SFG3071

REPUBLIC OF KENYA

MINISTRY OF WATER & IRRIGATION

COAST WATER SERVICES BOARD (CWSB)

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT PROJECT REPORT FOR IMPROVING THE EXISTING STORM WATER OUTLETS, OUTFALL AND COMBINED SEWER OVERFLOWS IN MOMBASA ISLAND

Works carried out under

Contract No.: CWSB/WaSSIP-AF/C/37/2016

Report Prepared by:

Zamconsult Consulting Engineers

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ESIA EXECUTIVE SUMMARY

Background

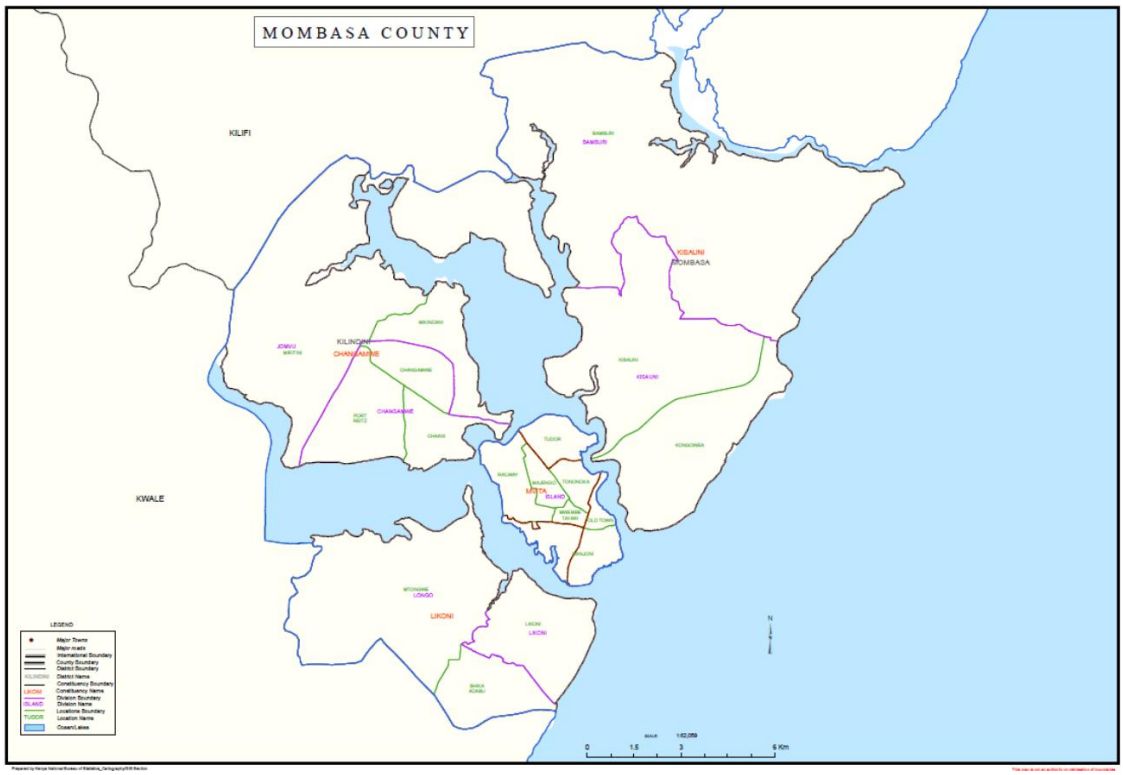
The Coast Water Services Board (CWSB) is a Parastatal (Government Owned and Autonomous) created under Water Act, 2002 and established through a Gazette Notice No. 1328 of 27 February 2004.

CWSB (or the Board) is the agency charged with the responsibility for the effective and efficient provision of water and sanitation services within the Coast Province. The Board undertakes this by contracting Water Service Providers.

As part of its mandate, CWSB intends to reduce the pollution of the Indian Ocean, by the removal of floatables and grit from seven storm water outlets, one outfall at Kizingo Waste Water Treatment Plant and four Combined Sewer Overflows (CSOs) in Mombasa Island under the Kenya Water and Sanitation Development Project. These twelve sites have been selected for improvement. The improvements will involve the construction of grit removal chambers and coarse and fine screens to reduce the amount of floatables and grits making its way to the Indian Ocean. The sites selected for improvement are:

1. Makupa
2. Mbaraki
3. Nyali
4. Railways
5. Tudor Minor
6. Buxton
7. Coast General
8. Kizingo
9. Pump Stations CSOs (4)

The project area is shown in the map below:



These improvements are part of a series of events to improve the sanitation within Mombasa Island, and will go a long way in the improvement of the aesthetic environment within Mombasa Island and the Indian Ocean, which will in effect have a positive benefit on the general marine ecosystem in the area,

Zamconsult Consulting Engineers has been contracted to undertake the ESIA and RAP for the proposed improvements works as part of the KWSDP projects with funding from the World Bank.

Study Methods

The study approach and methodology adopted included screening to determine the extent of the project and desktop data search and analysis for the baseline bio-physical and social environmental parameters of the project area. In addition, the consultant worked with the project design group and was briefed and obtained design approaches to be used which informed the requirements of the environmental reporting process and for which excerpts have been obtained on salient design information. The Consultant engaged on multi-faceted public consultation process which included ad hoc roadside interviews, household social and environmental surveys using structured questionnaires duly analysed and key informant interviews to institutions and lead agencies and public consultation meetings. Based on these findings and expert judgement, the consultant has compiled the projected social and environmental impacts (positive and negative) likely to emanate from proposed project activities and the Environmental and Social Monitoring and Management Plan (ESMMP) which details how adverse impacts will be reduced or eliminated and by whom.

Legislative Framework for this Study

The principal National legislation governing issues of environmental concern in Kenya is the Environmental Management & Coordination (Amended) Act of 2015 typically referred to as EMCA. EMCA calls for Environmental Impact assessment (EIA) (under Section 58) to guide the implementation of environmentally sound decisions and empowers stakeholders to

participate in sustainable management of the natural resources. Projects likely to cause environmental impacts require that an environmental impact assessment study to be carried out. It is under this provision that the current study has been undertaken.

Other legislation adhered to during this study are the regulations borne of EMCA Cap 387 namely the Environmental Impact Assessment and Audit Regulations 2003; The Environmental Management Coordination Act (Waste Management) Regulations 2006; the Environmental Management Coordination (Water Quality) Regulations 2006; and the Environmental Management and Coordination (Noise and Excessive vibration pollution Control) Regulations2009 (Legal Notice 61), Air quality Regulations 2009 among others.

Sectoral legislation applicable to this Project include The Lands Act (2012), the National Land Commission (2012), the Constitution, The Public Health Act (CAP. 242), among others.

In addition to the local legislation, the Consultant identified the various World Bank operational policies relevant to the project. Some of these policies include Operational Policy (OP) 4.01, OP 4.04, OP 4.12, as well as the World Bank Policy on Access to Information, 2010.

Expected impacts

The expected impacts emanate from the Planning phase, the Construction Phase, the Operation phase and the De-commissioning Phase of the project.

In general, successful implementation of the project will have high environmental and socioeconomic benefits to the people and will contribute to their health and well-being. Overall, negative expected impacts are related to the construction activities and operation of the projects. These impacts are localized and not considered significant and long-lasting and can be mitigated through appropriate mitigation measures. The severity and duration of these impacts can be minimized by ensuring that the construction and operation activities adhere to the proper construction and operation standards specified by the design and supervision engineers.

A significant Planning Phase impact will the displacement of people particularly in the Tudor and Makupa sites where there are informal settlements. Several tenants will lose their domiciles and land lords will lose their sources of income. A Resettlement Action Plan has been prepared to mitigate these impacts.

Construction Phase impacts are generally significant in magnitude and socially and environmentally adverse but are also reversible, short-term and largely manageable. The Construction phase activities will include trenching, concrete works and laying of pipelines, during the installation of the inlet works, coarse and fine screens and the grit removal chambers. Construction camp impacts include generation and inappropriate disposal of solid and liquid wastes, increased spread of Sexually Transmitted Diseases (STD) and HIV/AIDs and change of cultural norms from migrant workers. Construction work impacts include noise, dust, water pollution, loss of flora and fauna among others. Positive construction phase impacts include economic boost from injected construction money which is spent in the local environment for purchasing food and other supplies, rental accommodation and local travel. Also, there will be opportunity for skills transfer and skills acquisition.

Operation phase impacts will largely be positive benefits accruing from the removal of floatables and grit from the Indian Ocean. These include improved aesthetics of the Ocean and Beach front, improvement of fishing activities due to the reduced choking of the marine system by plastics. However, significant adverse impacts from operations include solid waste and air pollution if the works are not continuously maintained.

De-commissioning of the Project is not envisaged. Project components however will be rehabilitated over time having served their useful life. If during the de-commissioning, the facilities are inadequate, the facility can be expanded to fit the growing population.

Environmental & Social Mitigation and management Plan (ESMMP)

This was prepared to reduce, minimize or altogether eliminate the adverse impacts. Positive impacts are project enhancements and do not require mitigation.

The ESMMP is fully described in chapter 9 of this report, however the table below presents the identified environmental and social impacts, their mitigation measures and the party responsible for carrying out the mitigation measures, in summary.

Project Phase	**Environmental / Social Impact**	**Mitigation Measure**	**Responsibility**
Pre-construction	Loss of structures	Compensation in accordance to RAP	CWSB/MOWASCO/ County government/National Land Commission
	Loss of livelihoods	Compensation in accordance to RAP	
	Loss of housing	Facilitation to move in accordance to RAP	
Construction	Loss of flora and fauna	Re-plant the indigenous vegetation. Minimise the interference with flora and fauna through proper construction methods.	Contractor Supervising Engineer County Officer- Water Energy and Natural Resources CWSB Community Leaders Contractor and Local Administration Contractor
	Air quality	Use protective clothing on construction crew. Water spraying of construction routes. Proper maintenance of construction plant.	
	Noise pollution	Avoid night time construction with noisy machinery. Avoid noisy machinery near sensitive areas. Proper maintenance of construction plant. Where possible, ensure non mechanized construction.	
	Site Related Oil Spills	Proper procedures for dealing with oil spills. Proper maintenance of construction plant to prevent oil spills.	

Project Phase	**Environmental / Social Impact**	**Mitigation Measure**	**Responsibility**
	Soil Related Impacts	Temporary drainage channels, holding ponds or retaining walls employed in areas susceptible to erosion. Restoration of ground vegetation after construction. Proper procedures for dealing with oil spills.	
	Impacts on Water resources	Proper solid and liquid wastes disposal.	
	Public Health & Safety	Sensitize workers and the surrounding communities on awareness, prevention and management of HIV/AIDS through staff training and safe uses of drinking water.	
	HIV & AIDS Impacts	Sensitize workers and the surrounding communities on HIV/AIDS. Use of existing clinics to provide VCT services and ARVs.	
	Socio-economic impacts	Job opportunities for locals. Use of manual labour where possible. Ensure effective and matching contractual provisions for contractor to manage labour influx Sensitize workers and the surrounding communities on HIV/AIDS. Use of existing clinics to provide VCT services and ARVs. A code of conduct for construction employees	
	Traffic Congestion	Provision of Signage and traffic controls. Provide a traffic management plan.	

Project Phase	**Environmental / Social Impact**	**Mitigation Measure**	**Responsibility**
		Designates loading/unloading areas.	
	Gender empowerment	Ensure equitable distribution of employment opportunities between men and women	
	Impacts on Cultural Heritage	Use of "chance find" procedures provided in the appendices	
	Crime Management	Fencing around project area. Working with local committees (e.g. "nyumba kumi) to provide security within the site in addition to the Contractor's own security. Ensure all project employees follow a code of conduct and any misconduct be reported to authorities.	
	Impacts on Cultural Heritage	Follow Chance find procedures provided in the appendices.	
	Child Labour and Protection	Children protection against exploitation	
	Gender Equity, Sexual Harassment	No Sexual Harassment and Non-Discrimination Policy, in accordance with to protect women The contractor should prepare and implement a gender action plan	
	Liability for loss of life, injury or damage to private property	Provision of PPE. Contractor to have and enforce a code of conduct for employees. Follow prepared Health and Safety Plan. Provide a safe working environment, with first aid facilities	

Project Phase	Environmental / Social Impact	Mitigation Measure	Responsibility
		The Contractor to repair any damage done to private property.	
Operation	Generation of solid waste	Continuous maintenance of the facility to ensure efficiency.	MOWASCO
	Noise Pollution	Proper maintenance of transportation vehicles All transportation vehicles should be licensed by NEMA	
	Air Quality	Continuous removal of debris from the screens reducing foul odours.	
	Increased Tariffs	MOWASCO incorporates the "pro-poor" policy in its billing.	MOWASCO

Decommissioning on the plants is not foreseen however improvements and expansion can be done after the project has reached its design year.

Conclusion

As has been alluded in this report, the following can be said in summary.

The implementation of the proposed improvements to the storm water outlets will have the following benefits:

i) Reduced Pollution of the Indian Ocean in the short term and long term.
ii) Improved socio-economic benefits via improved tourism opportunities and fishing grounds

The recommendations of the public consultation and participation was incorporated into the findings of this report.

The ESIA concludes that although the full positive environmental benefits will not be felt until the long term projects under the waste water master plan are implemented, however the short term benefits will also be beneficial in the removal of solid wastes from the storm water making its way into the Indian Ocean, which will have benefits on the flora and fauna of the ocean ecosystem.

MOWASCO will be in charge of the day to day running of the improved works and in meeting the goals of the short term measures, there will be no need for a change in the institutional framework to meet the need.

The adverse impacts on the physical and natural environment will be "in sum total," not significant, and can be handled through the recommended mitigation measures at a cost of K.Shs. 17,167,200.00 for all twelve sites. Compensation for demolition of structures and livelihood will be done through a detailed Resettlement Action Plan which is provided under a separate report, which identified 47 households that will be displaced by the proposed projects.

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ACRONYMS AND ABBREVIATIONS

AIDS	Acquired Immunodeficiency Syndrome
BOD	Biological Oxygen Demand
CBO	Community Based Organization
COD	Chemical Oxygen Demand
CSO	Combine Sewer Overflow
EMCA	Environment Management Coordination ACT
ESMMP	Environmental and Social Mitigation and Management Plan
ESMP	Environmental and Social Monitoring Plan
EIA	Environmental Impact Assessment
ESIA	Environmental and Social Impact Assessment
GoK	Government of Kenya
GHG	Greenhouse Gases
HIV	Human Immunodeficiency Virus
ID No.	Identity Card Number
KAPP	Kenya Agricultural Productivity
K.Shs.	Kenya Shillings
KFS	Kenya Forestry Service
KWS	Kenya Wildlife Service
MDG	Millennium Development Goals
CWSB	Coast Water Services Board
MOWASCO	Mombasa Water and Sewerage Company
Mg/l	Milligrams per Litre
MWI	Ministry of Environment Water and Irrigation
NEMA	National Environment Management Authority
NGO	Non-Governmental Organization
NMK	National Museums of Kenya
NPEP	National Poverty Eradication Plan
O&M	Operation and Maintenance
PAP	Project Affected Person
PEC	Poverty Eradication Commission
PPE	Personal Protective Equipment
STD	Sexually Transmitted Diseases
WASREB	Water Services Regulatory Board

WHO	World Health Organisation
WRMA	Water Resources Management Authority
WSB	Water Services Board
WSP	Water Services Provider
WSS	Water Supply and Sanitation Services
WSSD	World Summit for the Social Development
m^3	cubic metres
VOCs	Volatile Organic Compounds
CH_4	Methane
CO_2	Carbon Dioxide
IC	Individual Service Connection
NC	Communal Service Connection
WTP	Water Treatment Plant
Mbgl	metres below ground level

1 INTRODUCTION

1.1 COAST WATER SERVICES BOARD

Coast Water Services Board (CWSB) is and independent parastatal (Government Owned and Autonomous) created under the Water Act, 2002 but established through separate Gazette Notices. It operates under the Parent Ministry of Water and Irrigation and in accordance with:

i. The provisions and regulations of the Water Act, 2002;
ii. The State Corporation Act Cap 446;
iii. Other Relevant Provisions of the Laws of Kenya and
iv. Rules and Regulations given in form of circulars by the Parent Ministry and Ministry of Finance.

The CWSB area of jurisdiction covers a total of 83,040 km^2 out of which 28,450 km^2 is occupied by rivers, Sea, lakes and national parks, while the rest is used for agriculture, settlement and other human activities. CWSB's jurisdiction covers the counties of Mombasa, Kwale, Kilifi, Taita-Taveta, Lamu and Tana River. Within the six counties, CWSB has contracted seven (7) Water Services Providers (WSPs) as listed in Table below:

Figure 1-1: List of WSPs under Coast Water Services Board and their Jurisdiction

S/No	County	Main Areas Served/WSPs
1	Mombasa County	Mombasa (Island, West Mainland, South Mainland, North Mainland) served by Mombasa Water & Sewerage Co.
2	Kilifi County	Malindi Town, Watamu and environs served by Malindi Water & Sewerage Co Kilifi, Mariakani, Mtwapa and environs served by Kilifi-Mariakani Water & Sewerage
3	Kwale County	Kwale, Ukunda, Diani, Kinango and environs served by Kwale Water and Sewerage Company
4	Taita Taveta County	Voi, Taveta, Wundanyi and environs served by TAVEVO Water and Sewerage Company
5	Lamu County	Lamu Island, mainland and environs served by Lamu Water and Sewerage Company
6	Tana River County	Hola, Bura, Garsen and environs served by tana River Water and Sewerage Company

In addition, there is the Coast Bulk Water Supply Unit (CBWSU) which supplies water in bulk to Mombasa, Malindi, Kilifi/Mariakani, Kwale and TAVEVO WSPs. CBWSU is still not legally operational but it is operating under CWSB on an interim basis.

Within the Coast region, the Coast Water Services Board (CWSB) is mandated with the responsibility of ensuring efficient and economical provision of water and sanitation services.

1.2 KENYA WATER AND SANITATION DEVELOPMENT PROJECT (KWSDP)

Based on the good implementation progress of WaSSIP 1 and the need for additional investments the Government has requested the World Bank for additional financing for KWSDP. The KWSDP project is targeted at investments on rehabilitation and expansion of existing water supply schemes, design and development of bulk water supply systems, drought mitigation measures, planning and development of sanitation infrastructure and institutional strengthening.

