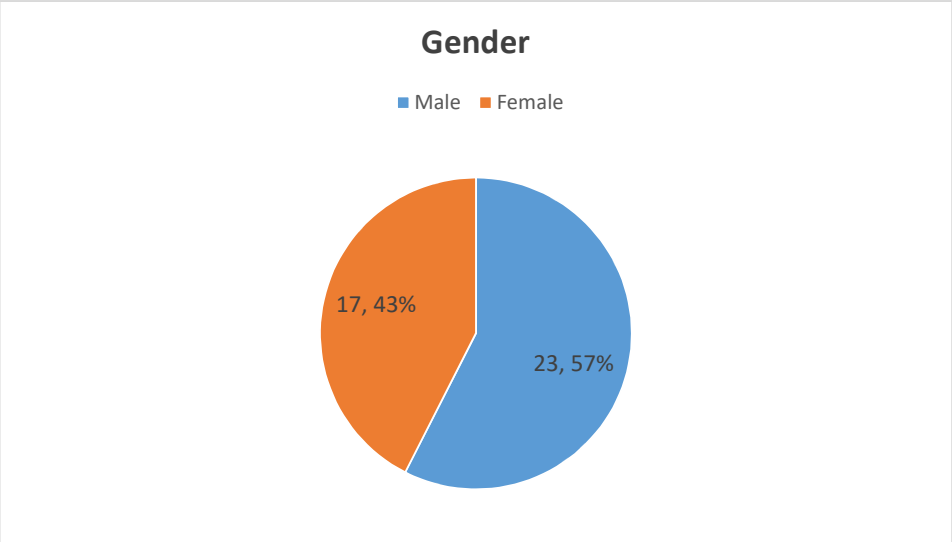


Figure 4-4 Gender of respondents

Age Group

The majority of respondents, 35%, were aged between 26 and 35 years old, 36-45 years represented 30% and 18-25 years at 15% representing a significant portion of the working-age population. The above 66 years age group accounted for 3% .

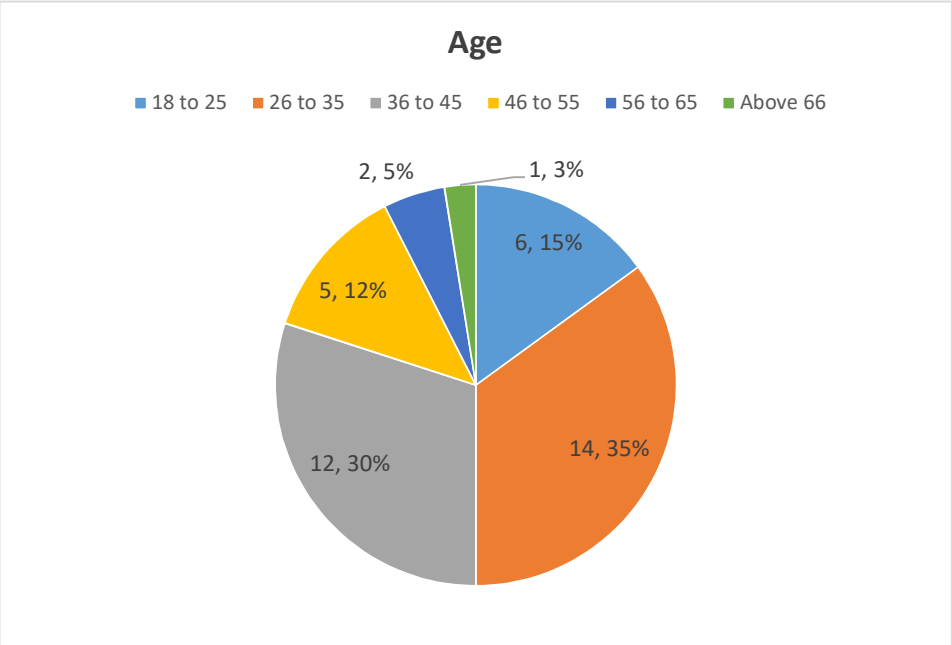


Figure 4-5 Age of respondents

Education Level

85% of the population has attained some form of education. Only 15% indicated that they have no formal education. The high literacy level could be attributed to the urban influence where schools are accessible. Literacy among beneficiaries enhances the level of participation in decision making in development projects. It will enhance comprehension of information of the proposed project during construction and operation.

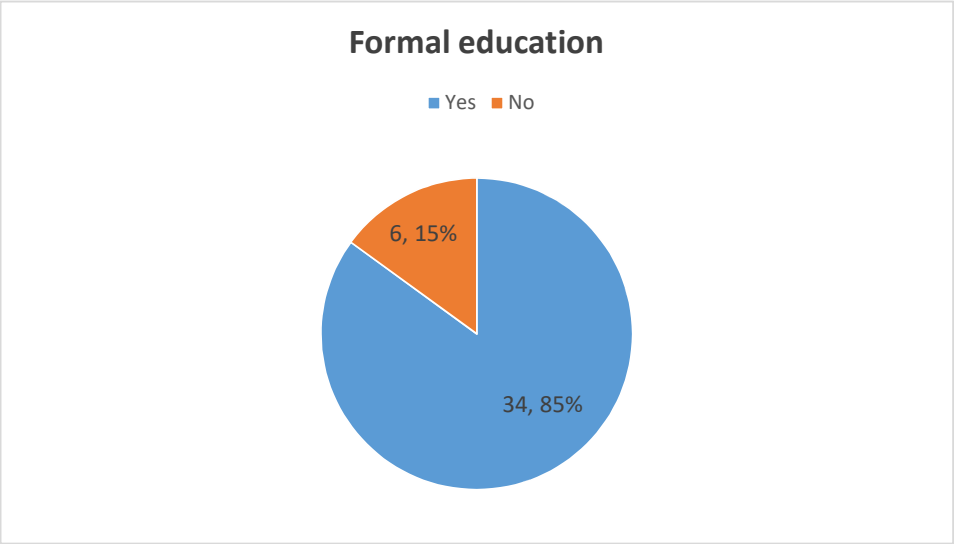


Figure 4-6 Formal education

Household Members (Adults)

73% of the respondents have less than 5 adults in their households while 27% have more than 5 adults in the household. This population is relatively low compared to the average household population in the Northern region of Kenya. This could be due to the prevalence of a youthful population who have young families.

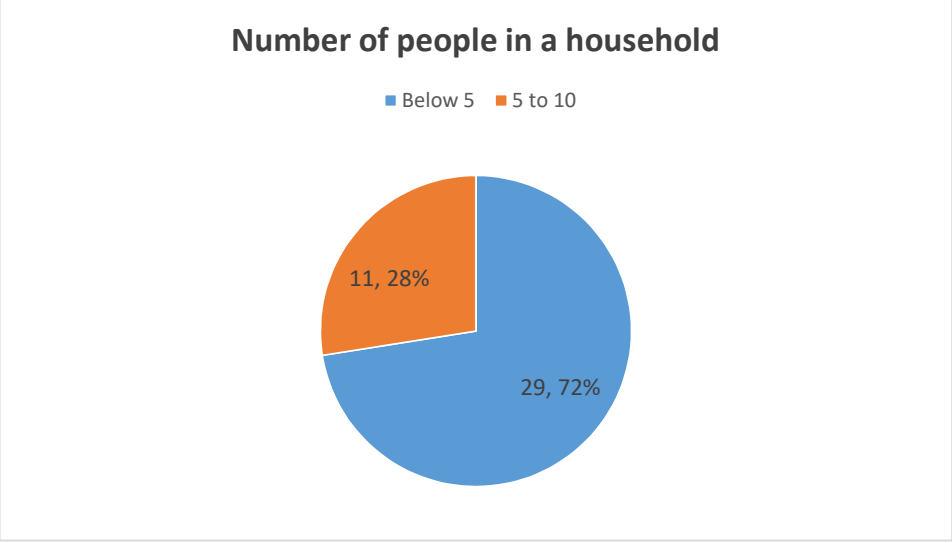


Figure 4-7: Household size

(ii).Main Source of Income

The primary occupation or socioeconomic activity among the respondents in Ramadhan village was micro businesses at 33%, casual labourers at 30%, 17% are in the construction industry and 15% boda boda.

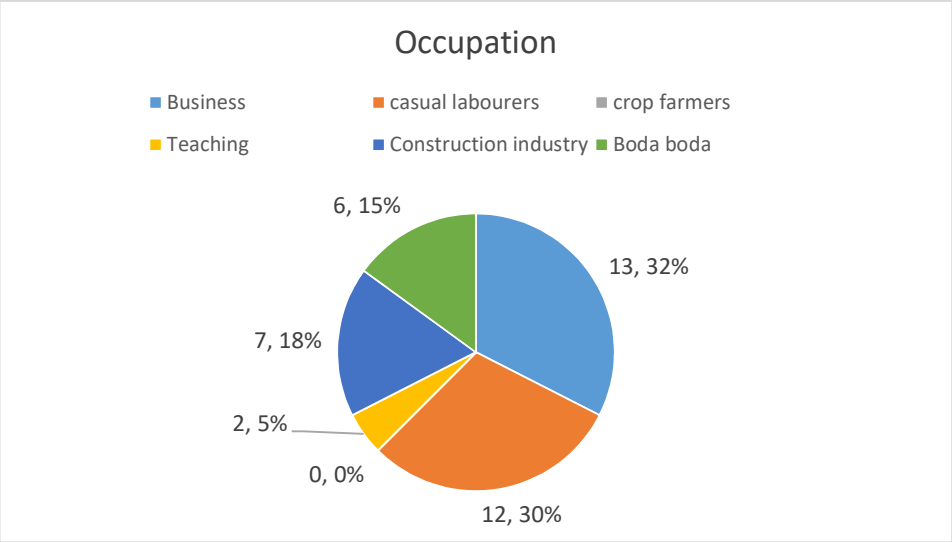


Figure 4-8:Main source of income

(iii). Length of Stay in Project Area

The majority of the respondents (30%) have inhabited their dwelling for 5-10 years, 23% for 6 to 12 months, 20% for 1-5years, 15% for more than 10 years. This pattern is consistent with urban settlements where people come for job opportunities.

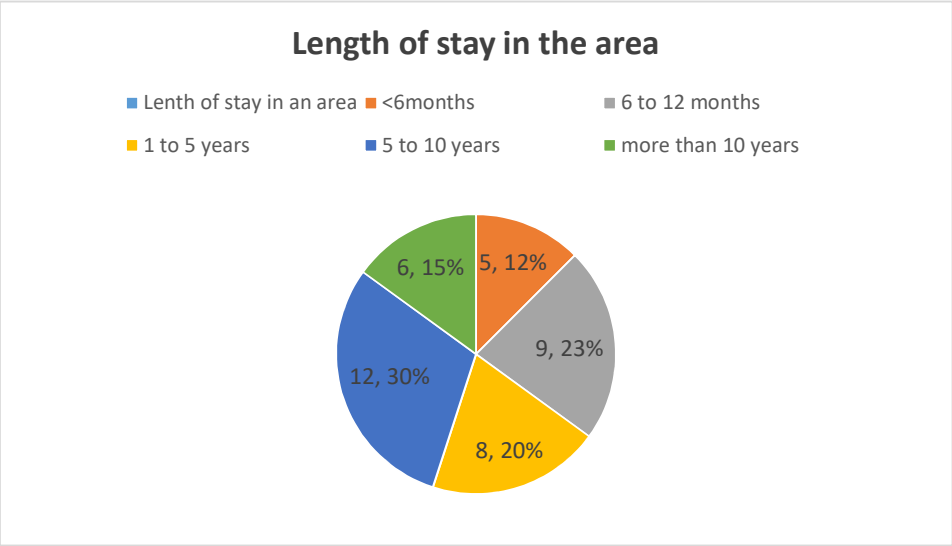


Figure 4-9 Length of stay in an area

(iv). House Ownership

Most of the respondents sampled live in houses owned by husband and wife at 63%, rented premises at 20% and 12% are owned by husbands.