Further support would consolidate the gains in sector institutional arrangements and help these institutions to improve and expand actual WSS delivery to Kenyans through sustainable infrastructure investments.

The proposed KWSDP will complement and build on the gains and achievements already made through the implementation of WaSSIP 1. The development objectives of the project are therefore to:

i. Increase access to reliable, affordable and sustainable water supply and sanitation services; and
ii. To improve the water and wastewater services in the areas served by NWSB and CWSB.
iii. Mitigate the effects of drought through response measures

This will be achieved by:

- Rehabilitating selected existing water production, transmission, storage and distribution facilities and wastewater collection, treatment and disposal facilities,
- expanding piped water supply services to under-served areas through a balanced program including the involvement of communities in decision making and extension of primary and secondary distribution pipes where required, and
- Refining and strengthening the institutional structure, emphasizing on increasing accountability and transparency of the institutional and governance and management framework for CWSB, NWSB.

1.2.1 The Improving of Existing Storm Water Outlets,Combined Sewer Overflows and outfall in Mombasa Island under KWSDP

One of the projects under KWSDP will be the improvement of the seven (7) existing storm water outlets, one existing outlet at the Kizingo Waste Water Treatment Plant and four combined sewer overflows within Mombasa Island. This project's main aim is to reduce the discharge of floatables made up of plastics and twigs, and gritinto the Indian Ocean via the existing storm water outlets located at several locations within the island. The project is further described in chapter 2 of this report.

1.3 METHODOLOGY OF WORK

The ESIA was undertaken at a level that was considered to be commensurate with the scale, complexity and sensitivity of the project. The key stages in the process included proposal definition, screening which included key informant & household consultations, impact assessment, mitigation, review, decision-making and monitoring, as part of the preparation of this project report. For this ESIA to be good, recommendations have been integrated into the project development process. This should not be seen as a barrier to development or as an unnecessary cost. As well as being a stepping-stone to consent from environmental regulators

and financial backers, it is a management tool for use during project planning and execution and will help avoid unnecessary impacts, delays and unexpected costs.

The consultant used a holistic approach to obtain the necessary baseline data and information on the below-listed aspects of the ESIA. An in-depth desk study, field observation, and wide consultation with stakeholders, key informant interviews and structured socio-economic interviews were carried out so as to obtain the requisite data and information on the following themes:

- Human Environment including; Socio-economic, Socio-cultural and Socio-legal
- Natural Environment including; Flora, Fauna, Soil, Water, Air, Climate and Landscape
- Built environment including; Material Assets, Historical /Archaeological Sites and Monuments and
- Aesthetic Environment

The consultant used the available information to derive or predict or assess impacts and classify them under human, natural and built environment at pre-construction stage, Construction Stage and Operation stage of each project sub-component.

Any negative impact was widely assessed and the most suitable mitigation measure apportioned as a solution to the problem. Positive impacts were noted as such and further reinforced by statements of actions that enhance their productivity and sustainability in the development process during and after the implementation of the project.

ESIA was done for all the stages of the project including planning, construction, operation and decommissioning.

2 PROPOSED PROJECT DESCRIPTION AND ALTERNATIVES

2.1 LOCATION

The project is located within Mombasa Island of Mombasa County, as shown in the map below:

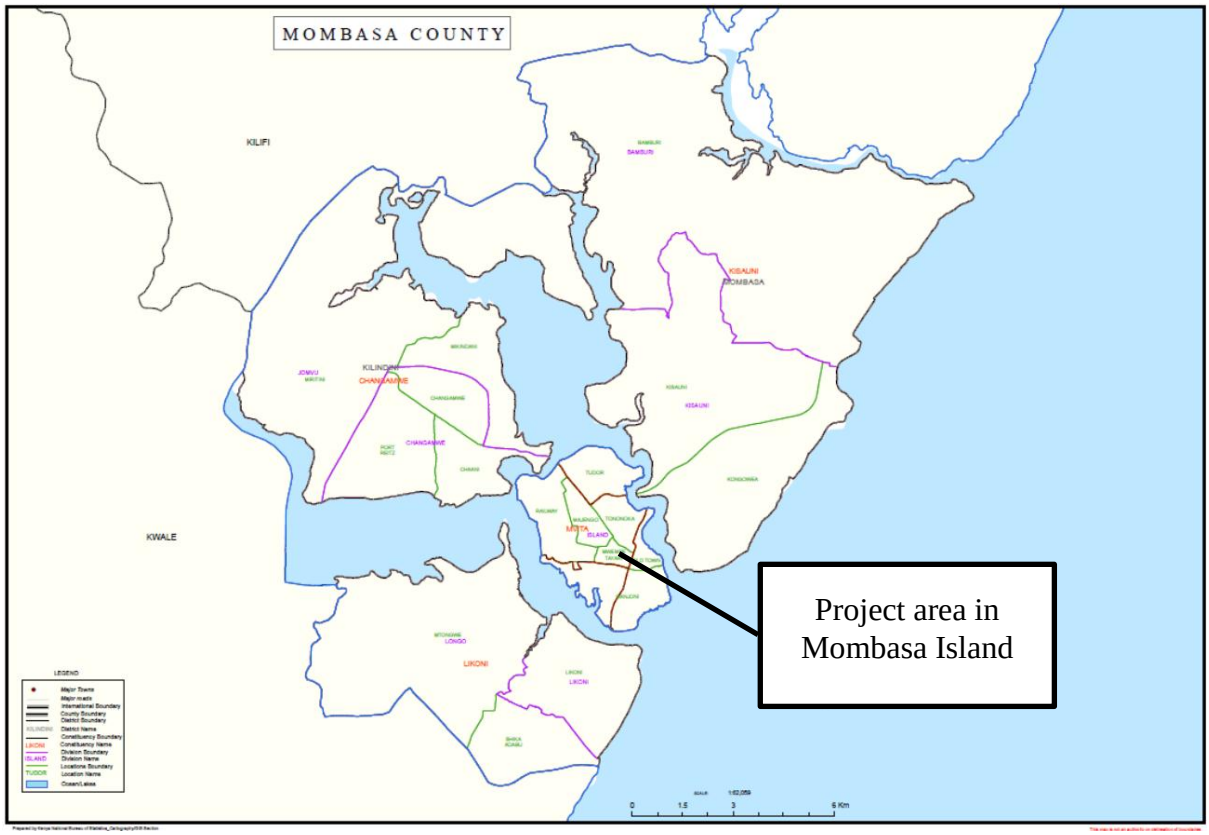

Figure 2-1: Map Showing the Location of the Project Area

The project intends to improve the following seven existing stormwater outlets, one outfall at Kizingo and four combined sewer overflows. These are listed below:

1. Makupa
2. Mbaraki
3. Nyali
4. Railways
5. Tudor Minor
6. Buxton
7. Coast General
8. Kizingo Waste Water Treatment Outfall
9. Combined sewer overflows at the existing pump stations (4)

All the sites will be located within Mombasa Island, with the table below showing the co-ordinates of each of the sites

Table 2-1: Table showing GPS Co-ordinates for each of the outfalls

No.	Outfall Name	Easting	Northing
1	Makupa	575427.96	9550131.58

No.	Outfall Name	Easting	Northing
2	Mbaraki	572206.75	9551314.49
3	Nyali	574334.32	9553596.40
4	Railways	572339.19	9554114.70
5	Tudor Minor	573058.24	9554700.59
6	Buxton	574671.61	9552941.82
7	Coast General	574518.25	9553121.17
8	Kizingo	575427.96	9550131.58
9	CSO Pump Station 1	575197.76	9551720.70
10	CSO Pump Station 2		
11	CSO Pump Station 3		
12	CSO Pump Station 4		

2.2 THE BACKGROUND OF PROPOSED PROJECT

Mombasa Island and is currently served by a storm water network that takes advantage of the natural topography that discharges storm water into the Indian Ocean by storm water outlets located at low lying areas. The existing storm water facilities are made up of precast concrete culverts, and concrete lined drains located all throughout Mombasa Island particularly along the road network. These drains from the drainage zones highlighted above and enter the Indian Ocean via the outlets as shown in the same figure. The existing outlets are located along the Indian Ocean within Mombasa Island. These outlets are made up of a covered drainage trench in some cases, a pipe (200-450mm dia) that leads into the Indian Ocean low water mark as shown in the figure below:

Figure : Existing Storm Water Outlet

In addition to the storm water network some areas within Mombasa Island are served by a sewer network that was constructed in 1962 to serve the Mombasa Old town and parts of the Central Business District with four pump stations located in Mombasa old town to convey waste water to a waste water treatment plant at Kizingo located at Ras Sereni within Mombasa island since then there has been minimal expansion in the system. A few housing estates including; Tudor Estate, Buxton Estate, and Makande Estates that are served by on-site treatment made up of septic tanks and soak pits. In addition new developments have on site treatment in form of septic tanks and soak pits. Currently the treatment plant and the pumping stations are not working, as such the wastewater is discharged into the Indian Ocean through the CSOs at the pumping stations and the Outfall at Kizingo. In addition all the debris made up of floatables and grit is making its way into the Indian Ocean via the storm water outlets located within the Island. The figure below shows the location of the existing outlets, outfall and CSOs and the areas they serve

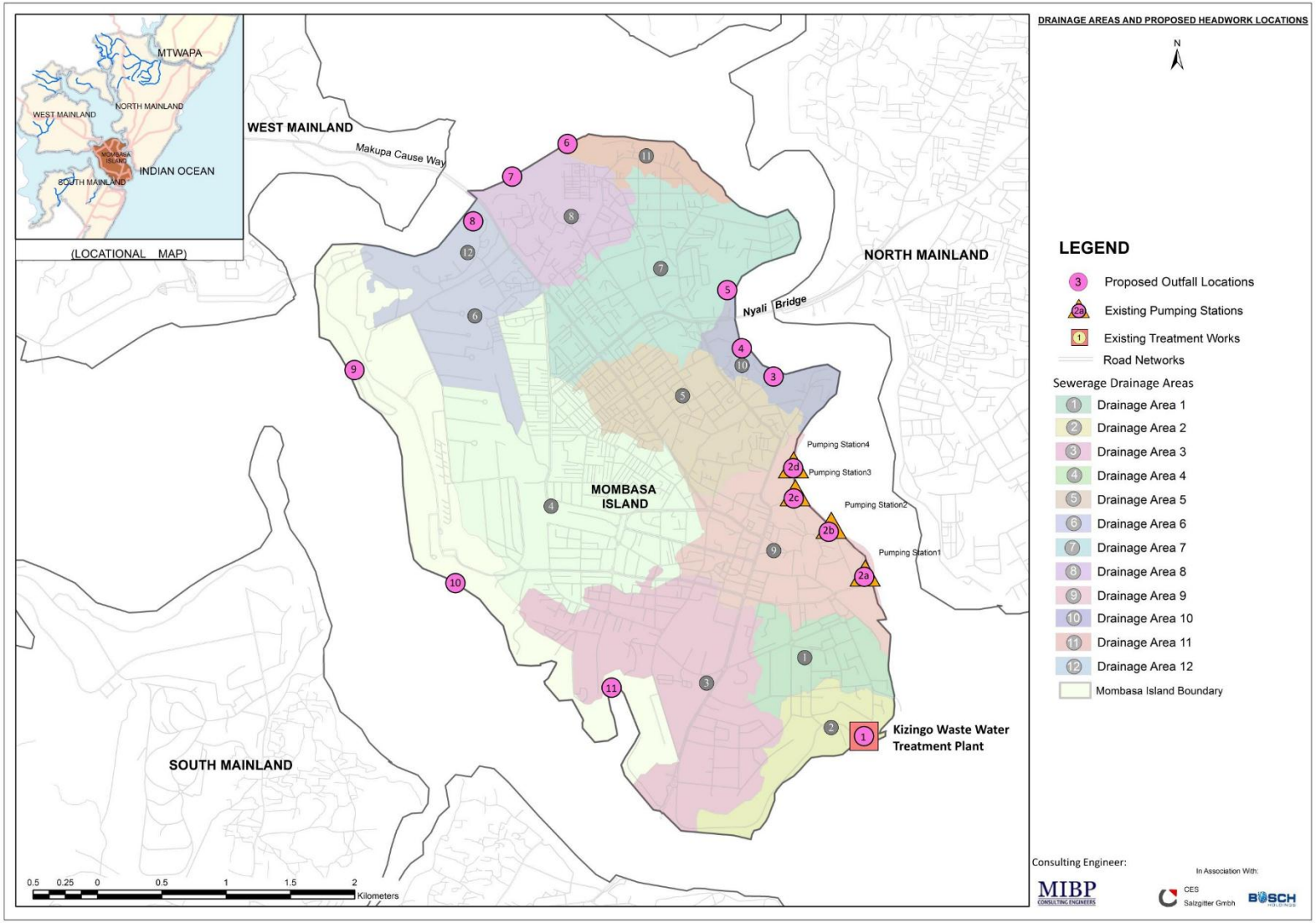

Figure : Existing Storm Water Outlets and the areas they serve

One of KWSDP's goals intends to plan and develop sanitation infrastructure in Mombasa including Mombasa island. In order to meet this goal, Mangat I.B. Patel a consulting firm based in Kenya was contracted by Coast Water Services Board to prepare a Waste Water Masterplan for Mombasa and several Other Towns. The section below highlights the objectives of the Waste Water Masterplan as well as the recommendations that will be implemented.

2.2.1 Proposed Plans for Mombasa Island with Regards to Sanitation in Accordance to the Waste Water Masterplan

Mangat I. B. Patel, an engineering consulting firm, was contracted by CWSB to carry out a waste water master plan for Mombasa County. The Waste Water Masterplan is aimed at preparing a sustainable waste water management system as well as propose an institutional framework for managing the proposals.

A condition survey of the area had the following results:

i. The Kizingo Wastewater Treatment Plant (WWTP), capacity 3,400m^3/day and pumping infrastructure conveying sewage flows from the old Town on Mombasa Island are inoperable and have been in this condition for over 10 years. In addition the design for the treatment plant is outdated and cannot be considered for rehabilitation due to the need for a larger amount of land to achieve the design standards.
ii. The storm water infrastructure serving Mombasa Island are being used to collect waste water and these flows discharge directly to the littoral zone surrounding the Island without any treatment.

Based on this the Consultant proposed long term measures for sanitation which will require significant time to be realized. It is therefore prudent to undertake immediate short-term measures aimed at improving sanitation standards within the island while awaiting the implementation of the Master Plan recommendations. The short term measures will have the highest impact within the least time, in preparation for the long term measures, without requiring a change in the institutional framework within the area.

1) Proposed Short Term Measures

The design consultant has prepared the following immediate measures to be undertaken to improve the sanitation within Mombasa Island, these will be achieved in five years:

i. Improving the existing storm water outlets, the outfall at Kizingo and CSOs in Mombasa Island (for which this ESIA report is presented)
ii. Rehabilitation of the Kipevu Waste Water Treatment Plant and Immediate Works in West Mainland
iii. Construction of ablution blocks
iv. Construction of sludge management facilities

These measures will be the first step in a series of events that will meet the ultimate goal of improving the sanitation in Mombasa.

2) Proposed Long Term Measures

The main long term measures will involve the establishment of a working waste water treatment plant as well as the rehabilitation and expansion of the sewerage network for Mombasa Island. These expect to be achieved in the year 2040

This rehabilitation will ensure that there will be a separate sewerage and storm water network for transmission of waste water and storm water respectively. After the establishment, there will be an exercise to disconnect all illegal connections on the storm water network to allow for proper functioning of the storm water outlets.

The proposed future treatment plant for Mombasa Islandwill be in Nguu Tatu located within reclaimed land within Mombasa North Mainland. Waste Water will be conveyed to the treatment works via pumping stations some of which will be located at the outlet sites, Kizingo and CSOs.

The Waste Water Treatment Masterplan has also prepared an institutional framework that will be capable of handling the changes.

2.3 PROJECT COVERED BY THE ESIA

This ESIA report covers the improvements that will be made to the storm water outlets, the existing outfall and Kipevu and the existing CSOs.

2.4 OBJECTIVES OF THE PROJECT

The proposed project is the first step in a series of actions to improve the sanitation of Mombasa Island.

2.4.1 Immediate objectives of improving the Storm Water Outlets, Outfall and Combined Sewer Overflows in Mombasa Island

The improvement of the storm water outlets, outfall and the combined sewer overflows in the short term will remove floatables (made up of predominantly plastics, branches, etc.) and grit from storm water and wastewater flowing into the Indian Ocean, and discharge at the low water mark of the Indian ocean thus improving the aesthetic of the Indian Ocean as well as have a positive impact on the marine biodiversity that are getting choked by the floatables making their way into the Indian Ocean.

2.4.2 Long Term objectives of improving the Storm Water Outlets and Combined Sewer Overflows in Mombasa Island

The long term objectives will be to have a completely separate stormwater and the wastewater system and to connect the sewer system to a well-functioning wastewater treatment plant at Nguu Tatu located in the Northmainland. The proposed improvements to the stormwater outfalls will then only remove floatables and screenings during stormwater events, while the improvements on the to the CSOs and outfall will only remove screenings and grit from the diluted wastewater in the case the sewer system would overflow because of too much stormwater entering into the sewer system, during the dry weather the CSOs and outfall will pump all the waste water to the waste water treatment plant. The storm water will be discharged into the Indian Ocean via a pipe that will discharge at the low water mark of the Indian Ocean/

2.5 DESIGN COMPONENTS

This chapter describes the design criteria used to design the improvements as well as the design itself of the storm water outlets and the combined sewer overflows. The major criteria that was looked at was the flows into the Indian Ocean from each of the discharge points, with all the facilities designed to hold the capacities and remove all floatables and grit from the storm water:

2.5.1 Storm Water Outlets Design Criteria

The design of the improvements to the existing storm water outlets is based on a purely storm water network system, with the headworks designed to adequately convey and remove floatables and grit.

The storm water component of the wet weather flow for individual drainage areas identified in figure 2.2 have been determined based on the rational formulae given by the expression: -

$$Q = C\ x\ A\ x\ i\ (Rational\ Formula)$$

Where: -

Q = Storm water run-off in m^3/s

C = Run-off coefficient (Ranging from 0.70 – 0.95 for concrete pavements)

i = Rainfall intensity in mm/hr (Read from Rainfall Atlas for nearest Station)

A = Gross contributing area (Ha) i.e. area of drainage area

For economic considerations with adequate provisions for conveyance of storm water flows, a 5-year storm was adopted and values presented in the table below.

Table 2-2: Estimated Storm Water Peak Flows for the Drainage Areas

Contributing Drainage Area	**Area (Ha)**	**Storm Duration (min)**	**5 Year Design Storm Flow (m^3/day)**
1 & 2	125.5	120	7.47
9	171.87	120	8.23
10	83.07	120	3.98
5	220.04	120	10.53
7	39.79	120	1.9
11	132.25	120	6.33
8	37.37	120	1.79
12	34.7	120	1.66
6	115.21	120	5.51
4	148.6	120	7.11
3	53.07	120	2.54

1) Proposed Improvements on the storm water outlets

A standard design concept was adopted for the headworks structures at each of the storm water discharge Points. The headworks structure has been designed to provide preliminary treatment to the wastewater through screening and grit removal.

The headworks will comprise of the following units: -

1. **Inlet structure**; - for diversion of storm water flows to the ocean,
2. **Coarse and fine screens**; - for preliminary treatment of wastewater, and
3. **Grit removal chamber**; - for preliminary treatment of wastewater.

Inlet Structure

This unit comprises of an inlet channel and an overflow weir. The inlet channel has been designed to convey peak wastewater flows and approximately 10% of storm water flows into the subsequent units of the Headworks. Once the flow builds beyond the design level, the overflow weir enhances diversion of storm water into an overflow chamber to a storm water drainage system discharging at a headwall to be located at the ocean shore.

Fine and Coarse Screens

From the Inlet Structure, the wastewater will enter the screening channels fitted with coarse and fine screens for removal of floating debris and other objects. The coarse and fine screens shall be of respective standard bar sizes and placed adjacent to each other, with the fine screens downstream of the coarse screens. The screens shall be manually cleaned type to minimize electro-mechanical equipment and associated costs.

The installation of bar screens shall be carried out in such a manner that manual cleaning can be carried out with ease, with an operating platform across the channel width.

A screening tray shall be provided next to the inlet structure for holding and consolidating the debris prior to transporting to designated collection skip.

Grit Removal

Due to the widely range of the combined storm-water and wastewater flow varying flow regimes at the different headworks, two typical Headwork arrangements based on the Grit Removal techniques have been adopted: -

a) Type 'A' Headworks - Constant Flow Grit Removal Chamber

For headworks handling less than 700 m^3/day of peak design influent flow, a constant flow grit removal chambers design has been adopted.

The constant flow grit removal chamber comprises of a rectangular grit chamber designed to provide 5-minute retention time. Grit and heavy particles settle by sedimentation as the supernatant wastewater flow over the outlet wall. An opening at the bottom of the outlet wall connected to drainage pipe fitted with control valve and filled with filter media allows for cleaning of the chamber. The chamber is manually cleaned from retained grits by stopping the inflow and allowing the grit collected to dry.

2 Nr Grit Removal Chambers (Type 'A') will be provided for headworks with design flows less than 400 m^3/day. For those with design flows ranging between 400 – 700 m^3/day, a total of 3 Nr. Grit Removal Chambers (Type 'A1') will be provided. Both grit chambers are shown in the figures below:

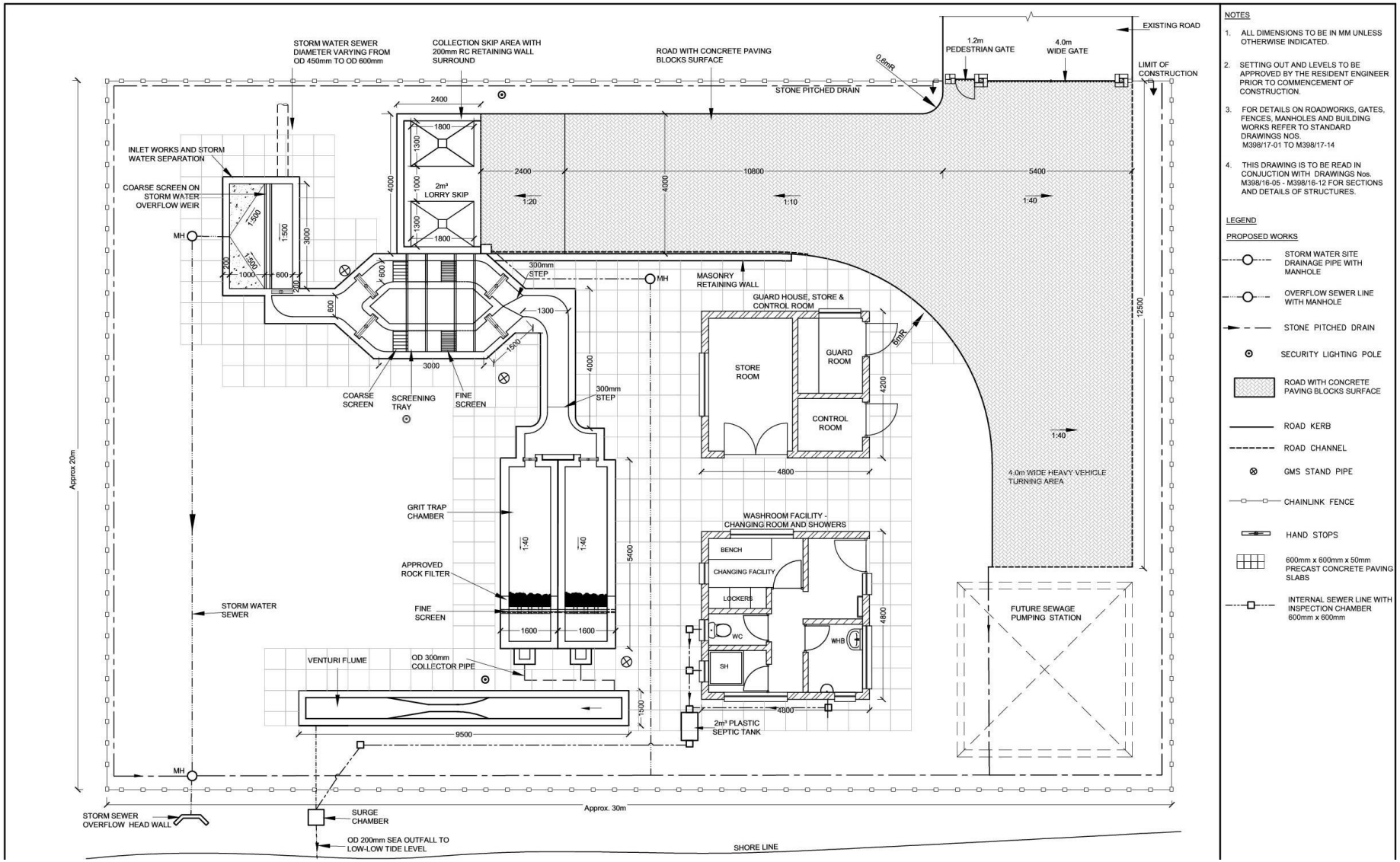

Figure 2-2: Type 'A' Grit Removal Chamber

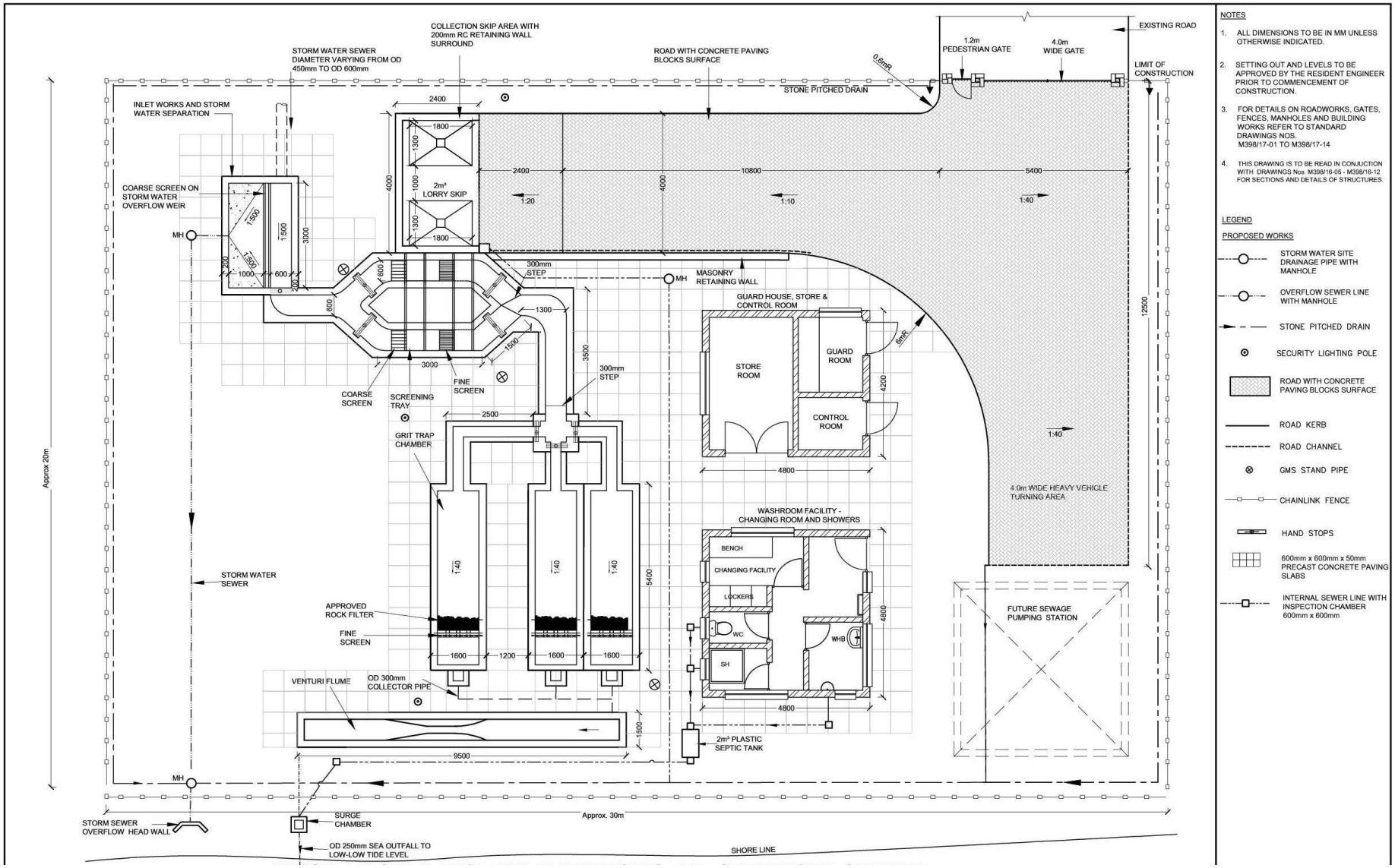

Figure 2-3: Type 'A1' Grit Removal Chamber

b) Type 'B' Headworks - Constant Velocity Grit Removal Channel

A constant velocity grit removal channel has been adopted for Headworks with peak design influent flow ranging between 700 m^3/day to 5,000 m^3/day.

The venturi flume within the channel structure controls the velocity of flow in the grit removal channel. The parabolic shape of the channel keeps the velocity constant at 0.3m/s and ensures grit settling devoid of volatile suspended solids.

The constant velocity grit removal channel is cleaned manually after closure at the channel inlet and providing adequate time for grit to dry.

A standard design has been adopted, with varying dimensions to suit two general categories of flow regimes. For discharge points with design peak flows less than 3,000m^3/day, Type 'B' Headworks Grit Removal Channel will be adopted while those with peak flows ranging from 3,000m^3/day to 5,000m^3/day will be provided with Type 'B1'Headworks. The figures below show the two grit removal chambers.

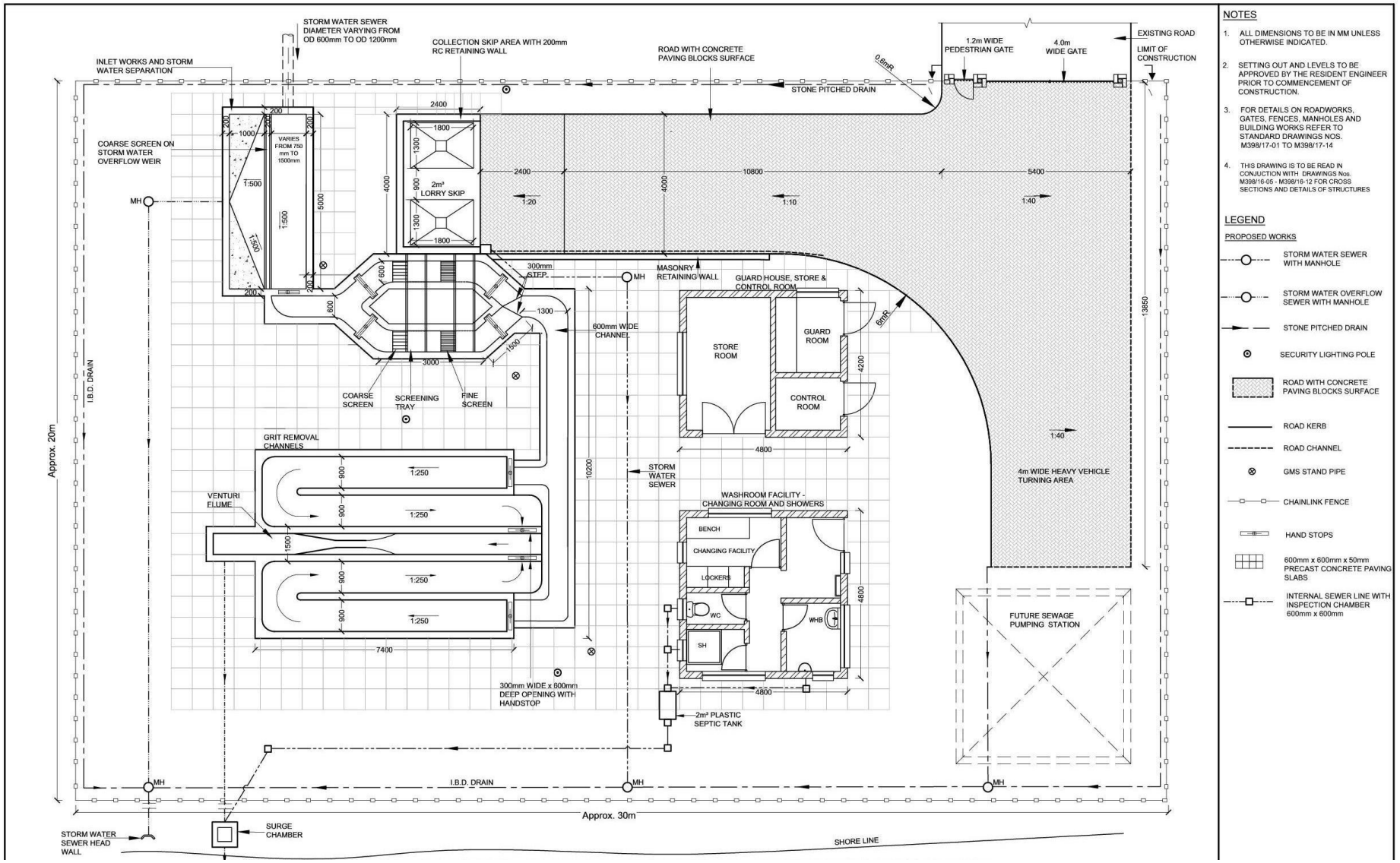

Figure 2-4: Type 'B' Grit Removal Chamber

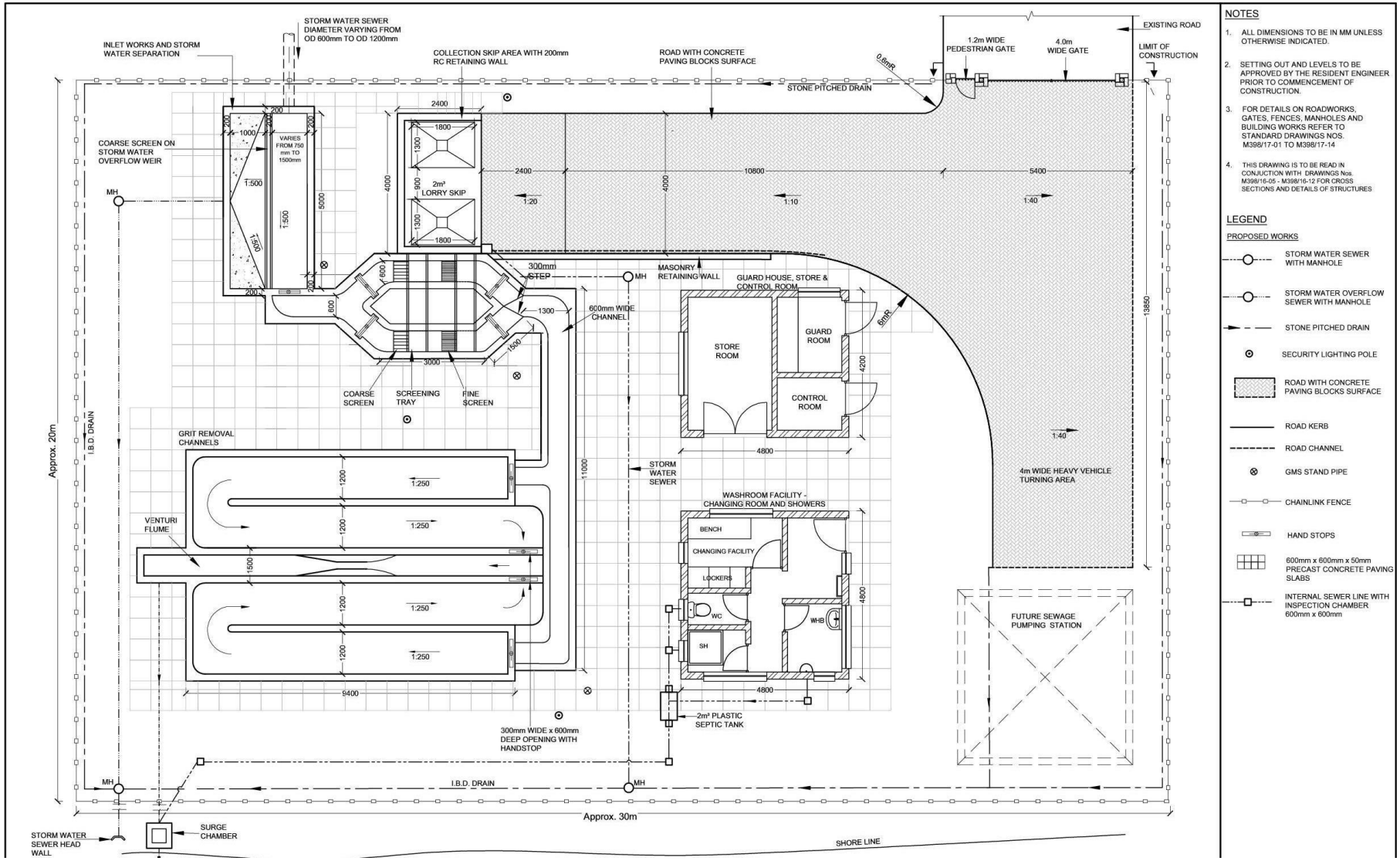

Figure 2-5: Type 'B1' Grit Removal Chamber

2.5.2 Combined Sewer Overflows and Outfall Design Criteria

The existing CSOs and the outfall at Kipevu were designed to take storm water and waste water as the most critical situation which is being experienced currently. Currently waste water is making its way into the Indian Ocean via the existing CSOs and the outfall at Kipevu, it was important to include the waste water flows taking the most critical situation which is occurring currently whereby waste water is making its way into the Indian Ocean via the CSOs and outfall at Kipevu. Again for purposes of this design with the long term measures of the improvements being made will be for a storm water situation whereby the overflows and outfalls will take the excess storm water and the dry weather flows will be conveyed to the treatment works via the pump houses.