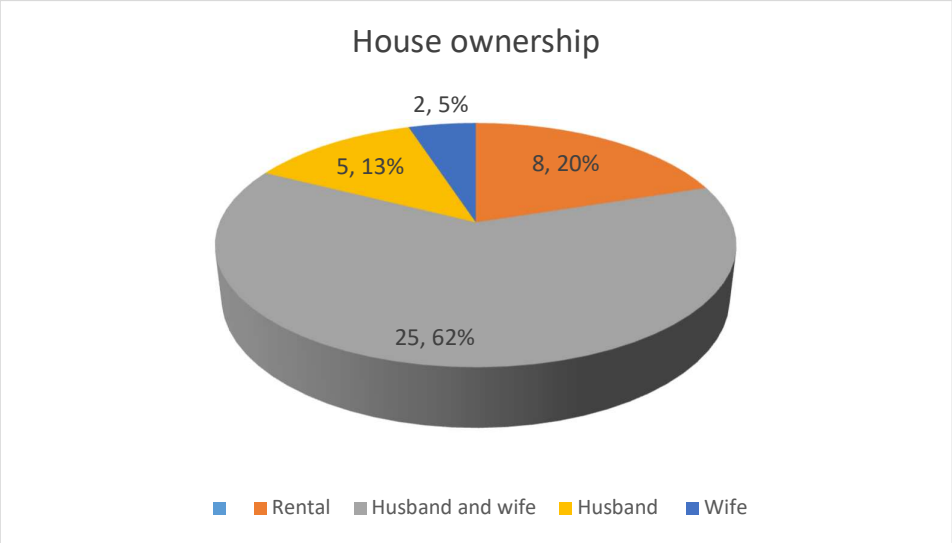


Figure 4-10: House ownership

(v). Energy Sources

Charcoal emerges as the most common cooking fuel, used by 50% of the respondents. Firewood is used by 43% and Gas/LPG by the remaining 7% of the households. This finding highlights the predominance of traditional biomass fuels for cooking in the area. There is a heavy reliance on wood fuel for cooking which could be a threat to vegetation in the area and it also poses a health risk due to indoor pollution.

Table 4-2: **Source of Fuel/Energy for Cooking**

	Frequency	Percent
Charcoal	20	50
Gas/LPG	3	7
Firewood	17	43
Total	40	100.0

(vi). Household Health Record

30 % of the sampled households had got sick within the last one month by the time of the survey. The most common waterborne diseases among households in the last one year were amoeba (45%), typhoid (35%), diarrhoea (18%) and Malaria (2%). It is anticipated that this project will lead to a reduction in cases of typhoid, diarrhoea and amoeba which are attributed to lack of adequate supply of clean water.

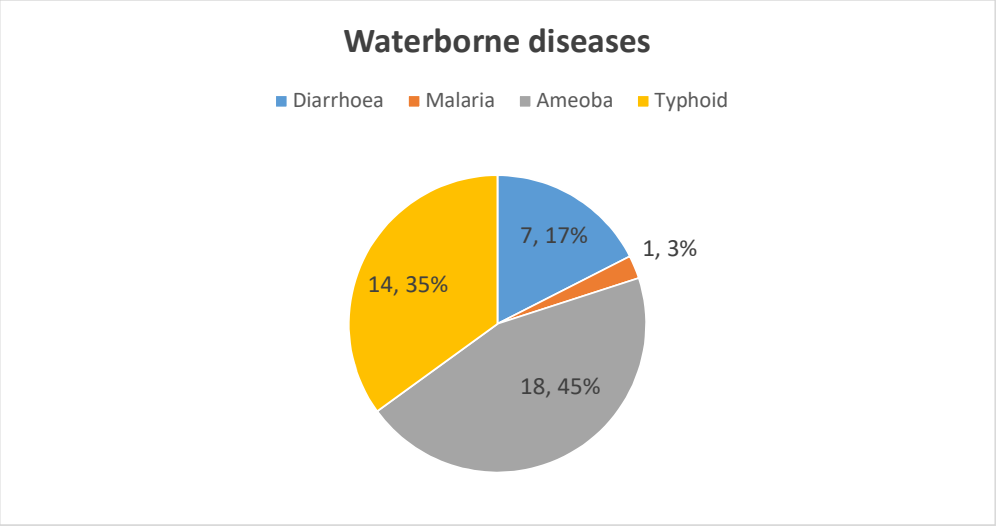


Figure 4-11: Disease prevalence & the common diseases

Majority (45%) of the households frequent government health centers for medical services, 20% pharmacies, 20% private hospitals and private clinics. 45% of the households are not satisfied with the services offered at the health center where they visit while 53% expressed satisfaction. The main reasons for dissatisfaction are lack of drugs and high cost of services. 95% of the respondents travel between 1 km – 5 km to the nearest health center. This means that health care is accessible and services not far from the community.

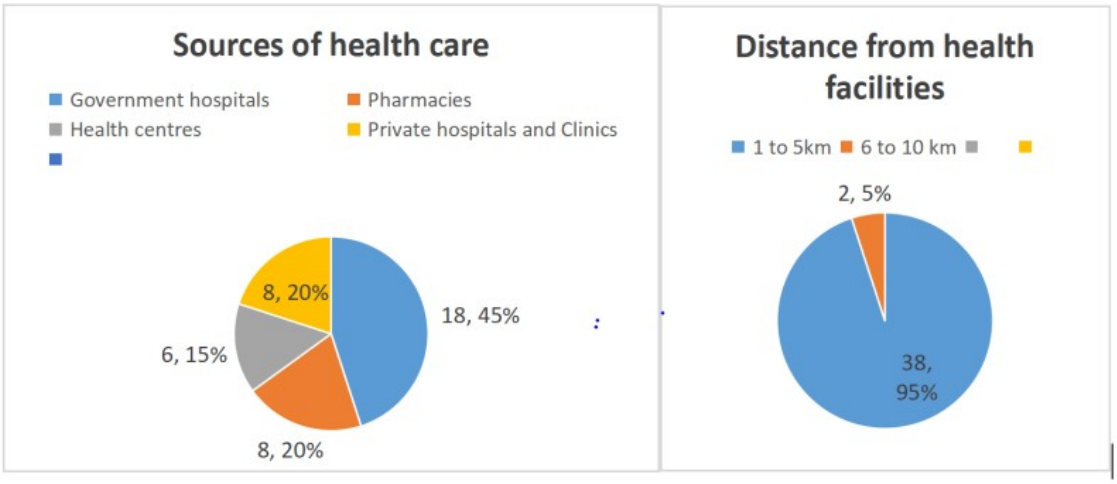


Figure 4-12: sources of health care for residents

(vii). Source of drinking water

Majority (80%) get water from Ramadhan borehole supply with 15% having a tap outside the house while 5 have a tap inside the house.

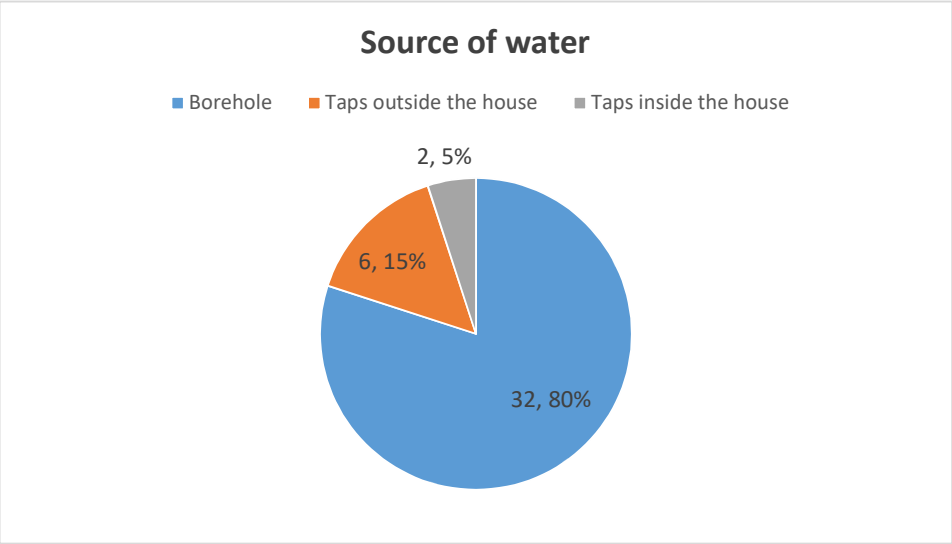


Figure 4-13: sources of drinking water for residents

The majority (90%)of the households spend between 0 – 15 minutes to the water source and back during the wet season.

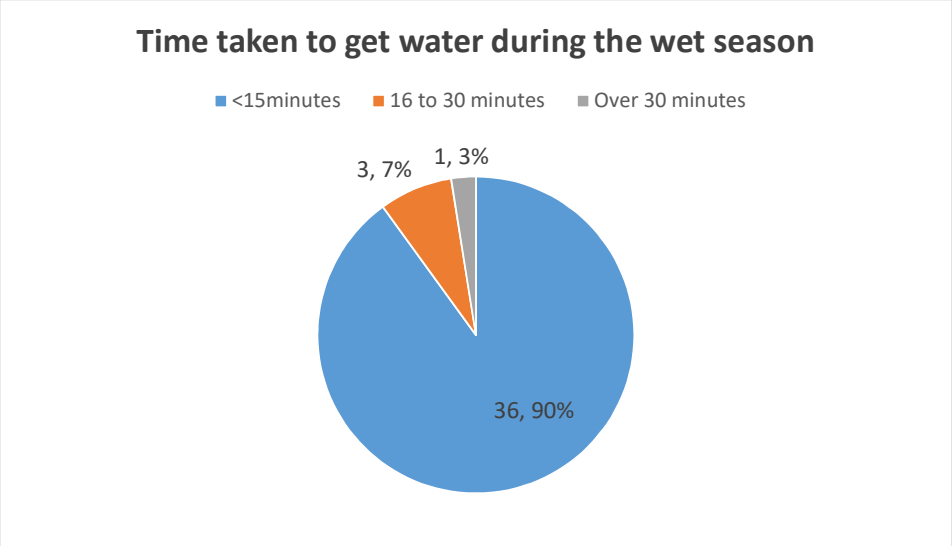


Figure 4-14: Time to water source & back during wet season

The majority (80 %) of the households walk for 1 to 5km in search of water spending between 16 to 30 minutes to the water source during the dry season. This shows that as the season changes, the fetching effort for water increases during the dry season.

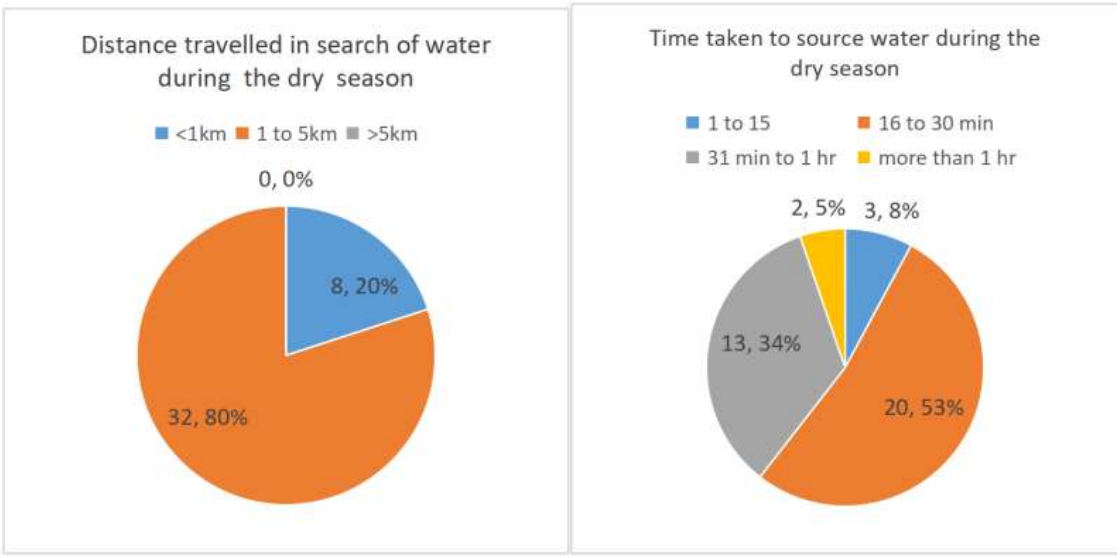


Figure 4-15: Distance and Time taken to nearest water source & back during the dry season

(viii). Water Consumption

65% of the household's consumer less than 100litres per day, 30% consume between 200-300litres and only 5% consume more than 300litres per day. This indicates there is water scarcity. With an average of 3.9 persons per household,a single household needs about 390 Litres per day. The amount of water in use is below WHO and UN guidelines. WHO (2003) recommends a minimum of 50 liters per person per day to ensure basic needs such as drinking, cooking, and personal hygiene are met. This amount is considered essential for maintaining good health and sanitation (Domestic Water Quantity, Service Level and Health." WHO, 2003: The United Nations (UN) in a document titled 'The Right to Water." UN, 2010 recommend 50 l to 100 l per person per day.

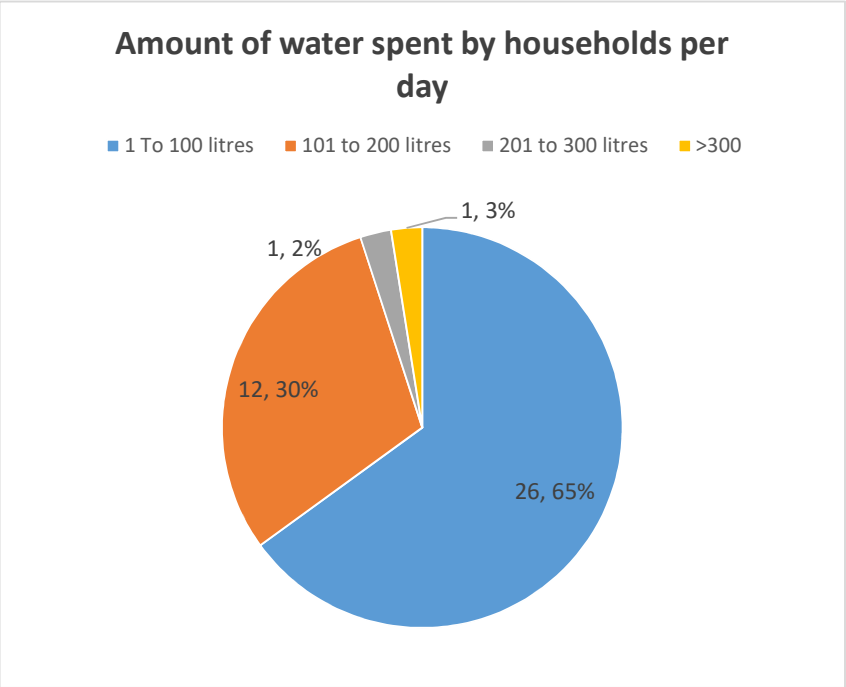


Figure 4-16: Amount of water used by a household per day

(ix). Use of IWASCO water

928% of the sampled households use IWASCO water thus a need to improve the provision is necessary.

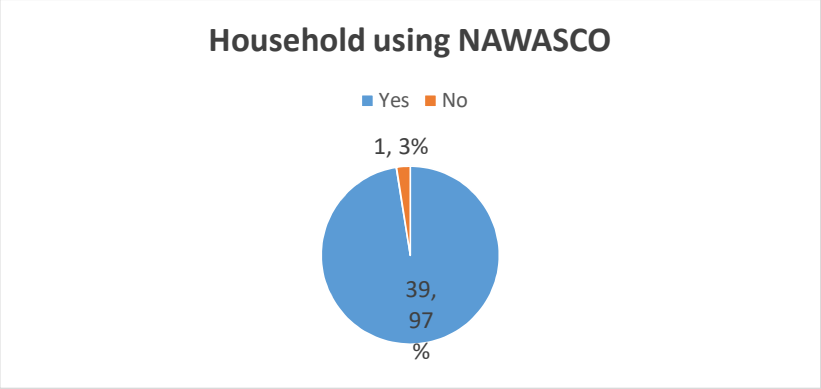


Figure 4-17: Use of IWASCO water

Cost of water

80% of the respondents pay for the water they consume while 34% do not pay. Majority of the respondents (55%) pay between KES 100 – 500 monthly for the water they consume, 33% pay between KES 501-1000. Only 7% pay more than KES 1500 per month

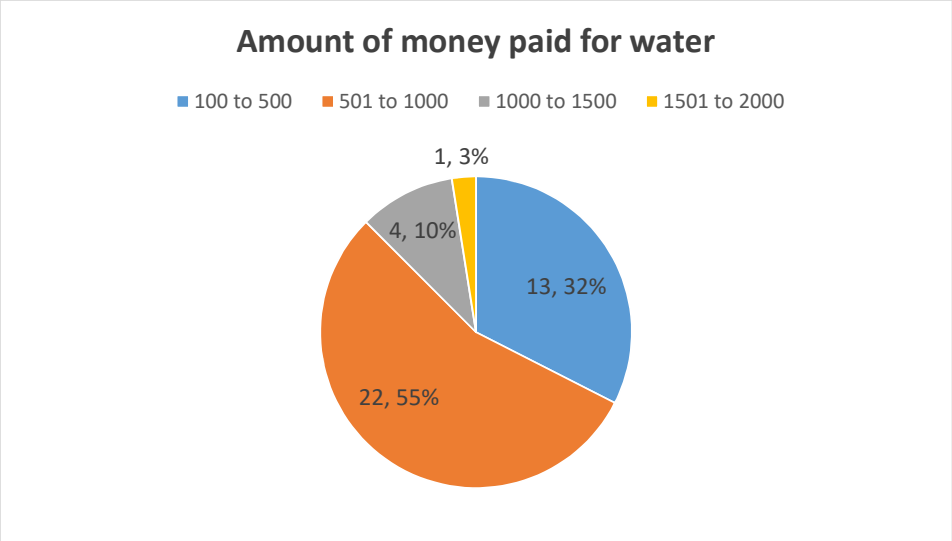


Figure 4-18: Cost of water

Satisfaction with water supply

55%of the respondents would prefer to have their water source to be a tap outside their house. 83% of the respondents were not satisfied with the current water supply and 95% would want the water supply improved while 70% are willing to pay for improved water services . This means that improvement of the water source is very important in the area.

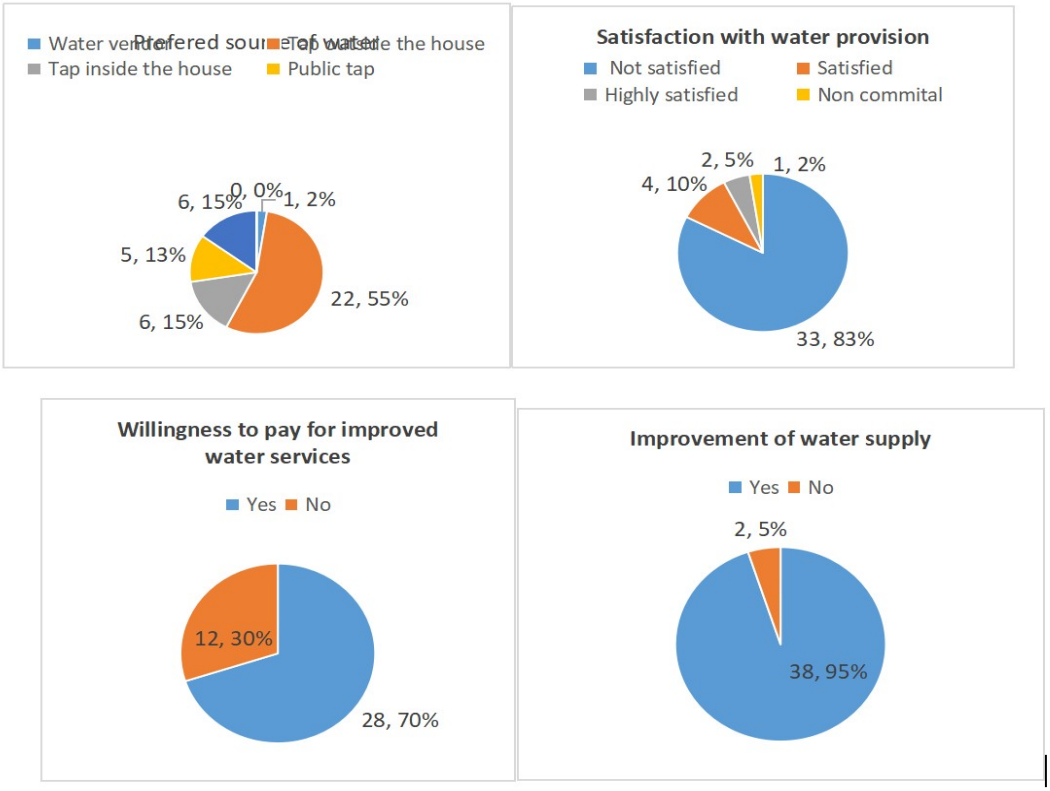


Figure 4-19: satisfaction with current water supply

Rainwater Harvesting

78% of the household indicated that they harvest rainwater and the water is stored in household containers and the rest is stored in tanks. The proponent should integrate rain water harvest in the proposed project. The rain water will augment the borehole source particularly in institutions where there is a wide roof catchment.

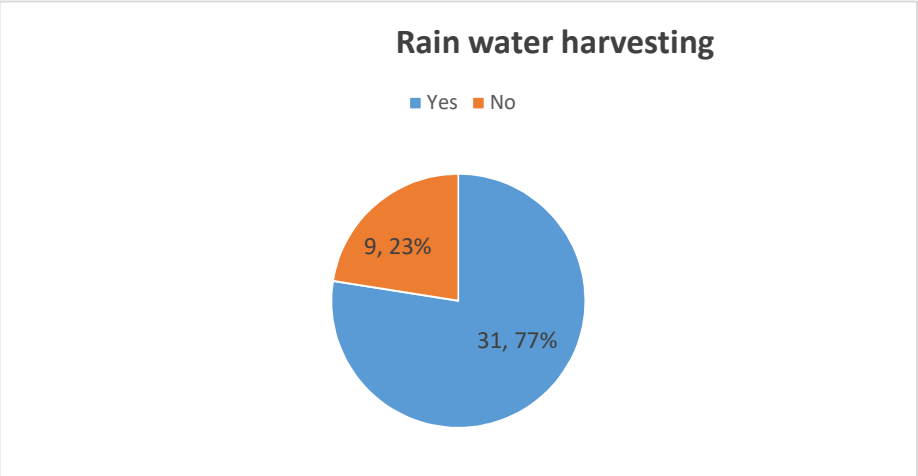


Figure 4-20: Rain water harvesting

Sanitation Facilities

All the households have a toilet facility. The most common toilet facility in the area is pit latrine with wall and roof (55%). 30% of the households have flush toilets and 15% used a communal toilet.. It is notable that 100% of the households have a hand-wash facility next to the toilet facility. 96% of the households have a bathroom shelter. The key sanitation challenges include: poor garbage collection services, water rationing and poor drainage systems. This could be improved through Sufficient water supply from the WSP, repair blocked sewer lines and proper maintenance of the working ones and improve the garbage collection services.

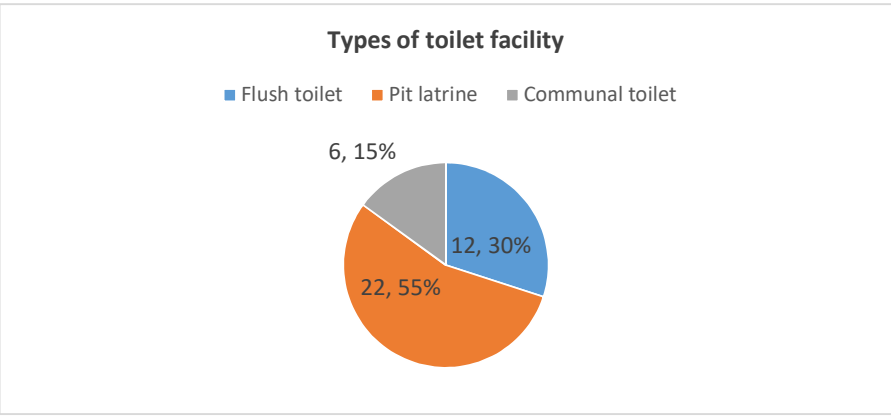


Figure 4-21: Toilet facilities

Community Organization

43% of the respondents are members of a women's group and merry go rounds while men and youth groups had a low score. In merry go rounds the respondents financial support on credit basis.

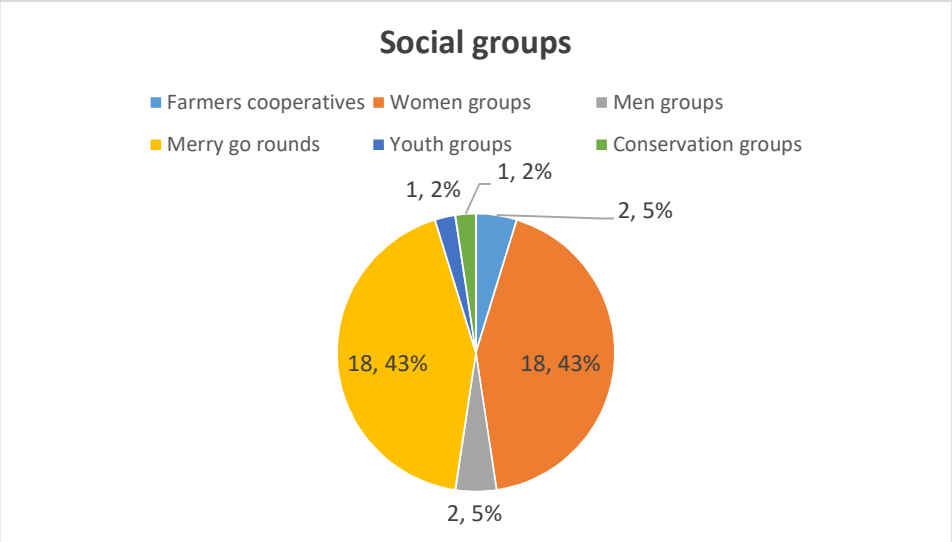


Figure 4-22: Social groups membership

(x).Cultural Sites

There were no cultural heritage/sites existing in the area therefore this will not affect the project development.