The waste water generation was computed for the most critical situation meaning that 100% of the waste water was being discharged at the CSOs. The waste water was computed as a factor of water usage based on the population and population growth estimates. Waste water accounts for 80% of the water consumption of households. the summation of the waste water computed and the storm water for a peak 5 year period are sumarised in the table below:

Table 2-3: Combined Flows

Contributing Drainage Area	**Area (Ha)**	**Storm Duration (min)**	**5 Year Design Storm Flow (m^3/day)**
1 & 2	125.5	120	7.477
9	171.87	120	8.268
3	53.07	120	2.542

1) Design of Improvements to Existing Combined Sewer Overflows

the existing CSOs and the outfall at Kizingo are already equipped with grit chambers as such the proposed improvements will be

- Installation of coarse and fine screens,
- Modifications of the existing grit removal chamber (for ease of grit handling),
- Provision for screens removal and compaction facilities,
- Rehabilitation of existing emergency overflow, and
- Construction of surge chamber and outfall pipe

These will be known as the Type ‘C’ headworks which are shown in the figure below:

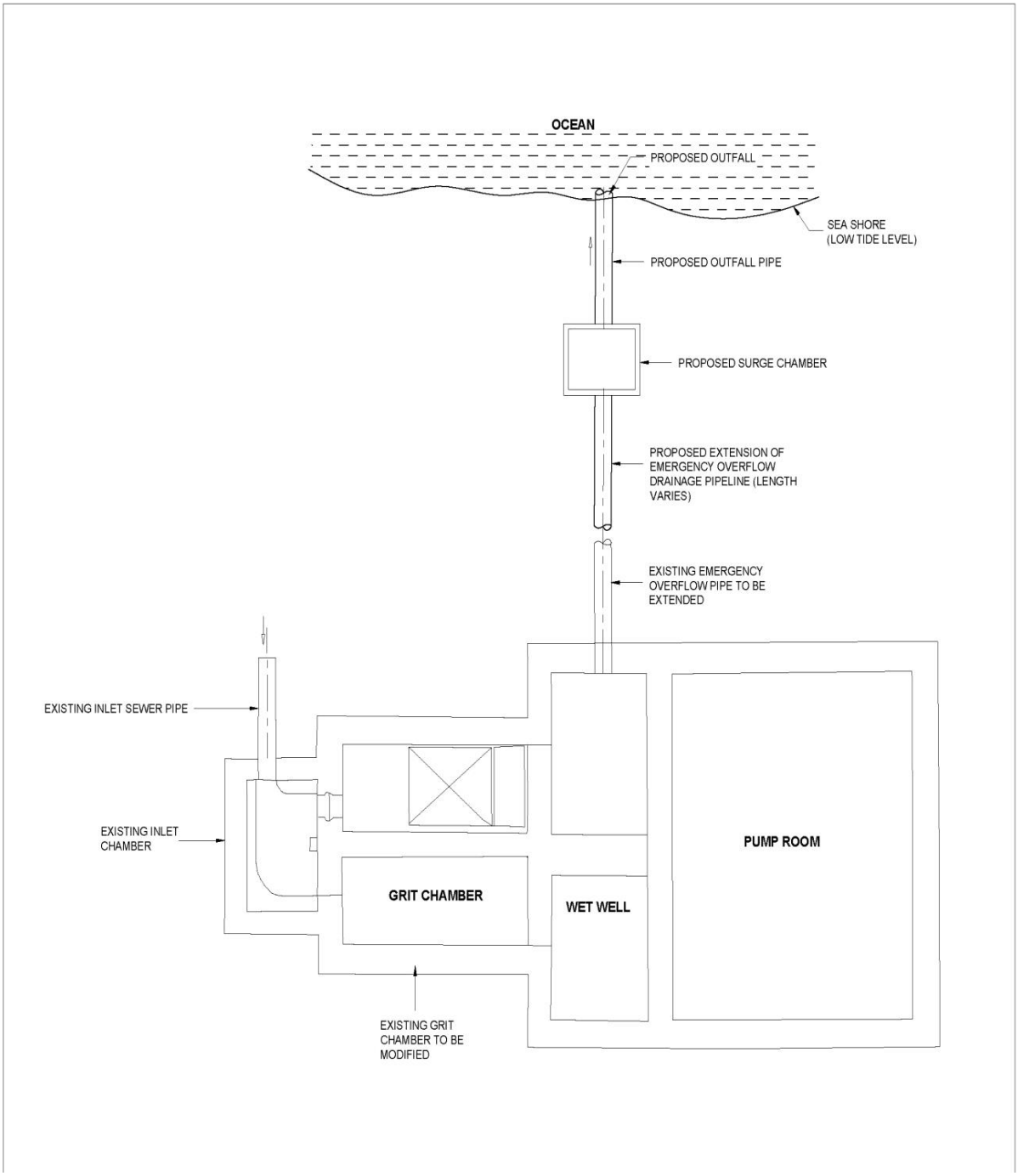

Figure 2-6: Type 'C' Grit Chamber Modification

2.6 OUTLET WORKS FOR ALL IMPROVEMENTS

after the removal of floatables and grit, the storm water will be discharged into the Indian Ocean via the outfall pipes ranging from 200mm diameter to 450mm diameter pipelines to the low tide water mark of the Indian Ocean. The surge chambers will be the final point before the outfall pipe which will be buried under the beach for minimum interference with beach activities, the pipe will discharge the storm water at the low tide mark of each respective outlet.

2.7 MODE OF OPERATION OF THE IMPROVEMENTS

After the construction, the proposed headworks will operate by the removal of floatables and grit from the storm water. The screens will be cleaned manually and floatables and grit compressed and transported to the local waste management facility located in Kibarani to the West of Mombasa, until the local land fill is constructed.

2.8 PROJECT COST

The proposed project is expected to cost K.Shs. 263,700,000.00 (Two Hundred and Sixty Three Million and Seven Hundred Thousand Only) for the installation of the improvements to the existing storm water outlets.

3 ALTERNATIVES TO THE PROJECT

This chapter highlights all the alternatives considered during the design of the improvements, these included looking at different locations as well as technology employed in the design. The following alternatives were considered.

3.1 ALTERNATIVE SITES FOR SETTING UP THE IMPROVEMENTS

This alternative considered constructing a whole new headworks system all around the Island in order to avoid interference with the current network. The current storm water outlets, CSOs and outfall at Kizingo take advantage of the natural topography and drainage patterns within the Mombasa Island, where majority of the Island water drains naturally thus providing the most environmentally friendly location for placing the proposed works and since there exists outlets, CSOs and an outfall, it is considered wise to just improve the existing infrastructure to accommodate the proposed headworks. In addition, being that the natural drainage pattern slopes to these areas, more construction would be needed to improve the topography to drain into the alternative sites, thus a higher probability of negatively interfering with the social, physical and biological environment.

3.2 USE OF A MORE MECHANISED METHOD OF REMOVING FLOATABLES AND GRIT AT THE HEADWORKS

another alternative that was looked into was the use of different technology in the removal of floatables from the storm water by use of mechanized screens at the proposed headworks. The mechanized screens would reduce the daily effort required to remove floatables. The manual screens were selected based on the fact that the short term were aimed at having the highest impact within the least time, in preparation for the long term measures, without requiring a change in the institutional framework within the area. The mechanized methods would require a new institutional framework in the form of training full time staff for handling the mechanized aspect of the project. The proposed design will ensure minimal manpower with minimal tranining thus achieving the short term goal. In addition, mechanized facilities are more difficult in the long run due to the higher need for maintenance during the operation.

3.3 NO ACTION ALTERNATIVE

The No Action Alternative is the future without the planned Project. This alternative involves not constructing the improvement on the storm water outlets, CSOs and outfall which will have negative impacts both in the short term and long term of the project implementation due to the fact that floatables and grit will continue to make its way into the Indian Ocean thus interfering with beach activities, the ocean biodiversity as well as the overall aesthetic environment of the beaches along Mombasa.

In the long term, storm water will make its way into the Indian Ocean will all the screenings which are usually plastic products and grit collected by storm water will be discharged into the Indian Ocean which will negatively impact the marine biodiversity.

4 PHYSICAL, BIOLOGICAL AND SOCIAL BASELINE CONDITIONS OF AFFECTED ENVIRONMENT

This Section discusses the baseline situation in respect of climate, topography, air quality, soils and geology, hydrology, terrestrial ecology, cultural heritage sites and socio-economic structure as well as existing infrastructure and utilities such as water, sewerage, transportation network, electricity, air transport and telephone/telecommunications and solid waste management in the region of the proposed project.

4.1 ENVIRONMENTAL AND SOCIO-ECONOMIC SURVEY

The socio-economic situation of the area was captured based on findings of a household survey carried out using a structured questionnaire. A sample group of 100 households, distributed within the project sites was interviewed for purposes of the analysis.

4.1.1 Population dynamics and household characteristics

The average household size is 5 people. The general trend shows that most of the people fall in the 19-35 and 6-18 age groups. Figure 4.1 shows the population age brackets.

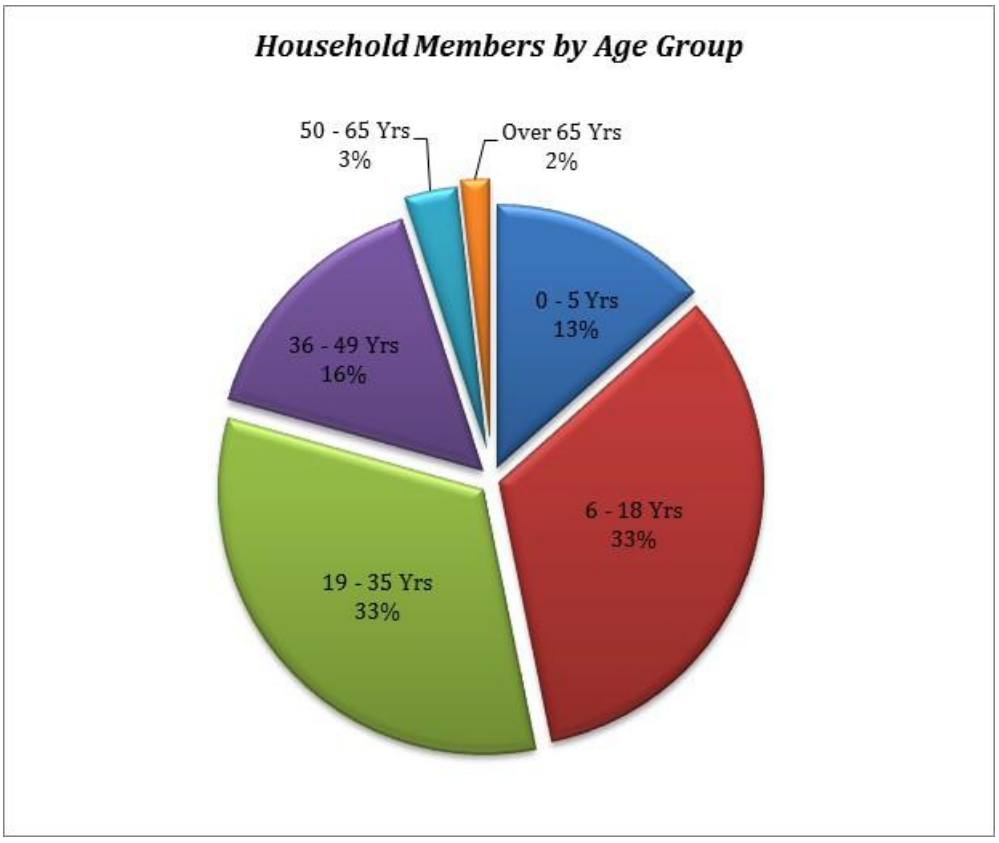

Figure 4-1: Age Distribution of the Population

Source: Survey data.

Literacy levels were as follows:- Primary level 34%, Secondary level 40%, college /university 13% and no education at all 13%. Therefore the areas have a high literacy level, which is common in urban settings.

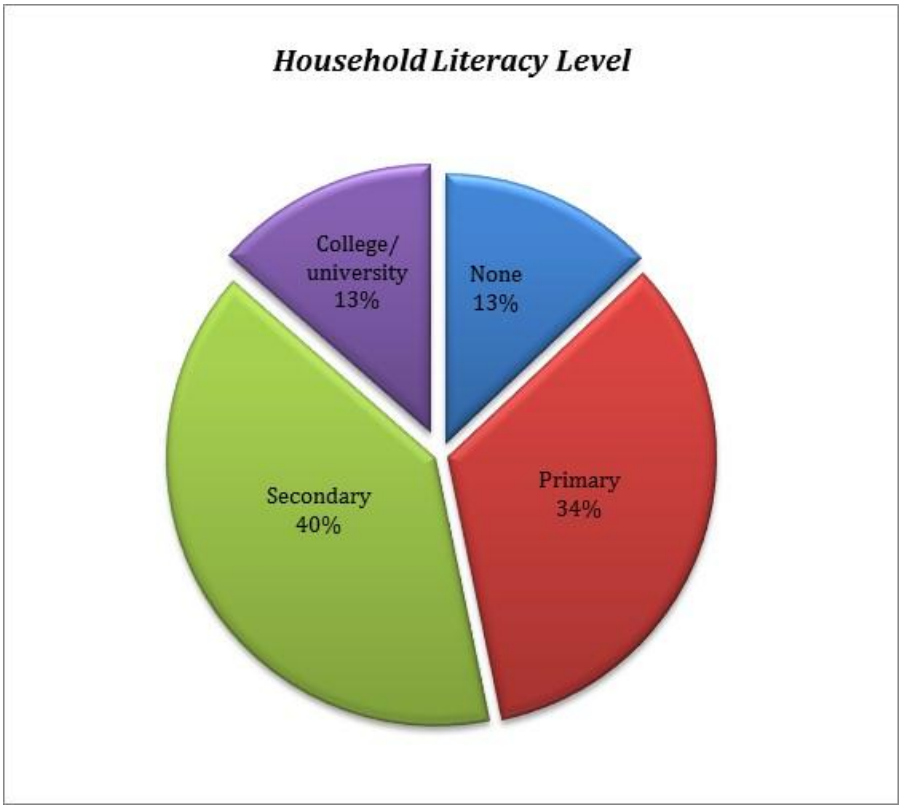

Figure 4-2: Household Literacy Level

Source: Survey data.

Both Christianity and Islam have a similar mass of followers with 51% and 49% of the population professing the faiths respectively.

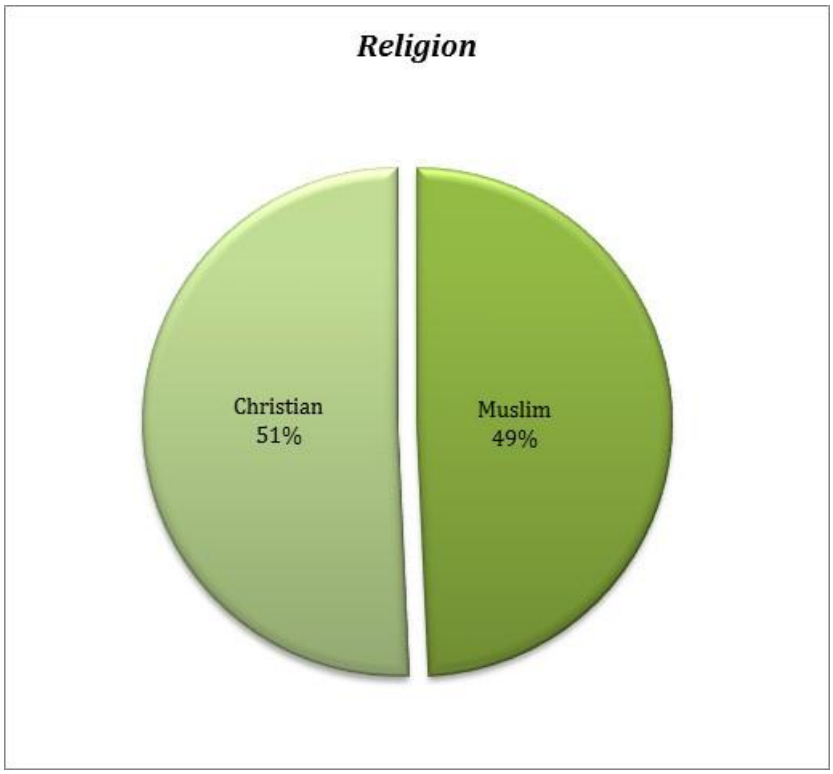

Figure 4-3: Religion of the Population

Source: Survey data.