(xi). Environmental Challenges in the Project Area

The main environmental challenges mentioned include: Drying of rivers, deforestation, and climate change emerge as the most pressing issues, reported by 45% of the respondents. This is followed by water borne diseases (30%) and poor waste disposal methods, each identified by 22.5% of the surveyed households. This information is crucial for the Ramadhan borehole solarization project, as it highlights the interconnected challenges of water scarcity, environmental degradation, and public health in the village. The project should adopt a holistic approach, integrating solar

energy interventions with water conservation, reforestation, and waste management initiatives.

*Table 4-3: **Major Environmental Problems in the Area***

	Frequency	Percent
Water borne diseases	12	30
Drying of rivers, Deforestation and Climate change	18	45
Poor water drainage	1	2.5
Poor waste disposal methods	9	22.5
Total	36	100.0

(xii). Addressing environmental Challenges

The key strategies mentioned include Public education (40%) and improving access to clean safe drinking water (28%) emerge as the most popular solutions, suggested by of the respondents. Re-forestation is recommended by 12% of the surveyed households and heavy penalties on polluters at 10%. This feedback underscores the importance of community awareness and participation in addressing environmental challenges. The Ramadhan borehole solarization Project should integrate a strong educational component, focusing on the benefits of the proposed project, water conservation, and environmental stewardship. By empowering the local community with knowledge and resources, the project can foster a sense of ownership and encourage sustainable practices.

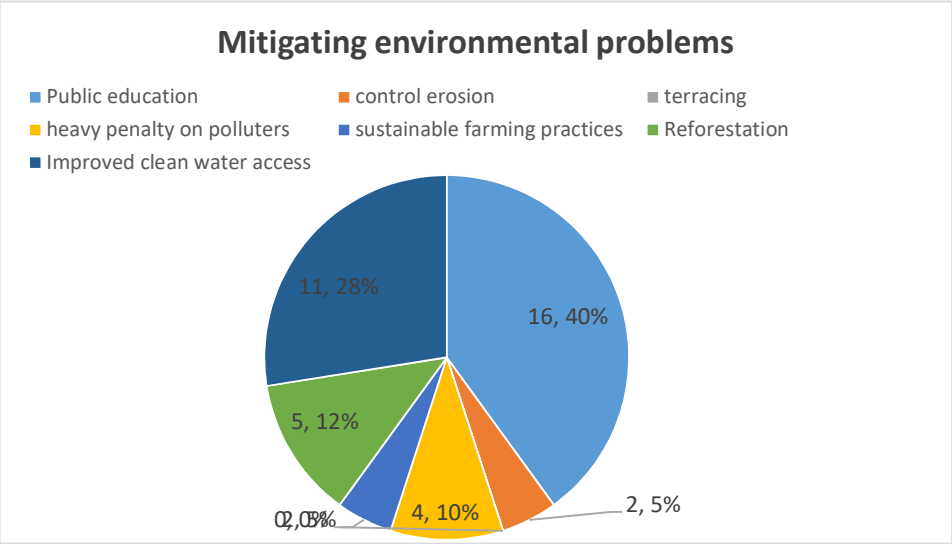


Figure 4-23: Mitigating Environmental problems

(xiii). Project Awareness

90% of the respondents in Ramadhan village are aware of the proposed borehole project, while 10% are not. This finding shows that community sensitization and engagement regarding the Ramadhan borehole solarization Project has been well done. The community members have been involved in the planning process.

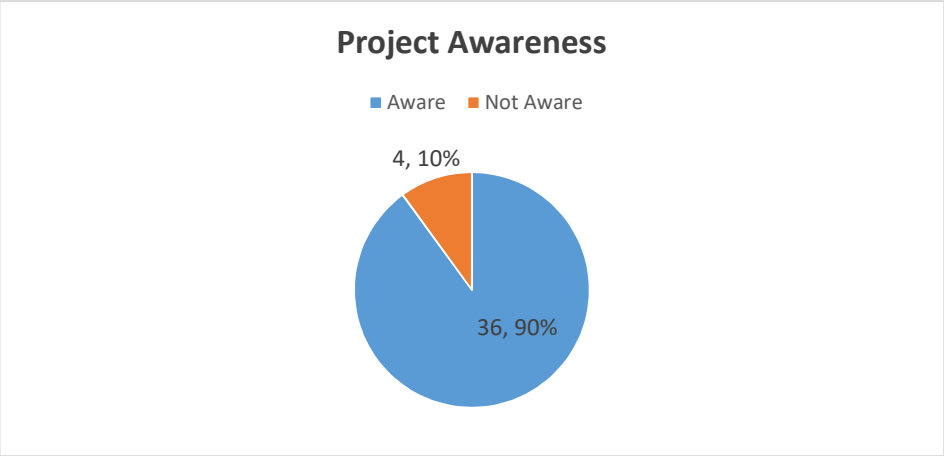


Figure 4-24: Project Awareness

5 PUBLIC CONSULTATION AND STAKEHOLDER ENGAGEMENT

5.1 Introduction

Stakeholder engagement is a critical process in a project as it significantly influences the project's success. Stakeholders in this report refers to person (s) who has an interest or can either affect or be affected by the project. It is important to undertake effective consultation with stakeholders from the project inception to closure.

In this project, stakeholders were mapped out as either primary or secondary. They were then analysed based on their impact, level of influence, importance to the project, and contribution to the project. This helped in determining the best strategy for engaging with them. It then concludes with a summary of the feedback obtained from the stakeholders that is reviewed and incorporated in the final design, construction and operation of the project.

5.2 Objectives of Stakeholder Engagement

Stakeholder engagement has the following objectives:

- ***Inform***: Provide accurate, relevant, timely and culturally appropriate information to Project stakeholders about the Project, its impacts and benefits, and the ESIA process.
- ***Engage:*** Provide opportunities for Project stakeholders to express their opinions and concerns about the Project, and to seek broad stakeholder support for the Project and impact management
- ***Understand:*** Enable the Project team to understand the concerns and priorities of stakeholders
- ***Review***: Incorporate justified concerns and priorities into the design, construction and operation of the Project
- ***Inform (feedback):*** Provide feedback to Project stakeholders and host communities as the Project develops so that the consultation process continues.

5.3 Stakeholder Mapping

Mapping of stakeholders is an essential process that assists the expert in understanding whom they need to prioritize in their engagement. The following stakeholders have been identified as persons who will be affected by the project or who could influence the project's success. They are mapped as either:

a) **Primary Stakeholders-** Those who hold a direct interest in the proposed project
b) **Secondary Stakeholders-** Those with an indirect interest, but they can influence the project's success.

They are mapped as shown in the table below:

Table 5-1: Mapping of Stakeholders

Primary Stakeholders	Secondary Stakeholders
• Ramadhan village community where solarization will be done • Isiolo Water & Sewerage Company (IWASCO) • Water Sector Trust Fund	County Government of Isiolo • Department of Water, Environment & Natural Resources National Government • National Government Administration • State Department of Gender & Social Services • State Department of Early Learning & Basic Education
	• National Environment Management Authority (NEMA) • Water Resource Authority (WRA) • Water Resources Users (WRUA) • NGOs / CBOs
	Political class

	• MCA • Ward Administrator
	National Government Administration • County Commissioner • Chiefs and their Assistants

5.4 Stakeholder Analysis

Table 5-2: Analysis of project stakeholders

Stakeholder Name	Impact *(Low, Medium, High)*	Influence *(Low, Medium, High)*	What is important to the stakeholder?	How could the stakeholder contribute to the project?	How could the stakeholder block the project?	Strategy for engaging the stakeholder
Water Sector Trust Fund	High	High	Grant administration to facilitate infrastructure development	By providing funds for undertaking the project	Withdrawing financial support for the project	Regular status report, monthly reports and other deliverables
IWASCO	High	Low	Obtaining water to supply to the public	Communicate with other stakeholders to express their	Ending their engagement with WSTF	Information and feedback meetings every 6 months

Stakeholder Name	Impact *(Low, Medium, High)*	Influence *(Low, Medium, High)*	What is important to the stakeholder?	How could the stakeholder contribute to the project?	How could the stakeholder block the project?	Strategy for engaging the stakeholder
				support for the project		
Ramadhan Residents	High	High	Understanding how the project safeguards their safety as the host community	By sharing their concerns, opinions about the project from the design stage.	Reject the project by refusing to cooperate during solarisation	Create project awareness and provide an open communication to ensure they understand the project well. Their engagement shall be ongoing throughout the project cycle

Stakeholder Name	Impact *(Low, Medium, High)*	Influence *(Low, Medium, High)*	What is important to the stakeholder?	How could the stakeholder contribute to the project?	How could the stakeholder block the project?	Strategy for engaging the stakeholder
County Government of Isiolo- Department of Water	High	Low	Ensuring consistent water supply needs in the county are met.	By sharing relevant information on proposed project with the Client/Consultant. Assist in the creation of project awareness and promoting acceptance	_____	Through KII and Focused Group Discussions. Consultant sharing their findings with the County.

Stakeholder Name	Impact *(Low, Medium, High)*	Influence *(Low, Medium, High)*	What is important to the stakeholder?	How could the stakeholder contribute to the project?	How could the stakeholder block the project?	Strategy for engaging the stakeholder
NEMA	High	High	Adequate Environmental and Social Impact Assessment is undertaken before the project construction	By availing the ESIA report for review and licensing	By not issuing ESIA License	Providing ESIA Report and all other necessary documentation regarding the project for review
WRA	High	High	Proper management and use of water resources	By sharing relevant information of the water resources that will be	By not issuing permits required for water abstraction	Consulting with the stakeholder during the design stage and providing the relevant

Stakeholder Name	Impact *(Low, Medium, High)*	Influence *(Low, Medium, High)*	What is important to the stakeholder?	How could the stakeholder contribute to the project?	How could the stakeholder block the project?	Strategy for engaging the stakeholder
				affected by the project.		reports needed for issuing of permits.
Politicians (MCA, Ward Administrators, MP etc.)	Low	High	The residents within their area of jurisdiction access and enjoy amenities like water	Creating awareness about the project in order to obtain support and project acceptance	Inciting residents against the project	Involving them in focused group discussions and public stakeholder meetings
Local Administration (CC, DCC, ACC, Chiefs &	Low	High	Law and order are adhered to during the project	Help in organization of local meetings, sharing relevant	-	Involving them in KII, focused group discussions and public stakeholder meetings.

Stakeholder Name	Impact *(Low, Medium, High)*	Influence *(Low, Medium, High)*	What is important to the stakeholder?	How could the stakeholder contribute to the project?	How could the stakeholder block the project?	Strategy for engaging the stakeholder
Assistant Chiefs)			implementation phases	information about the project area, assist in identifying the affected land owners, Help in resolution of any complaints that may arise during the project implementation phase.		Communicating all findings during each step of the project. Head the Grievance Redress committee once they are set up

5.5 Stakeholder Engagement Approach

Stakeholder engagement process is a crucial process in the undertaking of any project. The interaction is aimed at creating awareness, obtaining their views/opinions and concerns about the project.

Table 5-3: Methodology adopted in Stakeholder Engagement

Technique	Target Group	Objective	Date Undertaken
Key Stakeholder Interviews	Secondary Stakeholders County Government of Isiolo Department of Water, Environment & Natural Resources National Government National Government Administration State Department of Gender & Social Services State Department of Early Learning & Basic Education	• To create awareness about the project • To obtain their views regarding the project	12/6/2024-13/6/2024
Household Surveys	• Residents within the project area	• To understand the socio-economic status of the affected communities	12/6/2024-13/6/2024
Focused Group Discussion	Key stakeholders	•To obtain their input on the proposed design	12/6/2024
	Residents of Ramadhan area	•To obtain their input on the proposed design	28/08/2024

5.6 Joint Public Baraza for Isiolo

The Consultant undertook public participation through a community public baraza held on 12/6/2024 to create awareness and solicit views and opinions on all the proposed activities targeting the 7 boreholes where drilling or/and solarization would be done. the proposed project. The community baraza was held at the Sub County level in Isiolo Town CDF Hall to collect indepth concerns regarding the proposed project. The participants were drawn from all the project sites namely: Checheles, Mater area, Mwangaza, Ramadhan, Show ground, Ewaso Comprehensive school and Tulluroba.