Charcoal is the main source of energy used by the community with 52% of the population depending on it. Other fuel sources are Kerosene, LPG gas, electricity and firewood.

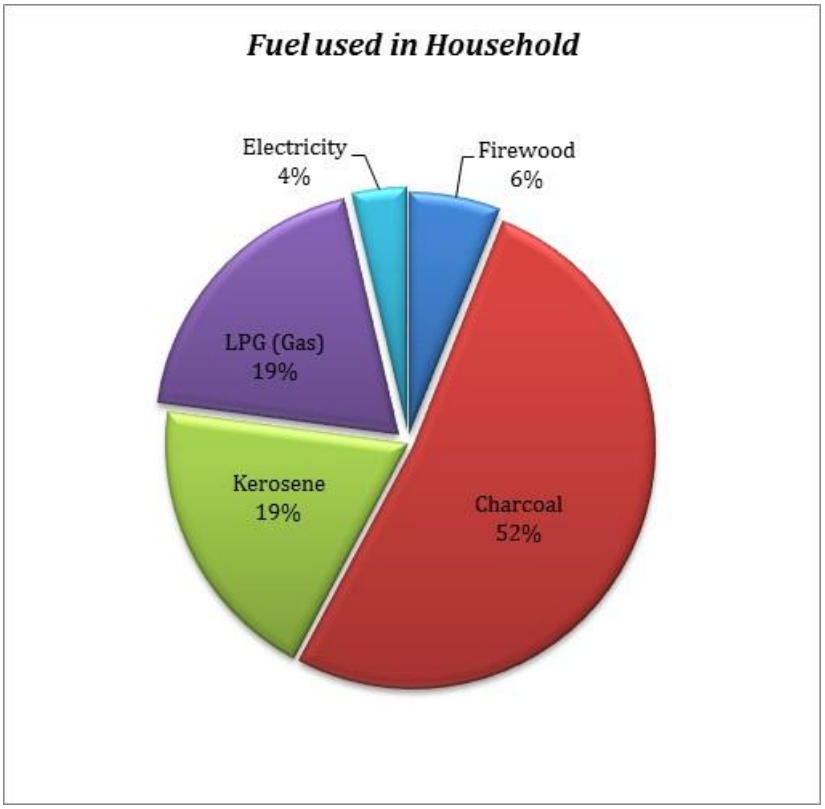

Figure 4-4: Sources of Energy

Source: Survey data.

The main socio-economic activities are businesses and formal employment, common to urban settings with 58% and 28% respectively. The other socio-economic activities are shown below:

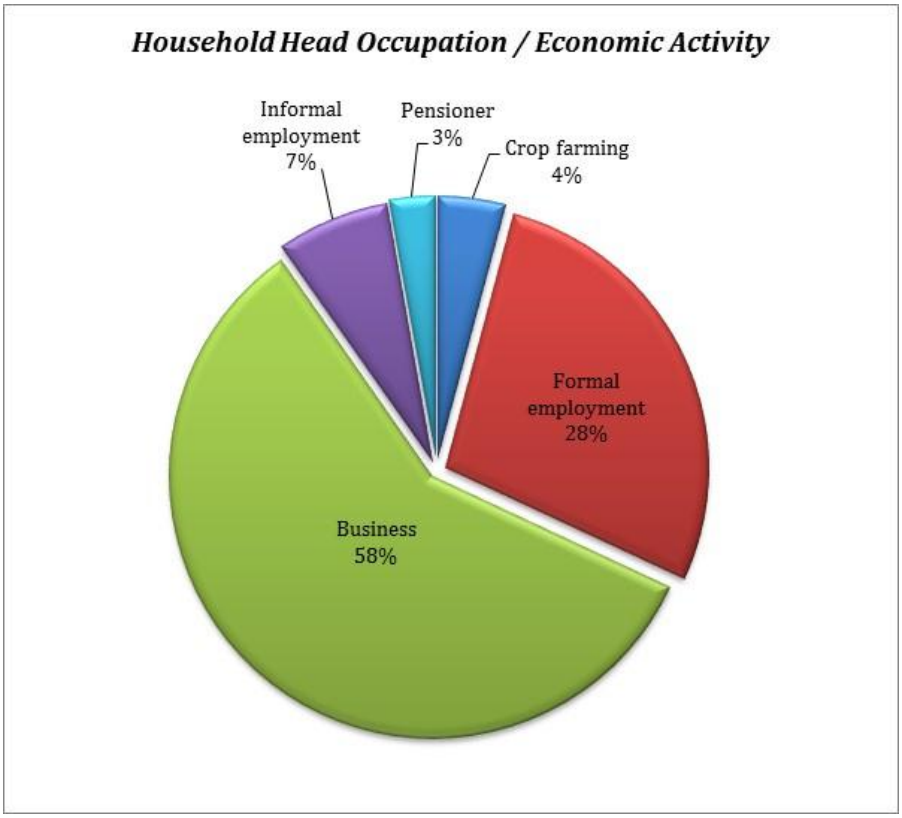

Figure 4-5: Household Socio-Economic Activities

Source: Survey data.

The household conducting business constitutes 58% of the total population. The most popular business in the area is the Jua Kali industry comprising of 48 % of the entreprising population. 30% of the entreprising population have shops while 15% sell groceries. Other businesses are shown in the figure below.

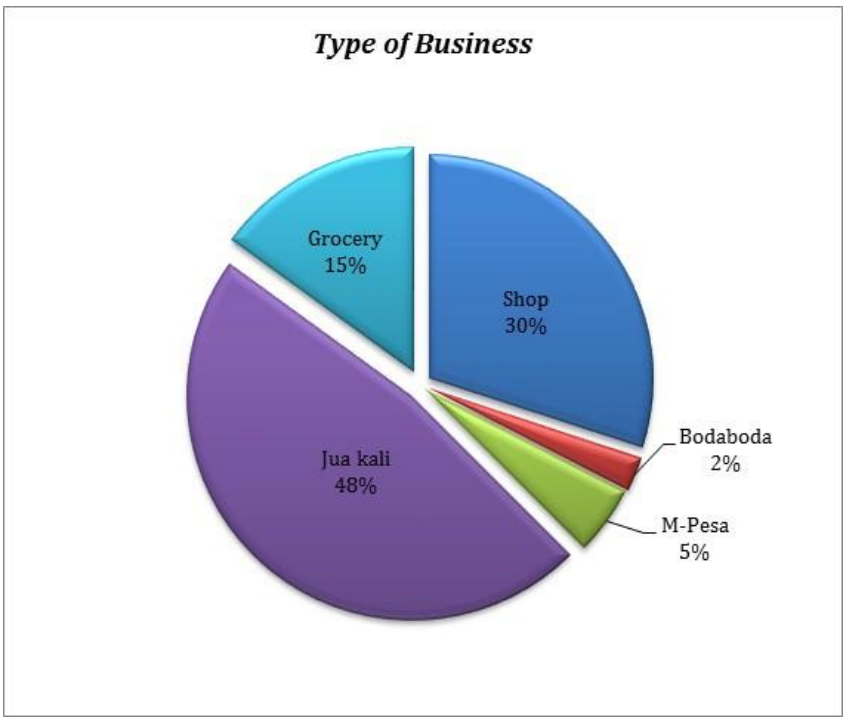

Figure 4-6: Business types in the project area

Most of the populations' income lies under 15000. Only 11% of the population receive an income of over 30,000 shillings per month.

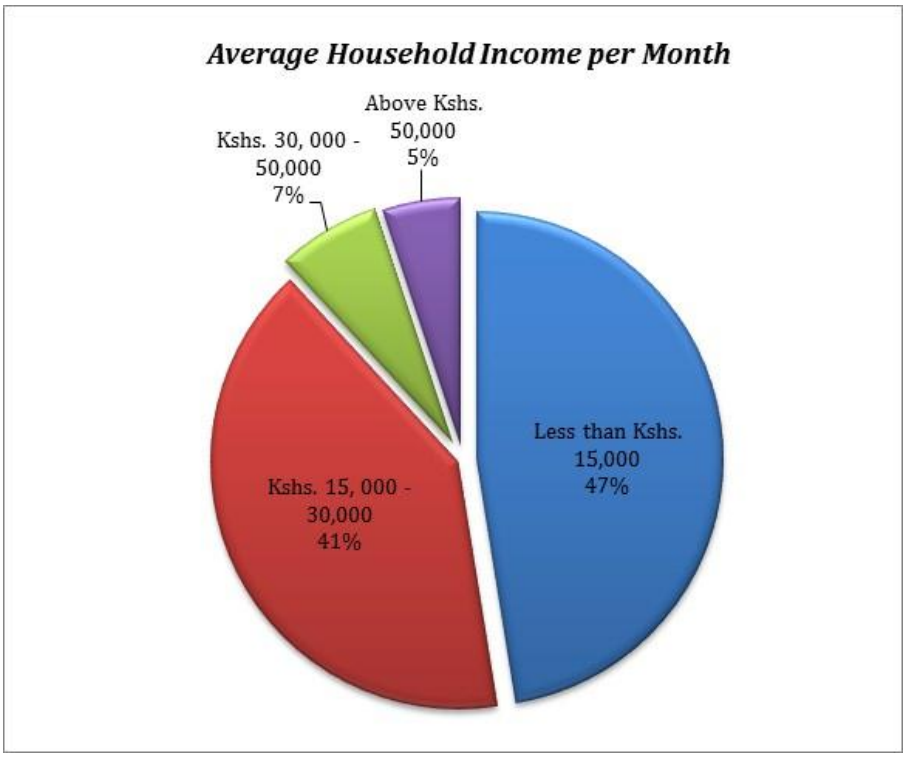

Figure 4-7: Household Income per Month

Source: Survey data.

4.1.2 Water Supply

Being an urban area, the project areas receive piped water, however majority of the sites are located within low income areas, most residents rely on a public water taps, boreholes and private taps as shown below.

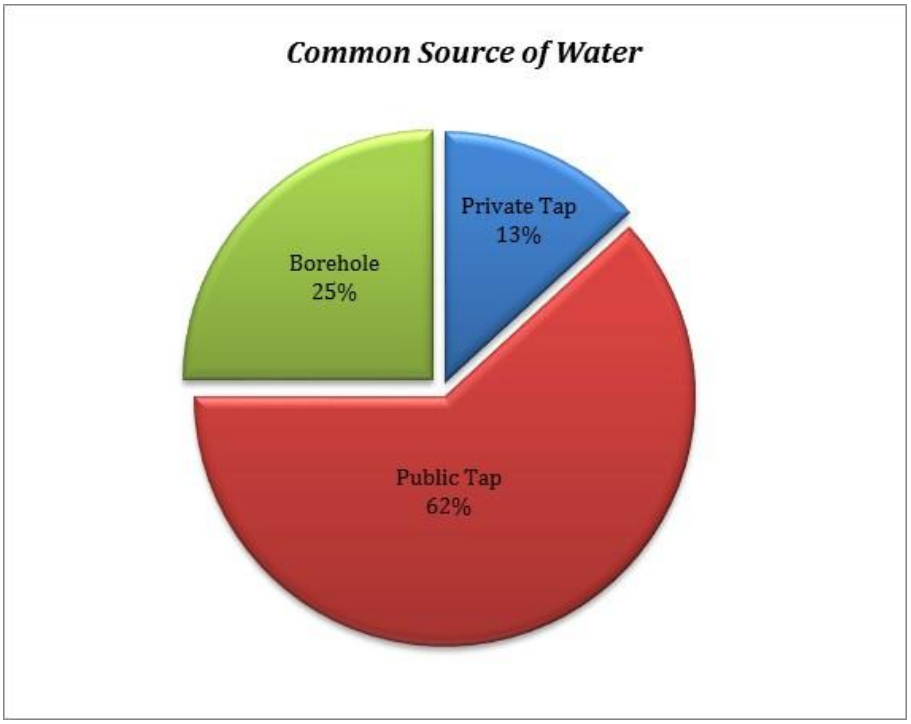

Figure 4-8: Main Sources of Water for the Community

Source: Survey data.

Where the population pays for water, majority of the population pays between 5 and 10 Kenya Shillings. 39% of the population pays above 10 shillings per jerrycan, as shown in the chart below:

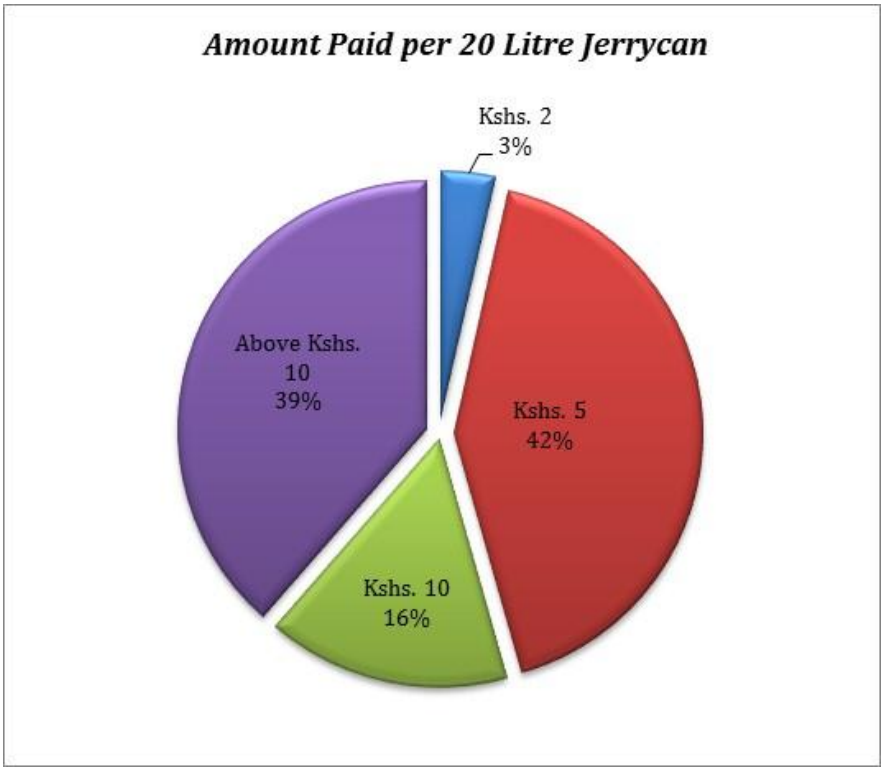

Figure 4-9: Percentage Population Paying for Water

Source: Survey data.

The water quality is generally fair with 64% of the respondents indicating that the water quality is acceptable. 30% of the respondents find the water to be good while 6% find it to be bad.

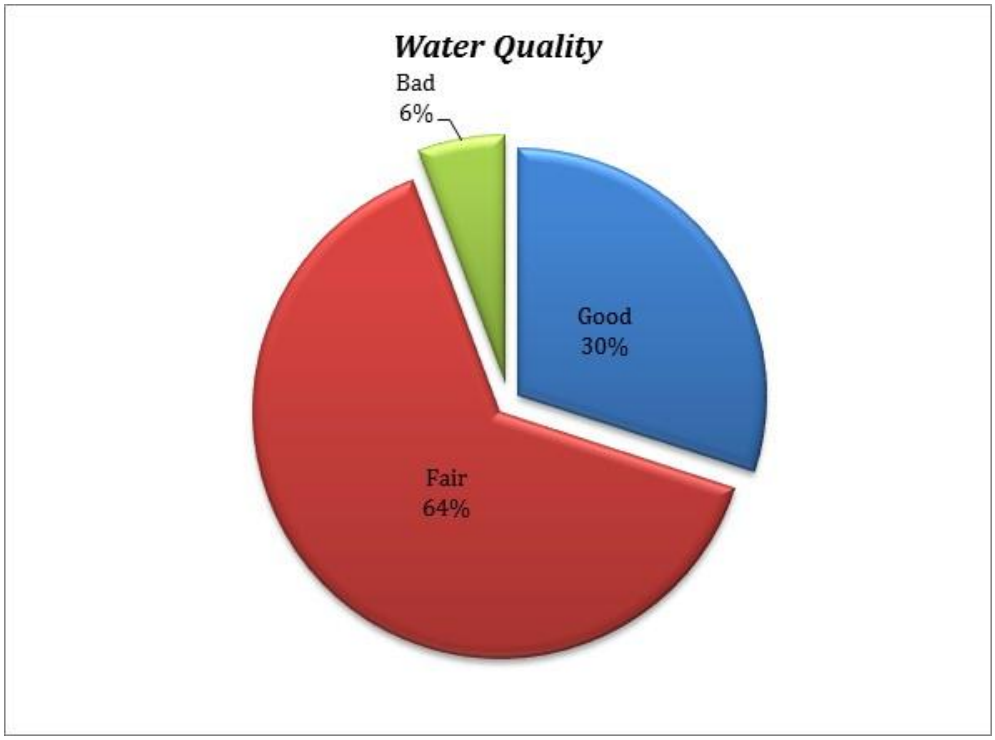

Figure 4-10: General Status of the Water Quality

Source: Survey data.

4.1.3 Sanitation

The methods used by the population to dispose refuse are distributed as follows: 50% rely on collection by the council, 23% dump household waste in open areas, 11% use compost pits/burying, 9% use local garbage collectors and 7% burn, the chart below shows the waste disposal figuratively.