The baraza had mixed participants drawn from the youth, Men and Women. The area leaders; nyumba kumi and religious leaders drawn from the Muslim and Christian community were also represented.

The IWASCO team introduced the project rationale and justification and the scope. The consultant provided a brief of the project Scope highlighting the importance of ESIA according to EMCA 1999 (Amended 2015), the importance of public participation, upcoming field activities and importance of the community views. The chief gave the areas covered by the project and then there was a question and answer session. They community members indicated they have suffered water shortages for so long and were all supportive of the project stating that lack of water is a critical issue in the area. The issues that were raised in the baraza include:

- *Scope of Water Supply Areas-* Areas that may not be reached with the water connections to the residential areas, consider putting up water kiosks at common points to boost accessibility.
- *Community safety concerns:* is a critical concern particularly among the residents living around the proposed sites.
- *The boreholes may yield salty water unfit for human consumption*. The water from the boreholes will be tested by Isiolo water company to ascertain its safety for human consumption.
- *Clogging of pipes by dirty water*: The water will also be subjected to water treatment including sedimentation to make it clean.
- *Construction materials and waste may be dumped carelessly*. All waste Materials and spoil will be disposed at NEMA approved sites
- *Bore hole may interfere with ground water levels* (water tables). A hydrological survey will be done to ascertain the water levels in the water table so as to get the place that will yield the highest amounts of water.
- *Possibilities of radioactive Materials from solar cells* . The consultants assured the community that solar cells are just like the normal cells and are not associated with radioactivity.
- *Increased costs of the water tariffs* IWASCO confirmed to the community that the unit cost will remain the same but water supply will be improved

The key questions asked during the joint baraza and the responses given are as presented below:

Question	Response by Consultant/IWASCO
Will the solar energy reduce the costs of operation for the project	Use of energy from the sun/green energy is a low cost venture since after the initial costs of installing the system.
Will the water costs be increased ?	IWASCO indicated that they will be guided by the accepted tariff of 54 per unit of water
Do solar panels need maintenance? If so who will meet the costs?	Like any other system, the solar panels need maintenance but the costs will be met by IWASCO. However the panels may stay for more than 20 years before needing repairs or changing.
Is there a possibility of giving other people water and leaving us without?	Fairness in distribution and sharing of water will be ensured.
Can we use the water for irrigation for those who have land?	The client indicated that the water is purely for domestic purposes and its treated for domestivc use and should not be used for irrigation.

5.7 Joint Focused Group Discussion for Isiolo Project

After the baraza, 3 FGDs discussions were held;

1. Women only FGD (16 participants)

2. Men Only FGD (11 Participants)

3. Youth FGD (12 Participants)

The key discussion points during the FGDs include:

Women Focus Group Discussion

- ✓ Women indicated that they bear the heaviest burden of water scarcity since they have to draw water from far areas or buy from a bowser/water vendors

- ✓ They experience gender based violence when they are late to do other domestic chores as they go in search of water;
- ✓ Once they go early to fetch water some have been sexually assaulted
- ✓ Some have health issues especially backaches due to fetching water
- ✓ They are not able to have kitchen gardens

Men Focus Group Discussion

- ✓ They felt that at times women are lazy and use fetching water as an excuse to go gossip
- ✓ Lack of water has contributed to school absenteeism
- ✓ They spend a lot of money on water
- ✓ Water conflicts

Youth Focus Group Discussion

- ✓ Inability to engage in agribusiness ventures
- ✓ Spending a lot of time sourcing for water
- ✓ Increased incidences of water borne diseases.

5.8 Site Specific Ramadhan Focus Group Discussion

One site specific focus group discussion was conducted at the village level (Combining both Ramadhan A& Ramadhan B villages). It was attended by 6 men and 12 Women. This included 2 youth, christian and Muslim leaders and representatives of the school management. Minutes are annexed to this report.



Plate 5-1: Community Meetings at Ramadhan Site including a Gender Disagreggated Focused group discussion

5.8.1 Feedback from Public during the Baraza and FGDs

- The community requested IWASCO to make sure the project comes to fruition and its not just a white elephant and to make sure it is implemented very fast.;
- Increased costs of the water tariffs : IWASCO confirmed to the community that the unit cost will remain Ksh 54 per unit of water consumed the same but water supply will be improved
- Increased debris and waste materials from the construction site: The wastes generated from the project should be bulked in one place and collected for disposal at NEMA approved sites
- Scope of Water Supply Areas- The community were concerned that the water may be distributed to so many beneficiaries compromising the amounts. IWASCO indicated that they are committed to providing adequate water and that is why they are drilling boreholes in many areas.
- The community requested that IWASCO should consider putting up water kiosks at common points to boost accessibility.

- Employment opportunities- The locals indicated that they should be given first priority in the available job opportunities especially during construction.
- Bore hole may interfere with ground water levels (water tables). A hydrological survey will be done to ascertain the water levels in the water table so as to get the place that will yield the highest amounts of water.

5.9 Key Informant Interview

Key informants were administered to institutional stakeholders using a key informant schedule from 12/6/2024-14/6/2024. The feedback is summarized below:

a) County Government of Isiolo- Department of Water & Sanitation

- The office is aware of the project
- The project will enhance water supply in a water scarce town
- Increased water supply will spur other benefits -improved hygiene & health
- Institutions can undertake other activities-e.g. promoting gardening
- There is need to safeguard against water wastage to those who will be served by the proposed project
- There is need to sensitize people on matters water recycling
- There are no sensitive areas in the proposed project sites
- Solar power failure
- The need to treat water
- The project will bear more benefits than negative impacts

b) County Government of Isiolo- Department of Social Development

- The project will lead to increased access to water by the community
- Improved hygiene & sanitation standards in the town
- The negative impacts include disruption of business along the pipelines
- Noise pollution

- To mitigate against negative impacts there is need for involvement of the community during the project in order to find a middle ground especially for the business people who will be affected

c) State Department State Department of Early Learning & Basic Education

- The water will be useful to the schools for multiple uses -drinking, watering seedlings but this will only be realized if there is no charge on the water
- There is an existing well which risk drying up
- There is need for a clear plan on how the schools will benefit
- Consider a revenue sharing plan

- Ensure that the proposed project activities do not disrupt learning during construction, operation and monitoring

6 IMPACT IDENTIFICATION, ANALYSIS

6.1 Potential Impacts and Mitigation Measures

It is envisaged that the proposed borehole solarisation project will generate both positive and significant negative impacts during its life. The construction, operation and decommissioning phase are evaluated for both positive and negative impacts. Positive impacts should be enhanced through enhancement measures while negative impacts should be mitigated to reduce them.

In the assessment, the assessors have suggested measures to mitigate against the negative impacts, while enhancing the positive one. The proponents should continuously monitor the effectiveness of the mitigation or prevention measures recommended in the report. This is because these impacts are interlinked and any fault in one component will affect all the other phases of the project.

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.

6.1.1 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 6-1: Impact significance rating criteria

SEVERITY OF IMPACT	RATING	
Insignificant / non-harmful / less beneficial	-1/ +1	CONSEQUENCE
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	
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	LIKELIHOOD
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 6-2: 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 6-3: 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

6.1.2 Construction Phase

6.1.3 Positive Impacts During Construction

The Proposed project could result into the following positive Impacts

a) Employment Opportunities: The construction phase will create job opportunities for local residents including positions in unskilled labour
b) Skill Development and Capacity Building: Workers involved in the construction phase receive training and develop skills related to construction and maintenance
c) Community Engagement and Awareness: The project can raise awareness about water management, construction practices, and community involvement.
d) Local business development: The project will promote local businesses through sourcing of construction Materials locally and other enterprises such as hotels
e) Improvement of infrastructure around the site (through negotiated CSR) e.g. security lighting or water tank

6.1.4 Negative Impacts During Construction

The proposed project could result into the following negative impacts:

Noise Pollution

Construction of the proposed Project will result in noise emissions as a result of the machines that will be used during setting up the solar panels and control rooms. Noise will also be generated from the construction workers. The receptors of this impact are the host community and Ramadhan Primary School.

Noise impacts would be considered significant if the Project would result in the following:

a) A substantial permanent increase in ambient noise levels (more than 3 dBA) in the project vicinity above levels existing before the project; and

b) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing before the project.

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	-1
Result	**-12 Very Low**

Mitigation measures

- Ensure that noise levels are controlled and do not exceed a maximum of 55 dBA during the day.
- All workers involved in the construction activity should be provided with appropriate personal protective equipment (PPE), such as ear protection to mitigate exposure to noise.
- Avoid installation activities at night when people are sleeping
- Limit the idling time of pickup trucks and other small equipment. Workers should be encouraged to shut off vehicle engines whenever possible, adopting a common-sense approach to vehicle use.
- Limit the idling time of pickup trucks and other small equipment. Workers should be encouraged to shut off vehicle engines whenever possible, adopting a common-sense approach to vehicle use.
- The receptors of the noise impact, including the nearby school, neighbouring residents, and on-site workers, should be kept informed of the drilling & solar installation schedule and any potential disruptions. Regular communication and

updates will help manage expectations and maintain good relations with the community.

Site Safety, Security, and Welfare arrangements

The nature of the project may bring into fore many safety, security and health issues. These range from electrical shocks from live wires and energized equipment, falls owing to the heights which solar panels are installed and exposure to extreme heat, leading to sunburn, thirst, and heat fatigue and may come in contact with hot objects like solar cells, which can cause burns

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

Mitigation measures

- Barriers shall be erected to prevent unauthorized access to the project sites by residents and other unauthorized persons
- Security personnel shall be deployed to secure the safety of the workers and property against vandals and to control access for safety purposes;
- The Contractor shall have his workers appropriately trained on safety and health matters-safety talks shall be held on a weekly basis;
- Any accident, incident or hazardous situation should be reported immediately it occurs or identified;
- The Contractor shall deploy as EHS officer at the project 'site' to foresee implementation of the EHS and security matter; and

- Ensure proper wiring with certified cables, secure grounding, and overcurrent devices
- Lockout/Tagout (LOTO) procedures should be in place to de-energize electrical circuits
- Use protective netting in elevated areas to prevent falls

Worker's welfare (hygiene and sanitation)

Welfare of the workers is crucial for a successful project. Both legal and moral standards require that workers are provided with adequate facilities that will guarantee safety and health. The Act (OSHA, 2007) obligates the employer to provide essentials facilities for namely water, bathrooms, toilets etc.

Impact without Mitigation	
Severity of impact	-4
Spatial scope of impact	-2
Duration of impact	-2
Frequency of activity / duration of activity	-2
Frequency of impact	-2
Result	**-32 Low**

Mitigation measures

- The contractors shall provide, free of charge, appropriate PPEs
- The Contractor shall provide clean portable drinking water for the workers
- The Contractor shall provide first-aid services
- The proponent/contractor shall provide adequate and suitable sanitary facilities for workers during construction period;
- Sanitation facilities for both sex including a hand washing facility;
- The Contractor shall communicate and implement the contents of the EHS policy of the Company to the employees
- The Contractor shall make available emergency services at the site;

- The Contractor shall retain a well trained and experienced EHS officer at the site

Effects on flora (plants/vegetation)

The borehole site already exists and solarisation will not use up much ground space hence there will be minimal vegetation destruction.

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 Very low**

Project Related Conflicts

There may be issues that arise during project construction that need attention. This may range from employment issues, project activities, duration of the construction period, engagement of host community etc.

Impact without Mitigation	
Severity of impact	-3
Spatial scope of impact	-3
Duration of impact	-2
Frequency of activity / duration of activity	-2
Frequency of impact	-1
Result	**-24 Very low**

Mitigation measures

- The project shall have in place a conflict/issues management strategy including engaging an EHS expert who will manage the project related conflicts
- A grievance redress mechanism should be developed by the contractors team.

- All matters or issues that may arise during construction shall be documented and presented to the relevant persons-IWASCO, Contractor, Administration Officers
- The Contractor shall ensure that locals are given first priority during recruitment of workers. Unskilled labour opportunities will be given to the locals

Grievances Redress during project construction

The proposed grievances mechanism will entail:

- ✓ Engagement of an EHS Expert by the contractor who will act as a liaison person and expert in management of conflicts arising from the project.
- ✓ Documentation of all issues or matters arising during the construction phase so as to allow for follow up by IWASCO and relevant stakeholders
- ✓ Sensitive Matters: If issues are beyond the control of the relevant persons or institutions, they should be referred to the court of law. This provides a formal legal avenue for resolving more serious or unresolved grievances.
- ✓ The Contractor will be required to prioritize local residents for recruitment, especially for unskilled labour positions.
- ✓ For specialized tasks, apprentices from the local community should be given opportunities, facilitating skills transfer and local capacity building.
- ✓ The Contractor is obligated to hold a meeting (at the inception) with community representatives and local administration. These meetings aim to communicate the project plan, design, and progress, ensuring transparency and continuous dialogue with the local community.

HIV/AIDs and STIs and Alcohol or Substance Abuse

The scourge still stands as a national disaster. Workers, especially upon payment are prone to indulgence in unprotected sex and alcohol.

Impact without Mitigation	
Severity of impact	-5
Spatial scope of impact	-1

Duration of impact	-1
Frequency of activity / duration of activity	-2
Frequency of impact	-2
Result	**-28 low**

Mitigation measures

- Conduct sensitization on HIV/AIDS through worker talks or sensitization messages on site

Gender Based Violence and Sexual Exploitation and Abuse

Construction works including solarization may introduce migrant workers who may interact with the local community creating an avenue for sexual exploitation or abuse. This may also lead to gender- based violence due to the suspicions that may be created in families. Harassment within the workforce, particularly for women and youth laborers could arise.

Impact without Mitigation	
Severity of impact	-3
Spatial scope of impact	-1
Duration of impact	-1
Frequency of activity / duration of activity	-1
Frequency of impact	-1
Result	**-10 Very Low**

Mitigation Measure

- Include measures to control GBV-SEA-SH risks during project planning.
- All workers should sign a code of conduct on GBV and SEA
- Awareness creation and community outreach to educate locals about their rights and available reporting mechanisms.

Child Labour

Direct child labour may be limited since solarisation is a specialised task. However a few casual positions such as carrying materials, clearing the site and waste bulking may attract child labour. Indirect child labour may occur when parents get engaged to work

in the project and as a result leave their children to take over household activities leading to missing classes.

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	-1
Result	**-12 Very Low**

Mitigation

- The contractor should adhere to the labour laws;
- The client should conduct regular inspections to ensure no children are working on-site.

6.1.5 Operational Phase

Positive Impacts during the operation phase

- Regular supply of quality water to residents of Ramadhan in Isiolo Town
- Reduced cost of operations in water supply as a result of solarisation
- Increased revenue to IWASCO due to operational cost reduction and increased water supply
- Reduced cases of water borne diseases among the locals
- Establishment/Improvement of livelihoods

Negative impacts during the operation phase

(i). Birds Mortality

Solar panels,can pose a threat to birds. Birds can be killed by flying into the panels.

Impact without Mitigation	
Severity of impact	-5
Spatial scope of impact	-2

Duration of impact	-5
Frequency of activity / duration of activity	-5
Frequency of impact	-5
Result	**-70 Low to medium**

Mitigation measures

- ✓ To avoid birds deaths the solar panels can have anti-Reflective Coatings to reduce glare that may confuse birds making them mistake the panels for water bodies (a phenomenon known as the "lake effect");
- ✓ Having textured Surface or patterned surfaces on solar panels can help break up reflections that might otherwise attract birds,

(ii).Generation of E-Wastes

Waste Management: At the end of their life cycle, solar panels generate electronic waste (e-waste). If not properly recycled, this waste can contribute to environmental pollution.

Impact without Mitigation	
Severity of impact	-5
Spatial scope of impact	-2
Duration of impact	-2
Frequency of activity / duration of activity	-2
Frequency of impact	-2
Result	**-36 Low**

- ✓ To avoid solar panels generating e-waste, use panels with longevity reducing the frequency of replacement and disposal;
- ✓ Using panels with modular design that can be easily disassembled to allow for the recovery of valuable materials and components;

- ✓ Use of Recyclable Materials: Prioritize the use of materials that are easier to recycle, such as certain metals and plastics, to ensure a higher recovery rate.
- ✓ Buy panels from manufacturer who have a "Take-Back Program" where they-to take back and recycle their products at the end of their life-cycle.

(iii). Vandalism of installed infrastructure

Water utilities often experience theft from residents especially when the system is not functional/no water flow. These activities can affect the delivery and management of the installed system, which results to limited access in the town. They range from theft of pipes, fittings, and water through bypassing meters and tempering with connections.

Impact without Mitigation	
Severity of impact	-5
Spatial scope of impact	-3
Duration of impact	-2
Frequency of activity / duration of activity	-5
Frequency of impact	-1
Result	**-60 low to medium**

Mitigation measures

- IWASCO should ensure good relationship with the local community through continuous engagement. The existing IWASCO area managers can facilitate this.
- Foster household ownership of the infrastructure through payment of water by households
- Enforce law against reported cases of vandalism

Water Conservation

Increased water provision may lead to wastage of the scarce resource among beneficiaries. The system could also present inefficiencies that lead to water loss in the course of distribution.

Impact without Mitigation	
Severity of impact	-3
Spatial scope of impact	-1
Duration of impact	-4
Frequency of activity / duration of activity	-5
Frequency of impact	-4
Result	**-72 Low to Medium**

Mitigation Measures

- The piping Material should be resistance to abrasions from external elements to prevent leakages
- Establish a monitoring system to allow for prompt detection of leakages and repairs
- Create awareness among project beneficiaries on the need to use water judiciously.
- Build the capacity of the water utility to continuously improve the efficiency of the water supply system including reduction of non-accounted water, installation of efficient technologies e.g. automated water points in water kiosks

Energy Use

The proposed project will utilize solar power in pumping water from the borehole. This will enhance sustainability, low operation and maintenance cost. Additionally, it will promote adoption of green energy in the community and the county. Negative impacts may arise where the solar system fails to operate optimally due to

changes in climatic conditions or technical failures. This may lead to disruption in water supply within the town.

Impact without Mitigation	
Severity of impact	-5
Spatial scope of impact	-1
Duration of impact	-1
Frequency of activity / duration of activity	-2
Frequency of impact	-2
Result	**-28 low**

Mitigation Measures

- Select high-quality solar panels, inverters, mounting structures, and other components from reputable manufacturers with proven track records.
- Hire certified and experienced solar installers who follow industry best practices and adhere to manufacturer guidelines for installation.
- Ensure the solar panels are kept clean and free of debris to maximize sunlight absorption.
- Regularly remove dirt, dust, bird droppings, and leaves that can reduce efficiency
- Periodically inspect and tighten electrical connections to prevent loose connections that can lead to system inefficiencies or failures.
- Install a monitoring system to track the performance of the solar panels, inverters, and overall system.
- Ensure all electrical components are properly weatherproofed and protected from rain, humidity, and extreme temperatures.
- Ensure proper charging and discharging cycles to prolong battery life

- Schedule periodic inspections by qualified technicians to check for wear and tear, corrosion, and other signs of potential problems.

Impact on vulnerable and marginal groups

Poorly managed boreholes can lead to over-extraction of groundwater, which can deplete local aquifers and impact water availability for vulnerable communities and ecosystems dependent on groundwater. If boreholes are not properly constructed or maintained, there is a risk of groundwater contamination, which can have severe health consequences, particularly for vulnerable groups who may be more susceptible to waterborne diseases.

Impact without Mitigation	
Severity of impact	-5
Spatial scope of impact	-3
Duration of impact	-3
Frequency of activity / duration of activity	-3
Frequency of impact	-4
Result	**-77 Medium to High**

Mitigation Measures

- Ensure equitable access to borehole water by implementing transparent allocation mechanisms and considering the needs of vulnerable groups in water distribution plans.
- Implement pro poor water supply program to increase water access among the marginally poor groups in the area
- Implement sustainable groundwater management practices to prevent over-extraction and ensure the long-term availability of water resources.

- Regularly monitor the impact of boreholes on vulnerable groups and adjust management practices accordingly to address emerging issues.

By taking these considerations into account and implementing appropriate measures, borehole construction and operation can contribute positively to the well-being and resilience of vulnerable communities, ensuring sustainable access to safe water and improving overall quality of life.

Influx of migrants

The improved water supply due to solarization in Ramadhan area may lead to population influx. The influx could result in secondary effects such as increased strain on social infrastructure such as schools and hospitals; there may be a rise in petty crimes.

Impact Analysis

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

Mitigation:

- The local administration should carry out sensitization on negative social issues that may result from on -going developments such as this proposed one.

6.1.6 Cumulative Impacts

During operation the following cumulative impacts will be experienced:

✓ Increased Water Access: Reliable, sustainable water pumping through solarisation ensures consistent water supply.

- ✓ Reduced costs of operation: Solar-power use will reduce dependency on Kenya power energy which is a major operation cost in water provision.
- ✓ Reduced cases of water borne diseases among the locals.
- ✓ Improved local economic development.
- ✓ Resilience to Climate Change: Solarisation produces clean energy making water access more reliable during power outages or fuel shortages.
- ✓ Energy Resource Conservation: Solar energy is renewable, reducing dependence on non-renewable fossil fuels.
- ✓ Reduction of Noise Pollution during operation since solar systems are quieter compared to diesel generators.

Negative Cumulative impacts

- ✓ E-waste from Solar Batteries: improper disposal of solar batteries can lead to environmental contamination.
- ✓ With affordable/cost-effective source of power from solar energy, over-extraction of water may occur due to continuous water pumping and this may lead to depleting the water table causing long-term water scarcity.
- ✓ During prolonged cold seasons, cloud cover or inadequate sunlight, there may be no solar power to pump water which would create water shortages.

<u>Decommissioning Phase</u>

The project shall not have detrimental impacts if necessary measures are put in place to prevent environmental hazards and risks resultant of the abandonment. This may include the borehole safetyand security issues, the conveyances and the changes to the concerned community.

Mitigation measures

- The Proponent shall subject the project to an abandonment environmental and social impact assessment/Decommissioning ESIA or risk management in the event of closure of the project.
- The process shall involve all the concerned parties
- The legislations and best environmental practices prevailing then shall apply.

7 ENVIRONMENTAL AND SOCIAL MANAGEMENT & MONITORING PLAN

7.1 Introduction

Several impacts have been identified that are likely to affect the project both positively and negatively. They have also been identified based on three different project phases: construction, operation and decommissioning phase. A plan illustrating how the identified impacts will be managed throughout the project cycle has been formulated in Table 8-1 below. However, it is important to note that before the construction commences, the contractor will be required to develop an updated Construction Phase-Environmental and Social Management and Monitoring Plan (CP-ESMMP) that will be implemented during the construction phase of the project.

Implementation arrangements

In order to ensure the sound development and effective implementation of the ESMMP, it is necessary to identify and define the responsibilities and authority of the various persons and Organizations that will be involved in the project. The following entities should be involved in the implementation of this ESMMP:

- IWASCO
- NEMA Isiolo County
- Contractor
- Design Consultant;
- County Government of Isiolo

7.1.1 IWASCO

IWASCO the project proponent, will be charged with the responsibility of implementing ESMP. This will be achieved by inclusion of the ESMP provisions in the tender documents and conducting ESMP monitoring to ensure the objectives of this ESMMP are met. Monitoring will be done on a daily basis by the ESS unit.

7.1.2 National Environment Management Authority (NEMA)

NEMA is tasked with overseeing and coordinating all aspects pertaining to the environment, serving as the primary governmental instrument in Kenya for implementing policies related to environmental matters. The Authority has an oversight mandate in ensuring proponents implement project ESMPs.

7.1.3 The Contractor

The person/firm contracted to undertake solarization will be required to comply with the requirements of the ESMMP within this report. To ensure strict compliance environmental specifications of this ESMMP should form part of the contract documents.

7.1.4 County Government of Isiolo

The relevant departmental officers in Isiolo County will provide advisory and institutional monitoring services according to existing guidelines and policies .