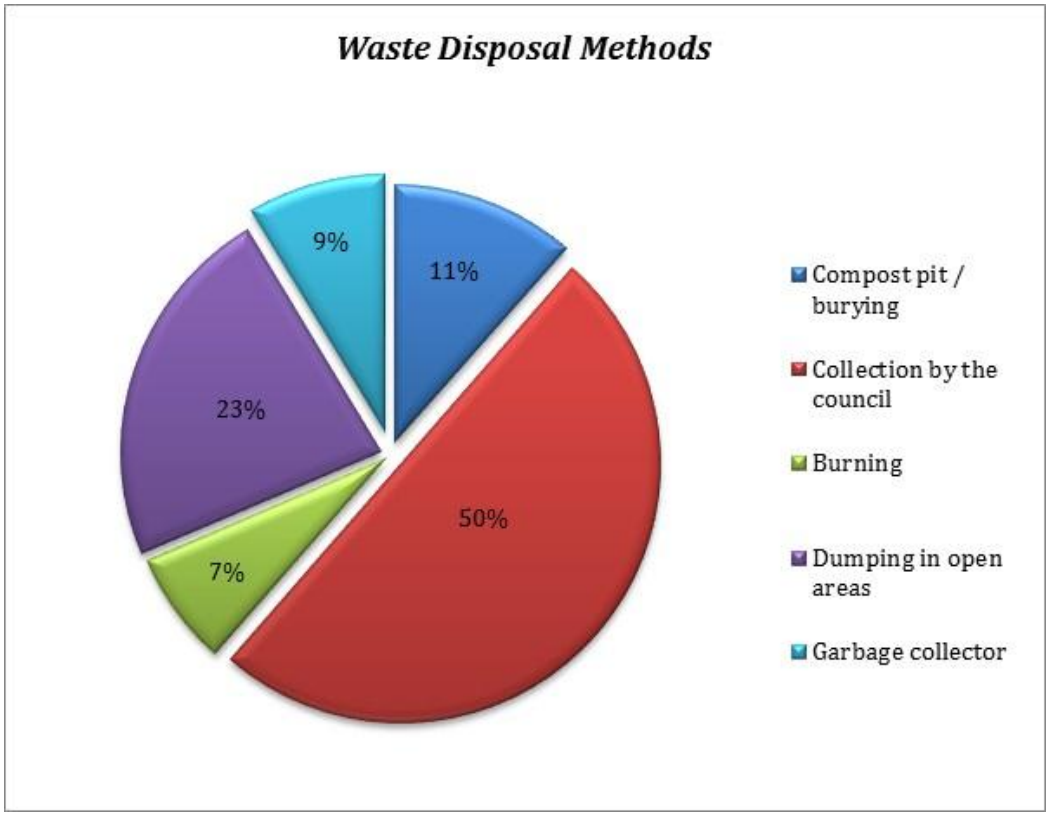

Figure 4-11: Common Waste Disposal Methods

Source: Survey data.

All of the households interviewed have access to a toilet, with most of the facilities being connected to the sewer system, however majority of the toilets in the project area are squat type toilets (pit latrine) illegally connected to the storm water system which in most cases dispose household waste directly to the Indian Ocean as shown in the figures below.

Figure 4-12: Respondents Who Have Toilets in Their Compound

Source: Survey data.

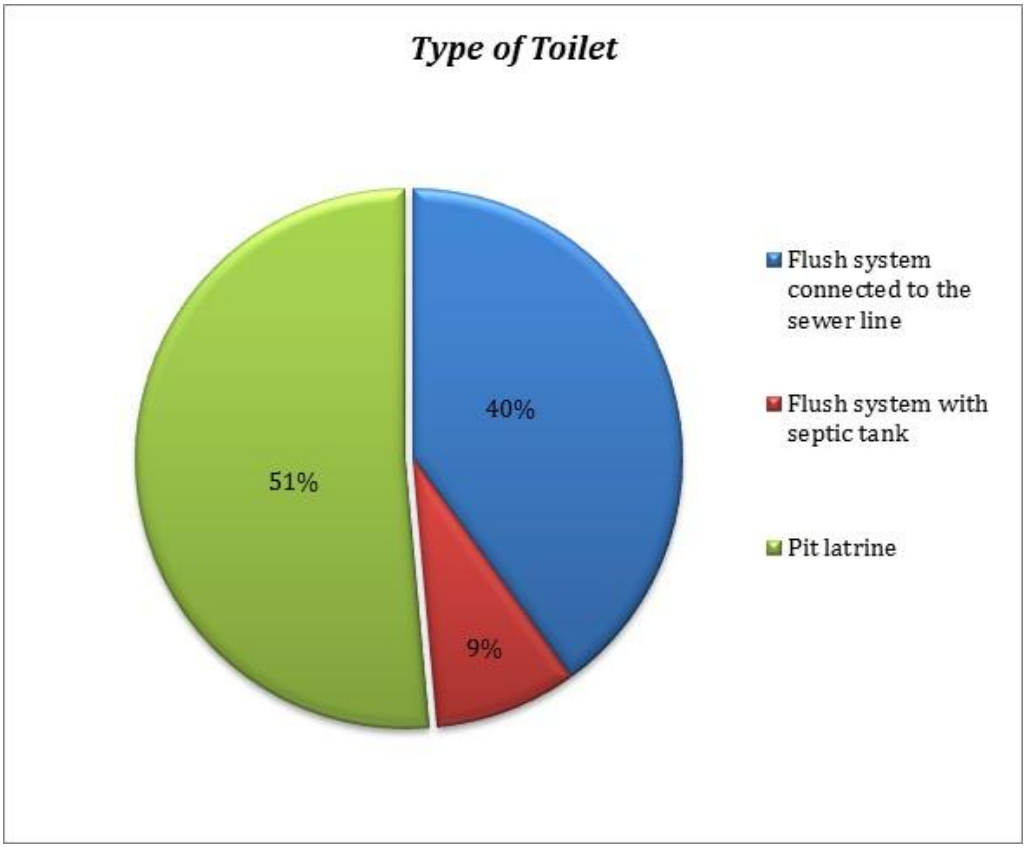

Figure 4-13: Types of Toilets Respondents Have in Their Compound

Source: Survey data.

4.1.4 Environmental Situation

The environmental concerns in the area include water shortage, mosquitos and malaria spread, solid wastes generation, extinction of endangered species (including fish) and poor sanitation.

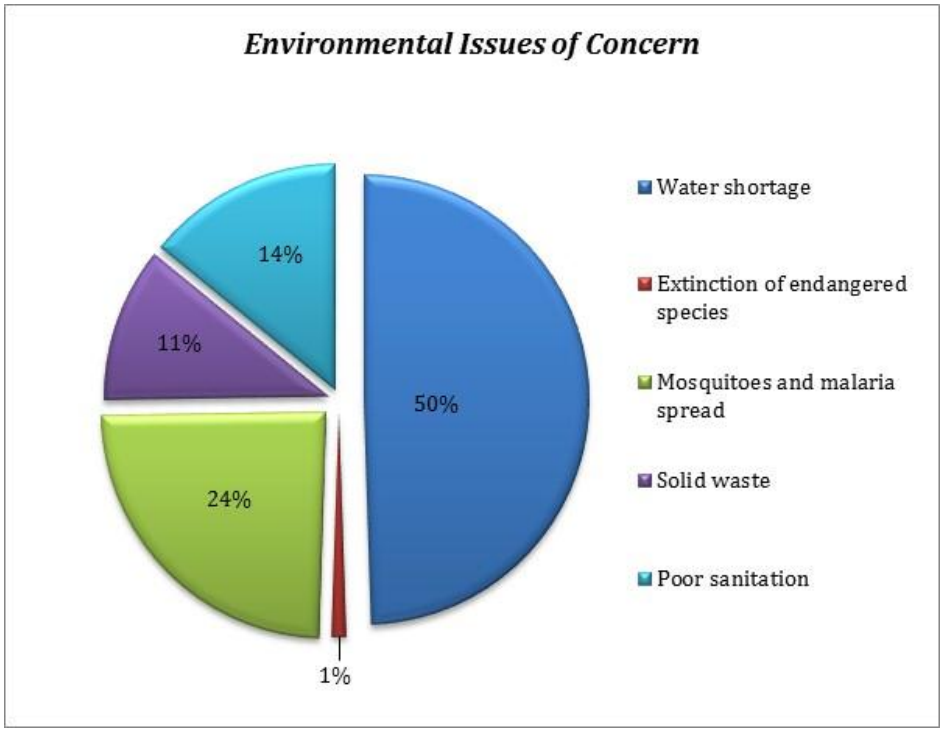

Figure 4-14: Environmental Issues of Concern

Source: Survey data.

There are a number of environmental conservation initiatives in the area such as educating the public on environmental conservation and clearing of mosquito breeding sites and others such and collection of solid wastes.

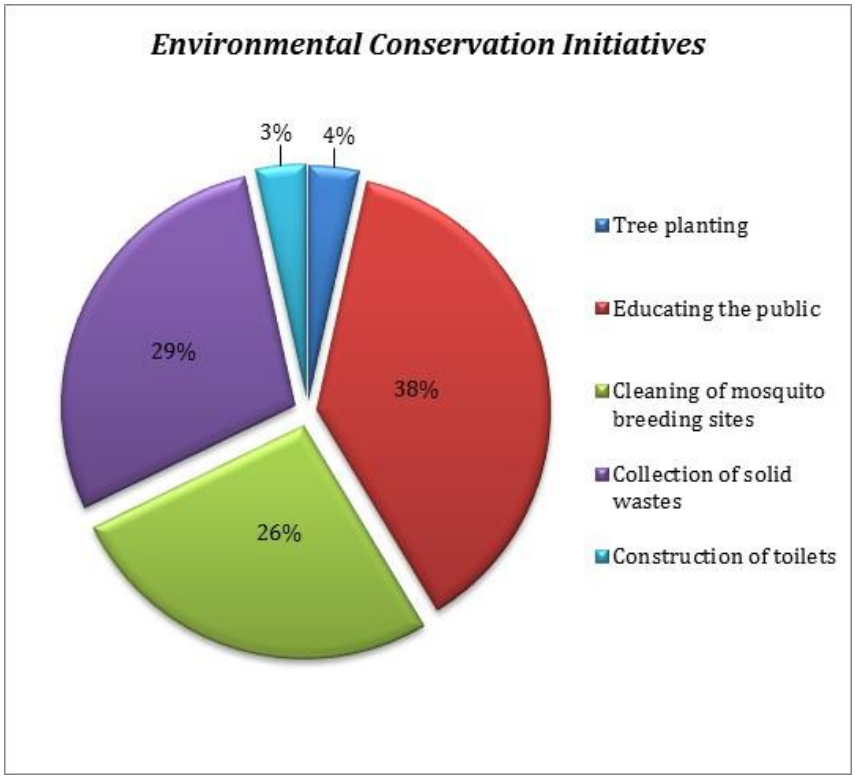

Figure 4-15: Environmental Conservation Initiatives

Source: Survey data.

These activities are carried out by youth groups, women groups, NGOs, CBOs as indicated in the figure below.

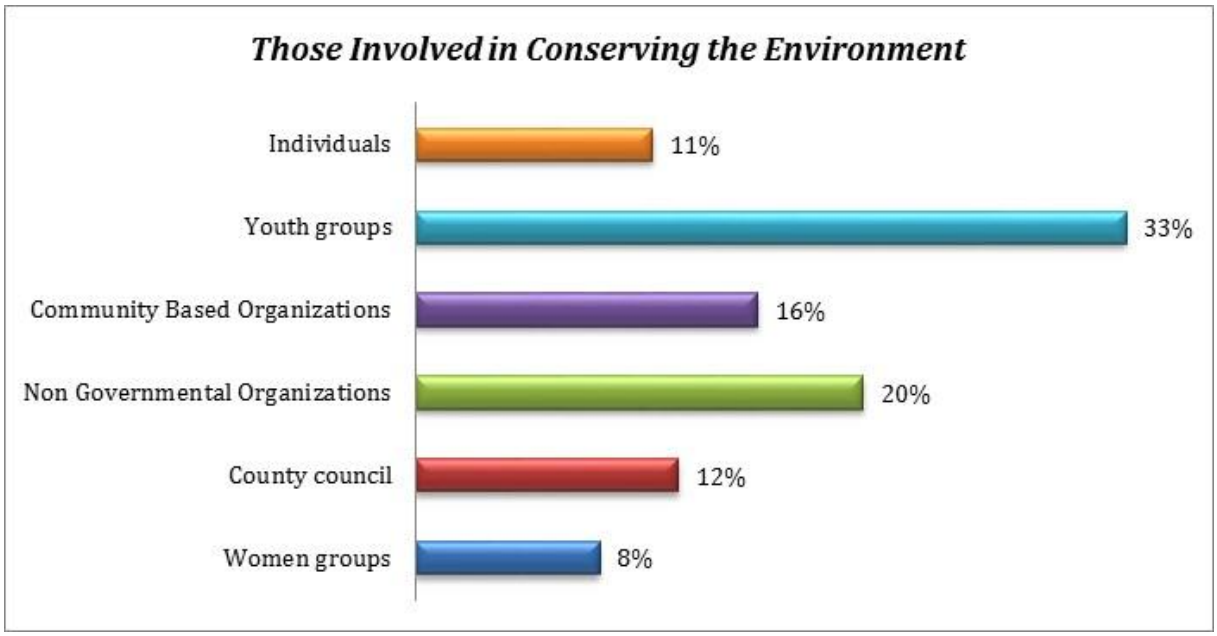

Figure 4-16: Implementers of Environmental Conservation Initiative

Source: Survey data.

85% of the population feel that the project will help conserve the environment due to the reduced raw sewage making its way to the Indian Ocean, while only 15% feel that it will not.

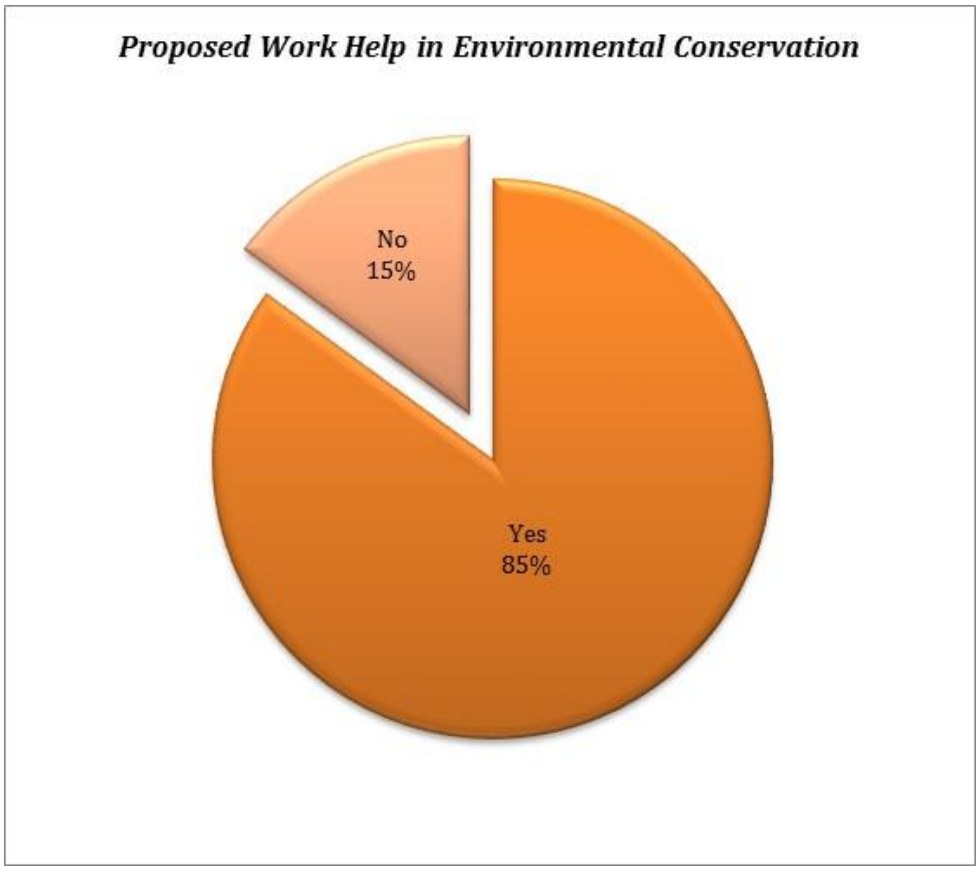

Figure 4-17: Will the Water Supply Project help in conserving the Environment

Source: Survey data.

4.1.5 Health Status

The prevalent diseases in the area are malaria, diarrhea, skin rashes cholera and respiratory infections most of which are water based.

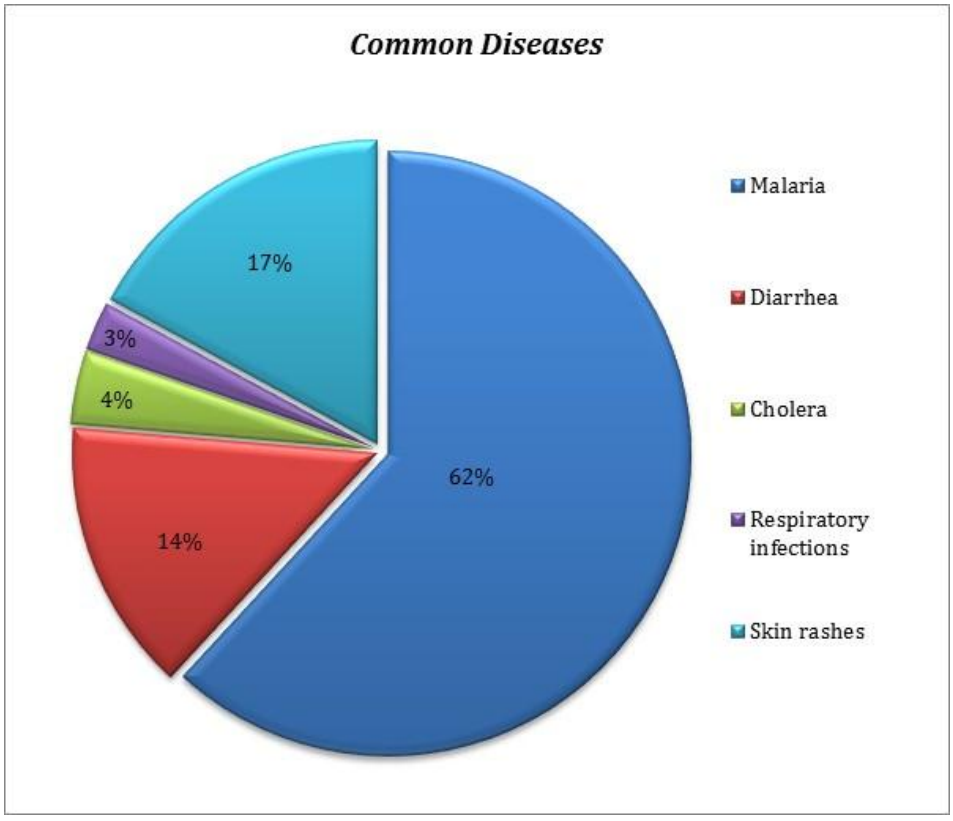

Figure 4-18: Prevalence of Diseases in the Area

Source: Survey data.

Most of the respondents when sick seek medical attention from a health centre.

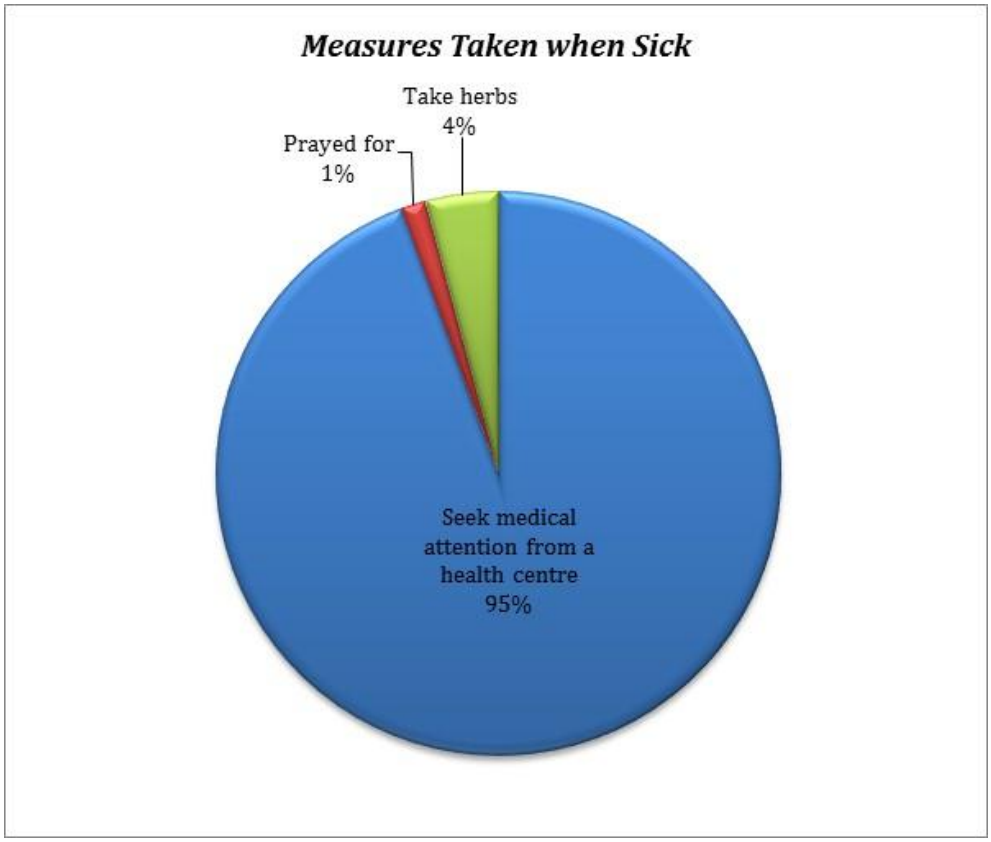

Figure 4-19: Type of Treatment

Source: Survey data.

The health facilities sought by the local population are mainly government health centres.

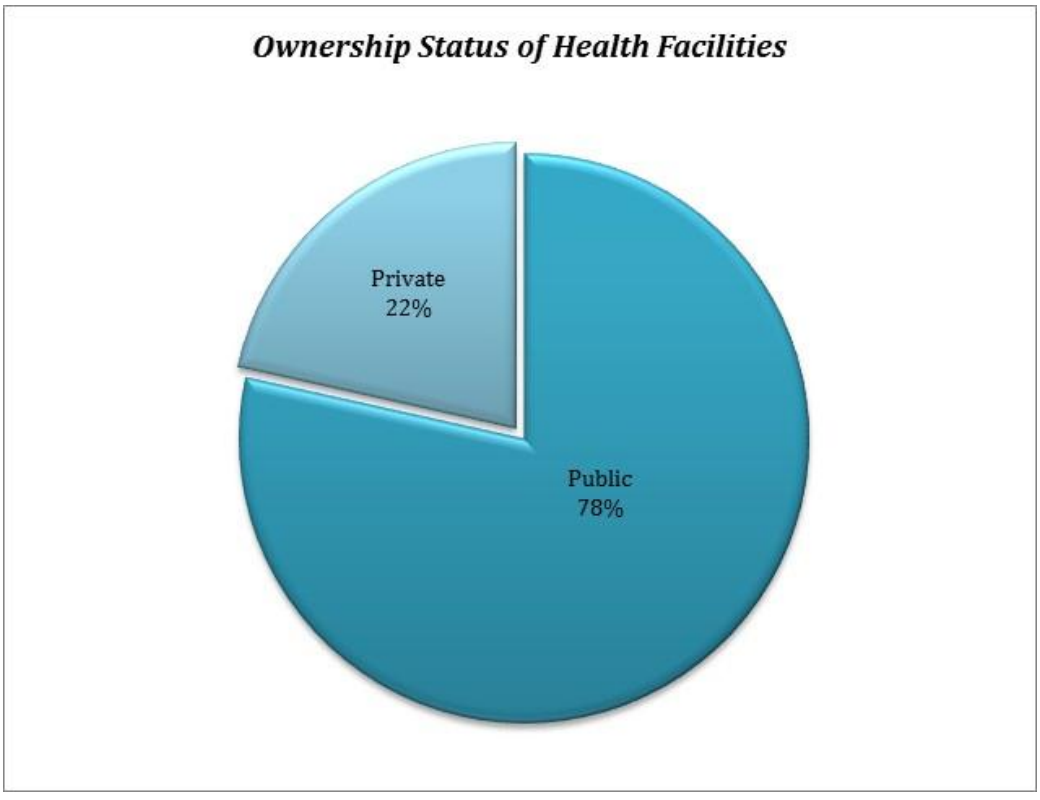

Figure 4-20: Ownership Status of the Health Facilities.

Source: Survey data.

Being an urban centre, the health centres are located nearby with majority located less than 5Km away as shown in the figure below.

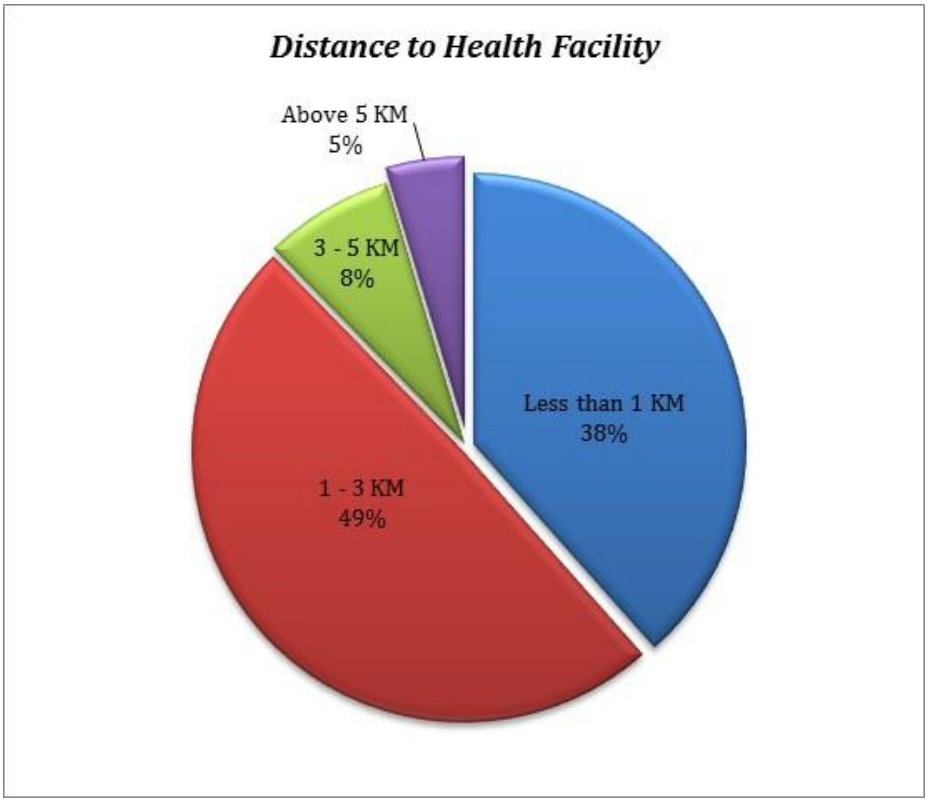

Figure 4-21: Distance to the Health Facilities.

Source: Survey data.

The level of HIV/AIDS awareness is high. 99% of the population is aware of HIV/AIDS.

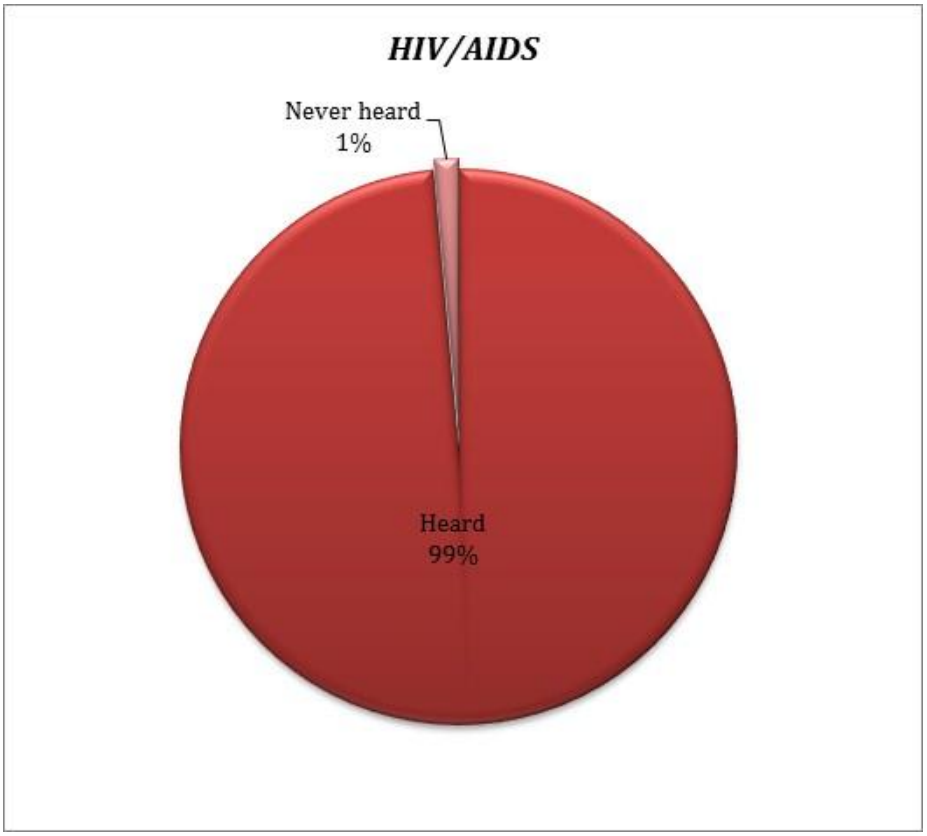

Figure 4-22: Level of Awareness on HIV/AIDS

Source: Survey data.

Information about HIV/AIDS is mainly got from the media, family members and friends, health workers, religious leaders, and NGOs/CBOs.

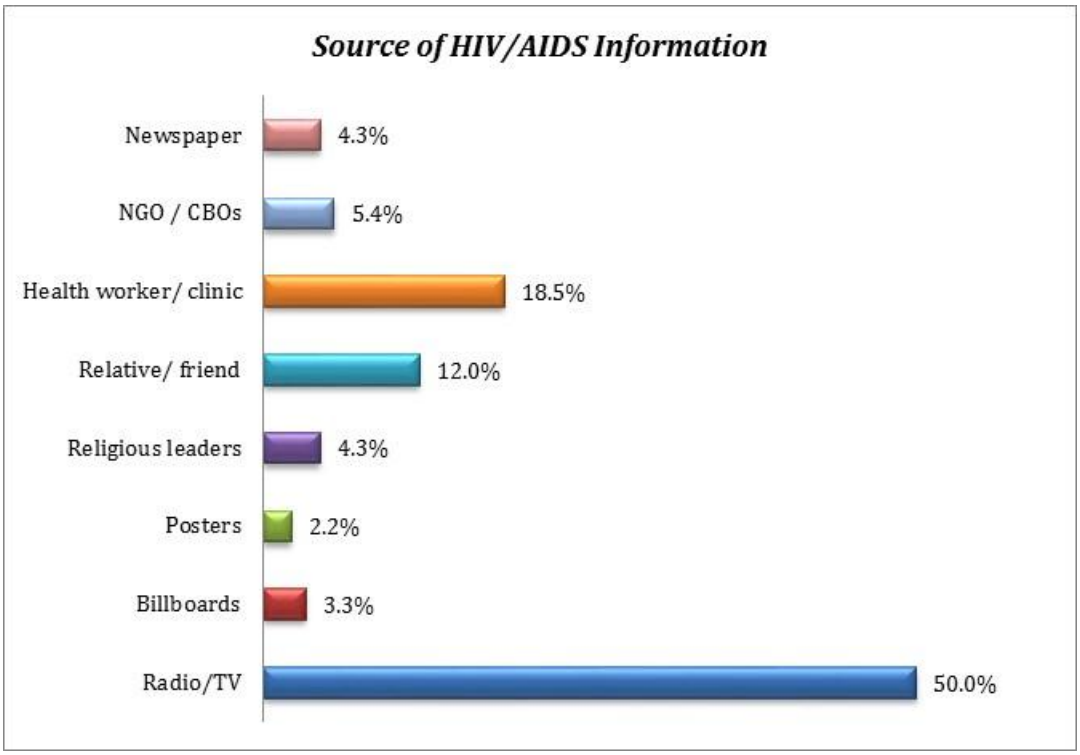

Figure 4-23: Source of information on HIV/AIDS

Source: Survey data.

11% of the respondents have been affected by the disease, in comparison to the county level in comparison to the 3% within the county. The higher rate within the project areas may be due to the fact that majority of the storm water outlets are in low income areas, within Mombasa Island. The affected population is treated as a vulnerable group due to the stigmatization of the scourge, and can be assisted by provision of ARVs during the project duration.

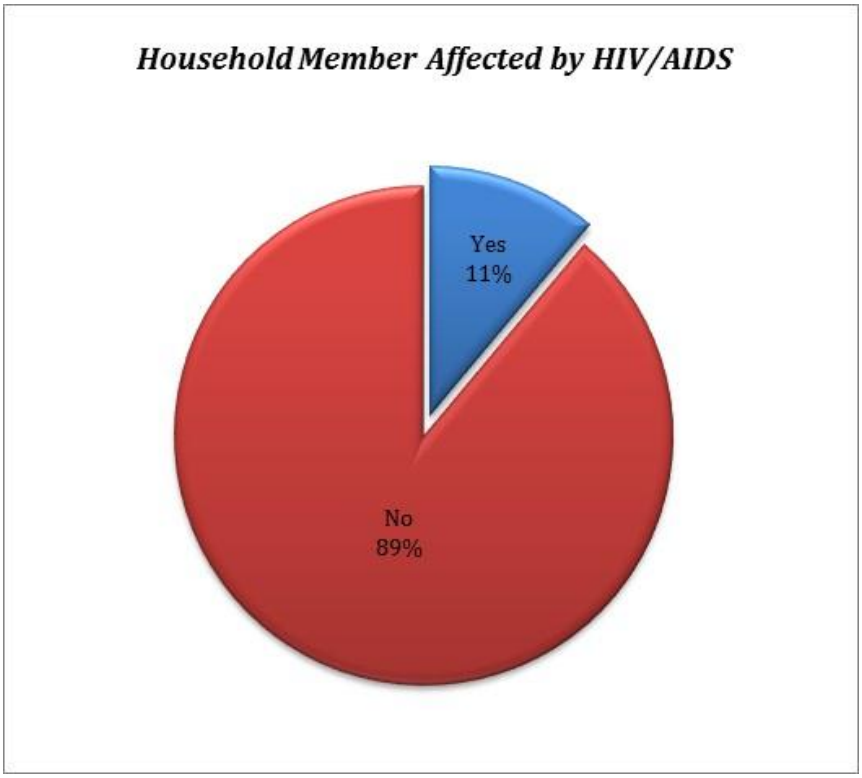

Figure 4-24: Household Members affected by HIV/AIDS

Source: Survey data.

97% of the respondents feel that HIV/AIDS can be prevented while a small fraction of the population 3% says it cannot be prevented.

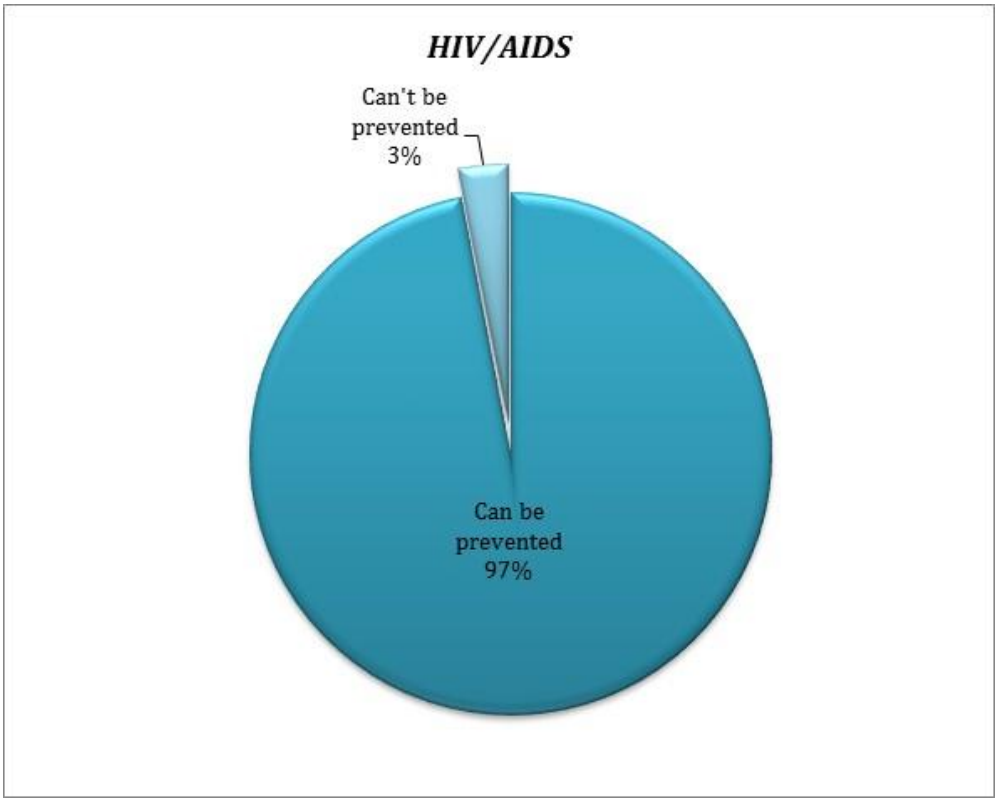

Figure 4-25: Knowledge on whether HIV/AIDS can be prevented

Source: Survey data.