Impact	Mitigation/s Remedial Action/s	Implementation agency/ies	Monitoring Indicators and Freq. (F)	Mitigation target	Mitigation Cost/s (KShs)
CONSTRUCTION PHASE					
Noise Pollution	• Provision of appropriate personnel protective equipment to workers • Traffic management to minimize noise e.g. minimum idling time, no hooting policy • Sensitize workers to avoid shouting, loud music and banging of equipment	Contractor IWASCO	-Noise level readings at various points within 1km radius below 55 dBA, -Availability and enforcement of PPE use. -Traffic management policy developed & enforced -Worker's sensitization schedule	Minimal noise levels	10,000 (hiring portable barriers, noise PPEs)
Site Safety, Security, and Health Risks	• Barriers shall be erected to prevent unauthorized access to the project sites by unauthorized persons • Security personnel shall be deployed to secure the safety of the workers and property against vandals and to control access for safety purposes;	Contractor IWASCO	-Presence of barriers around project site. -Security personnel deployed -Safety talks shall be held on a weekly basis; -Traffic safety policy developed -Incidence book availed	Safety and secure sites	10,000 (safety PPEs, security personnel, first aid kit)

	• The Contractor shall have his workers appropriately trained on safety and health matters- safety talks shall be held on a weekly basis; • Construction vehicles will observe the required speed limit of 50 KM/H. Any accident, incident or hazardous situation should be reported immediately it occurs or identified; • The contractor shall provide insurance cover for any eventuality during work to the employees; • The proponent/contractor shall provide adequate and suitable sanitary facilities for workers during construction period; • The Contractor shall deploy an EHS officer at the project 'site' to foresee implementation of the EHS and security matter; and • The Contractor shall abide by the all the relevant provisions of		-Worker Insurance cover provided -Availability of sanitary facilities on site- -Presence of the EHS officer on site -First Aid Kit availed on site -Emergency contact for a health facility provided to site agent & EHS officer		

	OSHA, 2007 and other relevant legislations				
Worker's welfare (hygiene and sanitation)	• The contractor shall provide, free of charge, appropriate PPEs • The Contractor shall provide clean portable drinking water for the workers • The Contractor shall provide first-aid services • Sanitation facilities for both sex including a hand washing facility • The Contractor shall communicate and implement the contents of the EHS policy of the Company to the employees • The Contractor shall make available emergency services at the site/ camp; • The Contractor shall retain a well trained and experienced EHS officer at the site	Contractor	- PPE provided & distributed -Drinking water points on site -Sanitation facilities availed -EHS officer deployed	Safe and health working environment	10,000 (drinking water PPEs)
Effects on flora (plants/vegetation)	• The Contractor and other project participants must ensure minimal disturbance to existing	The Contractor	-Clearly marked access route -Site restoration plan	Restoration activities implemented	5,000 (landscaping)

	vegetation by marking out access routes and construction area • The project will make provision for tree planting within the site restoration activity				
Water Quality	• Designate an equipment servicing location away from the proposed site • Appropriate storage of fuel and Materials on site • The contractor should engage a licensed waste collector to manage all the waste • Undertake water quality monitoring after construction to establish any contaminants in the water	The contractor	-Location maps showing storage areas and borehole sites - Contracts or agreements with licensed waste collectors - Water quality test results (e.g., levels of contaminants, pH, turbidity)	Zero Contamination	5,000 (waste collection, water quality test)
Project Related Conflicts	• The project shall have in place a conflict/issues management policy including engaging an EHS expert who will manage the project related conflicts • All matters or issues that may arise during construction shall be documented and presented to	Contractor	- Contactor's grievances management policy - Complete and accurate documentation of all construction-related issues. - Documentation and tracking of court cases.	EHS expert engaged to handle conflicts Grievances & Redress	5,000 (EHS, grievances book etc)

	the relevant persons-IWASCO, Contractor, Administration Officers • Sensitive matters beyond control of the relevant persons or institutions shall be referred to the court of law. • The Contractor shall ensure that locals are given first priority during recruitment of workers. Unskilled labour opportunities will be given to the locals • In specialized tasks, the Contractor shall ensure that apprentices are from the local community to allow for skills transfers • The contractor shall hold periodic meetings with community representatives and local administration to communicate the project plan, design and progress.		- Number of unskilled labor positions filled by locals.	record book provided Evidence of how grievances are addressed	
HIV/AIDs and STIs and Alcohol or Substance Abuse	• Conduct education and awareness campaigns on	Contractor	- Grievances redresss policy	Low or zero HIV/Aids prevalence	20,000

	HIV/AIDS, STIs, and the dangers of substance abuse.		- Contractor's policy on Sexual Harassment & Gender based violence	and sober and productive workforce	
Politics and Political Good will	• The project will provide for extensive public participation; • The community shall be sensitized on negative political influence on projects implementation • The politicians shall be encouraged to desist from negative politics for the sake of the community economic development	IWASCO County Government	-Number of community sensitization meetings held prior to the project -Number of Engagements with Politicians	Encouraging Positive Political Engagement	5,000 (meeting venue)
OPERATION PHASE					
Vandalism of installed infrastructure	• Continuous engagement - meetings, liaison staff • Foster household ownership of the infrastructure through payment of water by households • Enforce law against reported cases of vandalism	IWASCO	-Frequency of Community Engagement Meetings -Percentage of Households Paying for Water -Number of Vandalism Incidents Reported	Infrastructure is secured	10,000 p.a (meetings)

Water Quality	• Implement a regular monitoring program to assess water quality parameters such as pH, turbidity, total dissolved solids (TDS), microbial contamination (e.g., coliform bacteria), and chemical contaminants (e.g., nitrates, heavy metals) • Maintain the borehole and pumping equipment regularly to prevent buildup of sediment, biofilms, and other sources of contamination that could affect water quality. • Educate local communities on the importance of water quality protection, proper sanitation practices, and the potential sources of contamination that could impact their borehole water • Develop an emergency response plan to address sudden water quality issues or contamination incidents including: protocols for water testing, notification of	IWASCO	- Water Quality Parameters such as pH Monitoring - Borehole Casing and Screen Inspection - Community sensitization	Water quality is within recommended level	60,000 p.a (meetings, water tests)

	stakeholders, and remediation actions. • Secure borehole area to prevent accidental or deliberate water contamination				
Water Conservation	• The piping Material should be resistance to abrasions from external elements to prevent leakages • Establish a monitoring system to allow for prompt detection of leakages and repairs • Create awareness among project beneficiaries on the need to use water judiciously. • Build the capacity of the water utility to continuously improve the efficiency of the water supply system including reduction of non-accounted water, installation of efficient technologies e.g. automated water points in water kiosks	IWASCO	Material Durability Ratings -Leakage Incidents -Water Usage Trends -Training Sessions	Reduced water loss	50,000 p.a

Energy Use	• Select high-quality solar panels, inverters, mounting structures, and other components from reputable manufacturers with proven track records. • Hire certified and experienced solar installers who follow industry best practices and adhere to manufacturer guidelines for installation. • Ensure the solar panels are kept clean and free of debris to maximize sunlight absorption. • Regularly remove dirt, dust, bird droppings, and leaves that can reduce efficiency • Periodically inspect and tighten electrical connections to prevent loose connections that can lead to system inefficiencies or failures. • Install a monitoring system to track the performance of the solar panels, inverters, and overall system.	IWASCO	-Quality certifications and warranties from manufacturers. - Performance metrics and visual inspections of panel cleanliness. - Visual inspection for loose connections, and checking for system performance drops.	Reduced energy loss	10,000 p.a (solar system maintenance)

	• Ensure all electrical components are properly weatherproofed and protected from rain, humidity, and extreme temperatures. • Ensure proper charging and discharging cycles to prolong battery life • Schedule periodic inspections by qualified technicians to check for wear and tear, corrosion, and other signs of potential problems.				
Impact on vulnerable and marginalized groups	• Involve vulnerable groups in all stages of borehole planning, construction, and management to ensure their needs and concerns are addressed. • Ensure equitable access to borehole water by implementing transparent allocation mechanisms and considering the needs of vulnerable groups in water distribution plans.	IWASCO	-Stakeholder Engagement - Feedback Mechanism - Allocation Mechanisms	Ensure equitable and sustainable access to water for vulnerable and marginalized groups	30,000p.a

	• Implement pro poor water supply program to increase water access among the marginally poor groups in Isiolo town. • Implement sustainable groundwater management practices to prevent over-extraction and ensure the long-term availability of water resources. • Regularly monitor the impact of boreholes on vulnerable groups and adjust management practices accordingly to address emerging issues.				
DECOMMISSIONING PHASE					
End of project strategy	• The Proponent shall subject the project to an abandonment environmental and social impact assessment/decommissioning ESIA or risk management in the event of closure of the project.	IWASCO	Decommission strategy/Plan Freq: End of Project	Environmental Protection	TBD

	• The process shall involve all the concerned parties • The legislations and best environmental practices prevailing then shall apply.				

8 CONCLUSION AND RECOMMENDATION

9.1. Conclusion

The proposed project seeks to increase water supply in Ramadhan village A & B. The project entails solarisation of Ramadhan borehole. The borehole site was selected based on its suitability since the land belongs to IWASCO so there is no land acquisition or displacement of persons. Solarisation also poses minimum environmental impact, and future land use, offer a sustainable solution. Utilizing solar-powered pumping, the project aims to ensure reliable water supply, mitigate environmental impacts, and enhance water security despite climate variability. The construction phase is expected to provide local economic benefits and job opportunities but requires measures to mitigate environmental risks and community conflicts. During operations, benefits include regular water supply, reduced waterborne diseases, contingent upon strict water quality monitoring and sustainable management practices.

The borehole site is within land that belongs to IWASCO. There are no livelihood activities within the project area. There are no persons affected by the project so there is no land acquisition or displacement of persons.

9.2 Recommendations

The recommendation of this study is that the proposed project be allowed to proceed on strict condition that the environmental management plan is implemented and follow-up is made to ensure compliance as may be directed by NEMA. Recommendations for the prevention and mitigation of adverse impacts are as follows:

i. Environmental and Social Management Plan should be communicated to all the responsible actors including Contractor, IWASCO
ii. The contractor should develop a Construction Phase-ESMP for the proposed project

iii. The proponent should establish an environmental and social unit to oversee the implementation of the Environmental and Social Management Plan

iv. The proponent should institute a periodic monitoring plan to ensure regular reporting on environmental and social indicators

v. The proponent should document all environmental and social incidences occurring during project construction and operation

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APPENDIX A BILL OF QUANTITIES

RAMADHAN BOREHOLE SOLAR(EXISTING BOREHOLE)

Description		Unit	Quantity	Unit Cost	Total Cost
Installation of Solar			No.	KSh	KSh
Description					
1	6mm2 4core UG cable	Mtrs	60	350.00	21,000.00
2	1.5mm2 2core UG cable	Mtrs	60	170.00	10,200.00
3	Well probe	No	1	3,700.00	3,700.00
4	Sunverter SV3/2.2T 2.2kw controller	No	1	100,000.00	100,000.00
5	440W Dayliff solar modules	No	10	48,000.00	480,000.00
6	PV Disconnect Switch 1000V/40A	No	2	15,900.00	31,800.00
7	10mm² twin solar cable (DC)	Mtrs	60	910.00	54,600.00
8	MS ground mount 4m Support Structure /watt	No	1	100,000.00	100,000.00
9	Lightning arrestor c/w 5m copper tape	No	1	11,700.00	11,700.00
10	Installation sundries	No	1	20,000.00	20,000.00

11	14 Earth rod c/w clamp & Earth cable	No	1	1,500.00	1,500.00
12	Branding	L/S	1	50,000.00	50,000.00
13	Labour	No	1	10,000.00	10,000.00
				Sub-total:	894,500.00
	Add 16% VAT				143,120.00
				Sub-total:	143,120.00
				TOTAL	1,037,620.00

B: Attendance List and Minutes of Meetings

MINUTES OF BARAZA ON ENVIROMENTAL AND SOCIAL IMPACT ASSESSMENT FOR THE PROPOSED ISIOLO BOREHOLES DRILLING AND SOLARISATION HELD ON 12/6/2024 at ISIOLO CDF Offices

PRESENT

ATTENDANCE (ATTACHED SIGN LIST)

The meeting was attended by 49 members drawn from all the project areas.

Total Number of Attendees: 49

Men: 11

Women: 16

Youth: 12

Isiolo Water Staff: 6

Consultant team: 4

MIN 1. PRELIMINARIES

The meeting was called to order at 11.00 am and began with a word of prayer Dansoye Abkul.

Introductions

Isiolo water and sewerage company staff present Include:

- ✓ Nura Bonaya- The Finance Manager
- ✓ Catherine Mwenda-Internal Auditor
- ✓ Liban Guracha-Assistant Technical Manager
- ✓ Salod Jattan

Mr Liban gave a brief of the Isiolo area indicating that it's a fast growing area but there is inadequate supply of water. The area experiences recurrent droughts which aggravates the water scarcity. Community members can go for more than one week without water The Isiolo water project involves : Drilling and equipping of 5 boreholes, Solarisation of 7nr bore holes and Purchase and installation of 1,610 DN 15mmconsumer meters.

Ms Catherine Mwenda invited the consultants team to introduce themselves,The team comprised of:

- ✓ Dr. Rebecca Karanja (team leader)– Environmental Expert
- ✓ Dr Purity Muthoni- ESIA Expert
- ✓ Ms. Eunice Wanjiru - Sociologist
- ✓ Dr. Florence Ngari – Biodiversity Expert

The Members present were given a chance to introduce themselves and Rebecca Karanja took the community members through the ESIA requirement. She explained that EMCA 1999 stipulate that projects should have social and environmental compliance. Since 2022 in Kenya, its mandatory to carry out an ESIA for development projects and submit the ESIA report to NEMA for project approval and licensing. Rebecca further elaborated that a comprehensive report should include participant's names and signatures for meetings attended and also photos for community meetings. She introduced the enumerators drawn from the community who were to be involved in household surveys and indicated that they will be visiting households.

MIN 2. PROJECT AWARENESS AND ACCEPTANCE

The community were sensitized on the project components and the requirement for the public participation.

By a show of hands, all the participants indicated that they were aware of the project and they were willing to support it and have it implemented soonest possible.

MIN 3. ANTICIPATED PROJECT IMPACTS

The community members were able to enumerate the impacts of the project on them and the environment. They listed both the positive and negative impacts of the project. Some of the positive impacts include:

- ✓ Continuous water supply
- ✓ Establishment of Kitchen gardens
- ✓ Increased value of rental houses

- ✓ Saving of money and time
- ✓ Reduction of family conflicts
- ✓ Lighting using the solar panel
- ✓ Job creation during the implementation
- ✓ Enough water for domestic animals
- ✓ Water will reach out to the growing population
- ✓ Improvement of academic performance as children will concentrate on their studies
- ✓ Improved security since people will not have to go far to draw water

Some of the concerns highlighted by the community include:

Concern raised by the community	Consultants response
The boreholes may yield salty water unfit for human consumption	The water from the boreholes will be tested by Isiolo water company to ascertain its safety for human consumption.
Clogging of pipes by dirty water	The water will also be subjected to water treatment including sedimentation to make it clean
Construction materials and waste may be dumped carelessly	All waste materials and spoil will be disposed at NEMA approved sites
Bore hole may interfere with ground water levels (water tables)	A hydrological survey will be done to ascertain the water levels in the water table so as to get the place that will yield the highest amounts of water.
Possibilities of radioactive materials from solar cells	The consultants assured the community that solar cells are just like the normal cells and are not associated with radioactivity.

Increased costs of the water tariffs	The client confirmed to the community that the unit cost will remain the same but water supply will be improved

The possible negative impacts from the project include:

Negative Impacts	Mitigation measures
Disciplacement of persons	The client assured them that some the boreholes are located in Isiolo water company land and the ones that are located in mosques and schools, a memorandum of understanding plus letters of agreements will be availed.
Increased traffic flow	The Contractor 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; Ensuring moving equipment is outfitted with audible back-up alarms;
Devegetation due to access road construction	While opening new areas for access, the top soil shall be stockpiled and preserved for future restoration use; 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	Movement of the heavy machinery should be limited only to day time, e.g. 6 am to 7 pm
Dust pollution	Use of dust control methods, such as covers, water suppression, or increased moisture content for open materials storage piles, or controls; Care must be taken in the unloading construction materials

MIN 5. COMMUNITY EXPECTATIONS FROM THE PROJECT

1. Provision of jobs during project implementation
2. Involvement project management
3. Reduced water bills
4. Regular water supply

MIN 6. ADJOURNMENT

There being no other business the meeting ended at 1. PM with a word of prayer from one OF the community members.

Minutes signed by:

Client : ----------

ISIOLO WATER & SEWERAGE COMPANY LTD
P. O. Box 491 - 60300, ISIOLO
Email:isiolowater@yahoo.com

Date ---------- 12/6/24 ----------

Consultant

Date 12/6/2024

IWASCO
Isiolo Water & Sewerage Company

ATTENDACNE LIST FOR BARAZA FOR CLSG II PROJECT ESIA HELD AT CDF OFFICE HALL ON 12TH JUNE 2024

NO	NAME	VILLAGE/ORGANIZATION	CONTACT	SGINATURE
1	Bakaso Dabaso	Checheles/E.V.C	0713182951	
2	Waryo Hirahim	Checheles/Ramadha	0797986668	
3	Waro Hi Diba	Checheles/EVC	0701078065	
4	Hassan Abdulkh	T/Roba	0790264461	
5	Suleiman Bida	T/Roba	0721-317188	
6	Levina Mwimmu	Waso	0729740375	
7	Vincent Kini	Mwangaza	0707701324	
8	Meikam Mengesha	Kulamawe/Waso	0191803197	
9	DANSOYE ABKUL	T/ROBA	0700160592	
10	Hario Dida	Ramadan	0714422081	
11	TARI TADICHA	Ramadan	0701962852	
12	ABDULLATH ABDIBA	SHOWGROUND	0768769771	
13	Hawai Mohamud	ShowGround	0724399037	
14	Fatuma Bike	Show Ground	0715407677	
15	Amina Golicha	Checheles	0729615124	
16	ABDUL DIMA	Mwangaza	0701463805	
17	Nancy Mugambi	Mwangaza	0725876138	

18	Abdia Diba	TULLU ROBA	0720413368	
19	HAWO HASS JIRMA	Chelchele s/	0701005438	
20	JIRMA-ABDUBA	RAMADH	0713116309	
21	Suleiman Jaljila	Mater Care	0792611667	
22	FRIDAH NTARA	WASO	0723597609	
23	IBRAHIM HUSSEIN	MATER	0788877817	
24	Margaret Kagiri	Mater Care	0726951516	
25	SARAH KANANU	WASO	0728131666	
26	SARAH OGETO	WASO	0729381342	
27	JOHN ESEL.	OOP / Interior	0740171451	
28	Rebecca Karanja	water sector consultant	0722601849	
29	Cathrine Mwendwa	IWASCO Cathrine Mwendwa	0710180172	
30	LIBAN GURACHA	IWASCO	0720114662	
31	Nuno Hassan	Tulu Roba	0707087230	
32	Salad Jalla	CITEITES	0713119805	
33	EUNICE NDUARI	Social consultant Water sector fund	0725894389	
34	FLORENCE NJERI	Bio diversity expert Water sector	0700406016	

Youth only FGD

IWASCO
Isiolo Water & Sewerage Company

ATTENDACNE LIST FOR BARAZA FOR CLSG II PROJECT ESIA HELD AT CDF OFFICE HALL ON 12TH JUNE 2024

NO	NAME	VILLAGE/ORGANIZATION	CONTACT	SGINATURE
1	SARAH OGETO	WASO	0729381342	
2	ABDULLAHI ARBUBA	Shauri Ranch	0768769771	
3	Melkam Mengesha	Waso	0797803197	
4.	WAQO G. DIBA	Checheles/EUC	0701028065	
5.	ABDUB DIMA	Mwangaza	0701663805	
6.	KIARI VINCENT	Mwangaza	0707703324	
7.	IBRAHIM HUSSEIN	Matlab	0783877817	
8.	Suleiman JOLJOLA	Mater	0792611667	
9	JIRMA - ABDUBA	Ramahi	0731163C9	
10	TARI TADICHA	Ramadan	0701962852	
11	Mario Dida	Ramadan	0714422081	
12	EUNICE NYARIA	Water sector	FACILITATOR	

MINUTES OF A COMMUNTY MEETING ON ENVIROMENTAL AND SOCIAL IMPACT ASSESSMENT FOR THE PROPOSED SOLARIZATION OF RAMADHAN BOREHOLE ON 27/8/2024 AT RAMADHAN BOREHOLE SITE

PRESENT

ATTENDANCE (ATTACHED SIGN LIST)

Total Members =18

Men =6

Women =12

AGENDA

1. **Introduction**
2. **Brief of the proposed project from Isiolo Water & Sanitation Company**
3. **Project Concerns & Recommendations by the beneficiaries and host community**
4. **A.O.B**

MIN 1: PRELIMINARIES

The meeting started at 12.15pm with a word of prayer from Imam Abdinasir. The IWASCO team leader invited the consultant and community members for introduction.

MIN 2: BRIEF OF THE PROPOSED PROJECT FROM IWASCO

The IWASCO team leader gave a brief of the project. He noted that though there is an existing borehole, water pumping is normally done for few hours due to the cost of electricity. This causes water scarcity and intermittencies especially during the dry season. The solarization will allow for pumping of water for extended hours.

MIN 2: BRIEF FROM THE CONSULTANT

The Consultant gave a brief of this assignment. She noted that public participation is increasingly important for purposes of project ownership. The community members

were invited to indicate whether they knew about the project and were supportive of it. Further they were called on to raise comments and concerns regarding the proposed project.

MIN 3: PROJECT CONCERNS & RECOMMENDATIONS BY THE BENEFICIARIES AND HOST COMMUNITY

The Consultant invited the community give their comments, concerns regarding the project. The following issues were raised:

a) **The water committee leader noted that the community should be informed of the project benefits**
b) **The solarization will be helpful in multiple ways including increasing water supply in the area**
c) **Residents will be able to get water—those who have not been served before will have the benefit of access. The solarization will help in water scheduling night and day**
d) **Security guards who will be deployed should be from within this community**
e) **IWASCO should put measures to guard against vandalism of the equipment including the new solar system**
f) **IWASCO should improve on service provision especially to the immediate neighbours of the project**
g) **The project is welcome and there is need to speed up the planning activities so that it can commence**

MIN 4. A.O.B

The community thanked IWASCO for conceptualizing the project. There being no other business the meeting ended at 1.20 pm with a word of prayer from Imam Abdinasir.

MINUTES SIGNED BY:

Minutes signed by:

ISIOLO WATER & SEWERAGE COMPANY LTD
P. O. Box 491 - 60300, ISIOLO
Email:isiolowater@yahoo.com

Client : ----------

Date ---------- 28/8/2024 ----------

Consultant: ----------

Date: 28/08/2024

LIST OF ATENDANCE

Asharaf Ramadhan Msque

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) FOR THE PROPOSED INTERVENTIONS FOR ISIOLO NANYUKI AND MANDERA WATER SERVICE PROVIDERS (WSP)

NAME OF THE WSP_____

Name	Designation	Tel/ID Number	Signature
Abdinasir	Imam	0729334382	
AHMED	ALDA	0722448615	
Muhamed Shirif	elder	0722879644	
Yussuf Abdow	Alid	0708188704	
Anzaley Dahir		0713713066	
HABIBA KOLE	village manager	0723494342	
Zeituna Ali		0703779159	
Bordigo Guyo		0792833579	B.G
Daheso Yussuf		0729326098	
Kobale Jarso		0110498257	

WaterFund
Financing the Water Sector
WATER SECTOR TRUST FUND

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) FOR THE PROPOSED INTERVENTIONS FOR ISIOLO NANYUKI AND MANDERA WATER SERVICE PROVIDERS (WSP)

NAME OF THE WSP_____

Name	Designation	Tel/ID Number	Signature
Halima Mohamed		0715721112	
Issa Yussuf		0716634848	
HALKANO KHALF	Youth.	0757771586	
NURIA ADO		0702532250	
Halima Mohif		0723462954	
ZEINAB HUKA		0725587520	
LIBAN GUYACHA	IWASCO	0720114662	
Purity Muthoni	Consultant	0725896349	
Dr Rebecca Karanja	WSTF Consultant	0722648449	

APPENDIX C: BILL OF QUANTITIES

Ramadhan TREATMENT PLANT SOLARISATION

YIELD 40M3/HR

MOTOR 11KW

PUMP TYPE GRUNDFOS

No.	Description		Unit	Quantity	Unit Cost	Total Cost
	Installation of Solar			No.	KSh	KSh
	Description					
	1	6mm2 4core UG cable	Mtrs	50	350.00	17,500.00
	2	Londex duo core signal cable	Mtrs	50	524.20	26,210.00
	3	1.5mm2 2core UG cable	Mtrs	100	170.00	17,000.00
	5	Sunverter SV3/11T 11kw controller	No	1	200,000.00	200,000.00
	6	440W Dayliff solar modules 66	No	42	48,000.00	2,016,000.00

	7	PV Disconnect Switch 1000V/40A	No	2	15,900.00	31,800.00
	8	10mm² twin solar cable (DC)	Mtrs	60	910.00	54,600.00
	9	MS ground mount 6m Support Structure /watt	No	1	340,000.00	340,000.00
	10	Lightning arrestor c/w 5m copper tape	No	1	11,700.00	11,700.00
	11	Installtion sundries	No	1	50,000.00	50,000.00
	12	14 Earth rod c/w clamp & Earth cable	No	1	1,500.00	1,500.00
	13	Branding	L/S	1	50,000.00	50,000.00
	14	Labour	No	1	100,000.00	100,000.00
					Sub-total:	2,916,310.00
		Add 16% VAT				466,609.60
B5						

Sub-total:	466,609.60
TOTAL	3,382,919.60