96% of the respondents know where to go for voluntary counselling and testing for HIV/AIDS, which reflects positively on the awareness of HIV/AIDS and its repercussions.

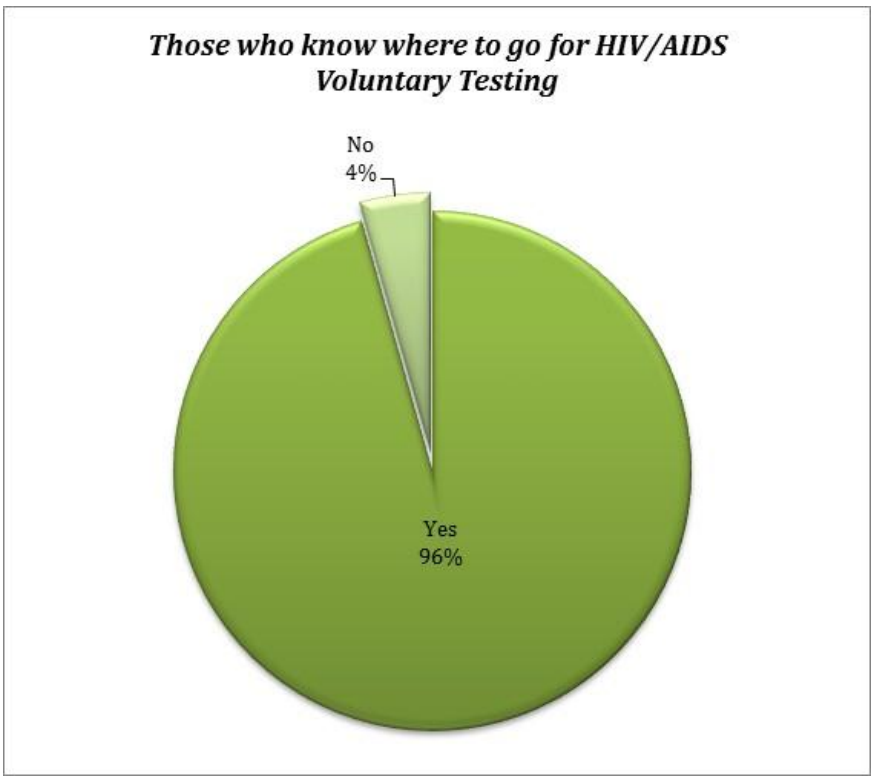

Figure 4-26: Respondents who know where to go to for Voluntary HIV/AIDS Testing

Source: Survey data.

4.1.6 The Project

Most of the residents are aware of the intended improvements to the existing storm water facilities

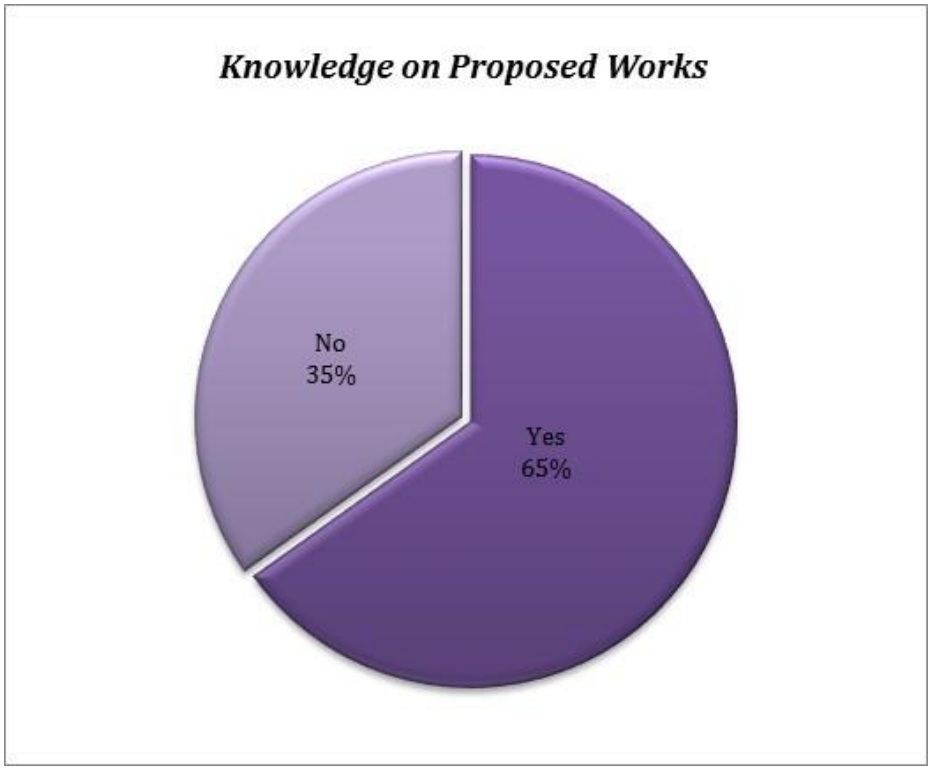

Figure 4-27: Public Awareness of the Intended Construction of the Pipeline

Source: Survey data.

97% of the respondents perceived that the construction of the pipeline will bring positive impacts while 3% percent perceived that it will bring about adverse impacts.

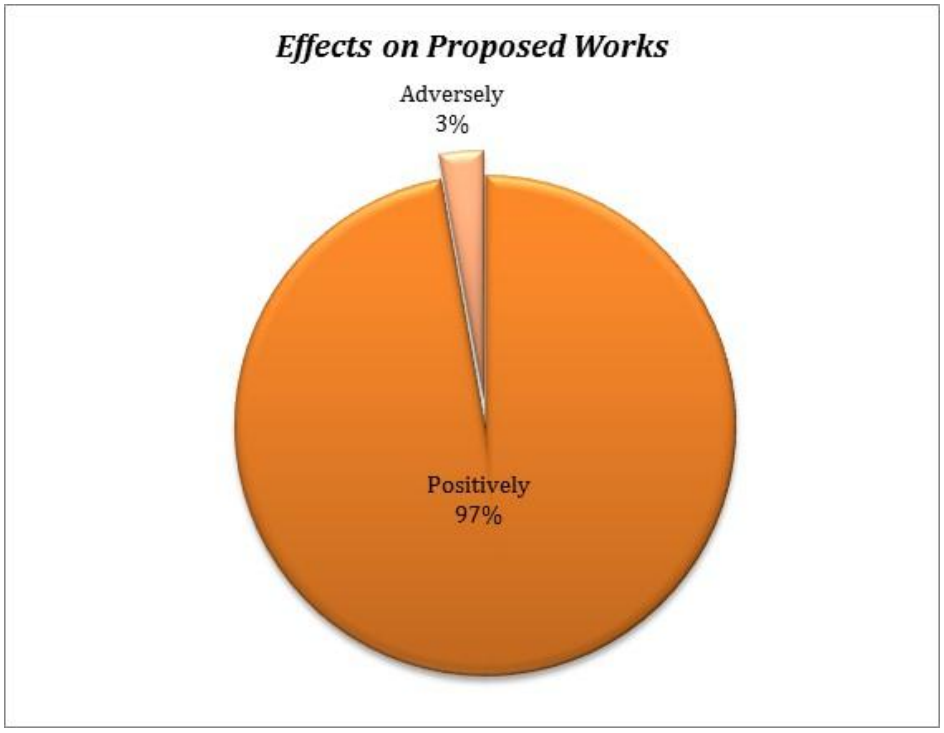

Figure 4-28: Perceived Impact of the Water Supply Project

Source: Survey data.

The positive impacts expected include improvements to sanitation, hygiene, business, job opportunities as well as reduced waterborne diseases.

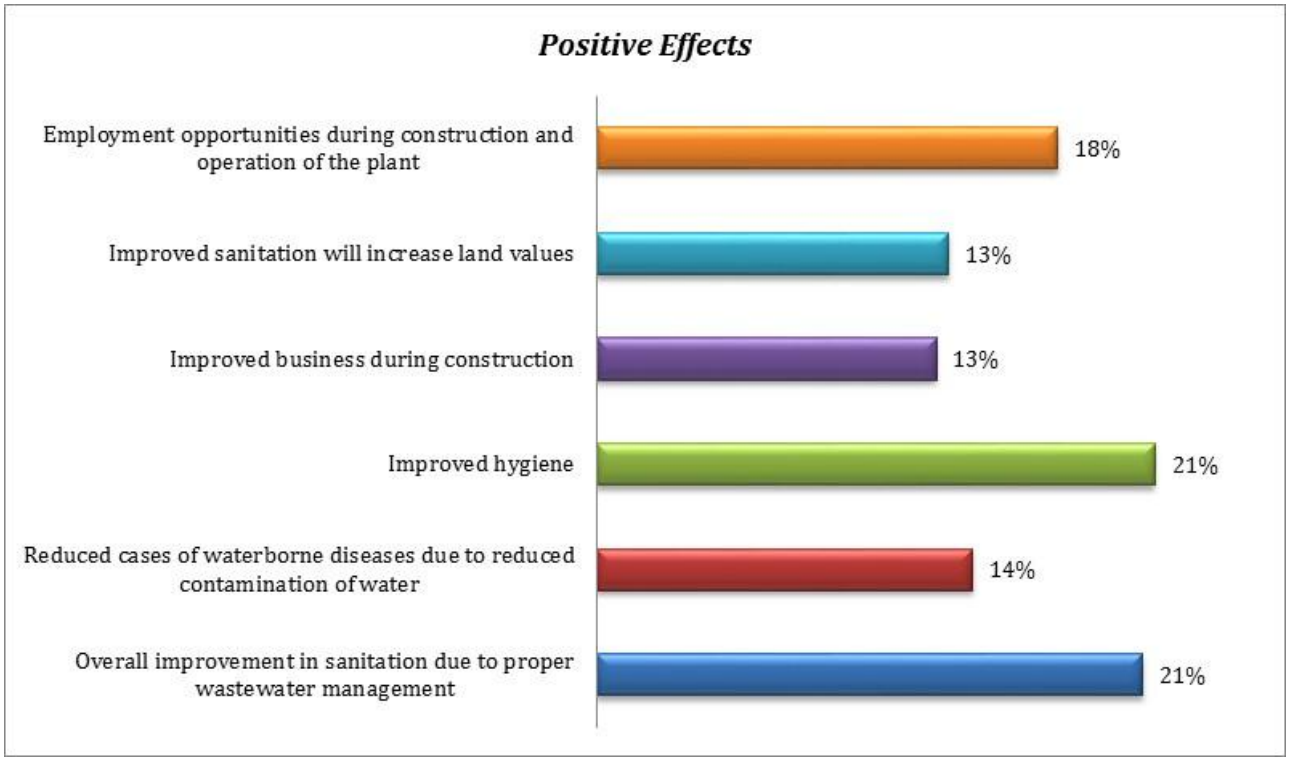

Figure 4-29: Positive Impact of the Proposed Project

Source: Survey data.

The negative impacts expected include demolition of structures and dust and noise generation during construction.

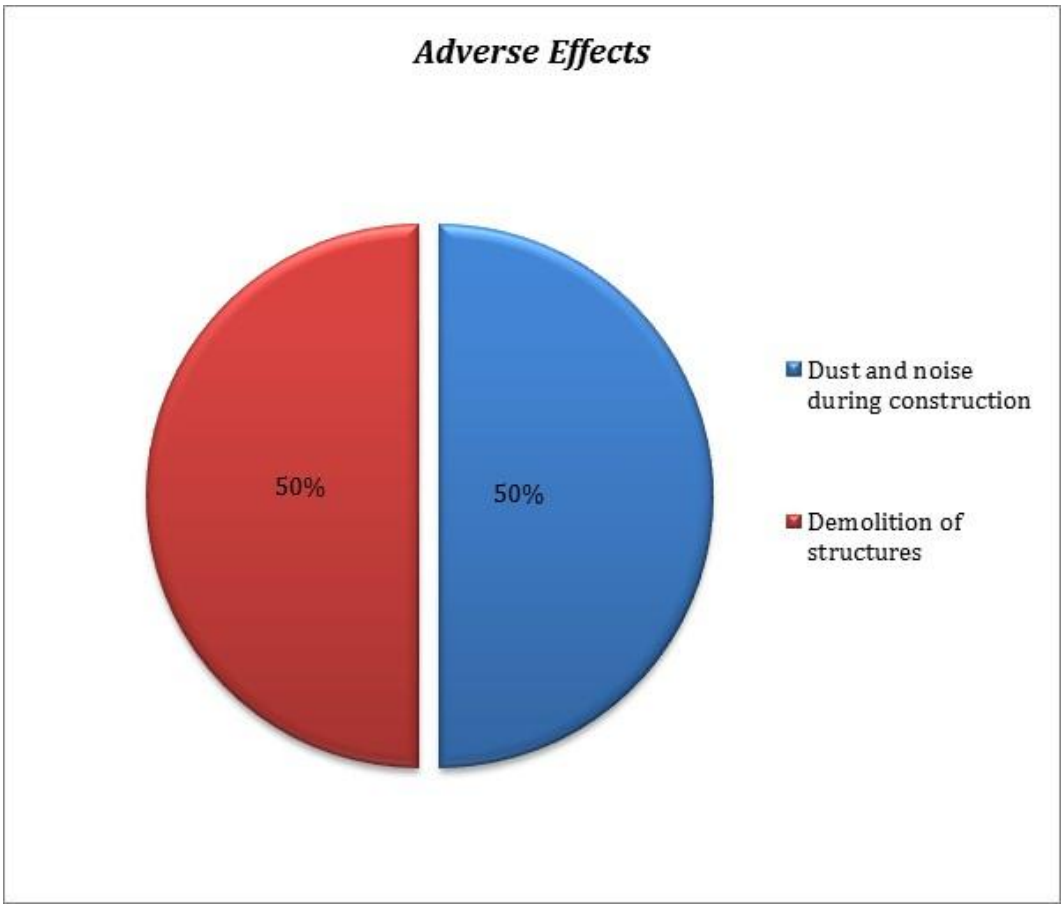

Figure 4-30: Negative Impact of the Proposed Project

Source: Survey data.

To mitigate the negative impacts the respondents feel that there is need to inform the public on any interruption of services, need to educate the public and the construction crew on health and safety, compensate the structure/land/crops/tree owners and avoid night time construction.

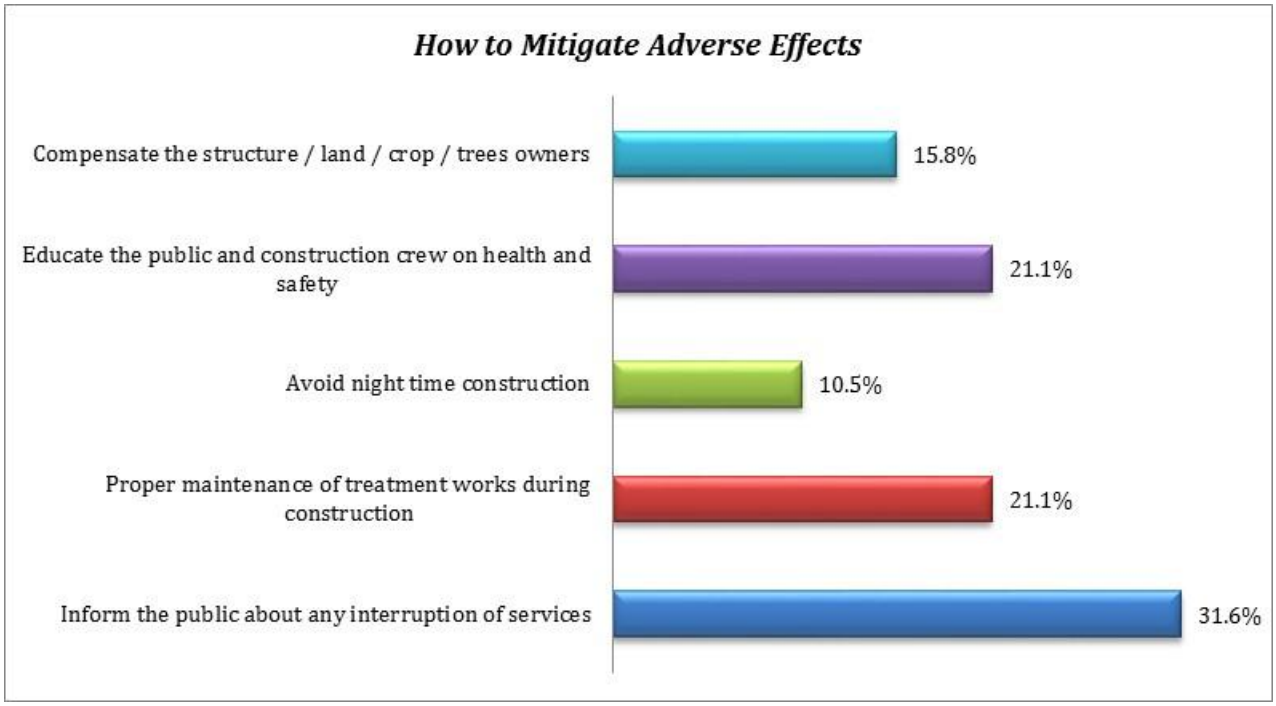

Figure 4-31: How to Mitigate Adverse Impact of the Project

Source: Survey data.

4.2 PHYSIOGRAPHIC AND ENVIRONMENTAL CONDITIONS

4.2.1 Location

Mombasa Island is located within Mombasa County which is located in the South-Eastern part of the Coastal region of Kenya. It covers an area of 229.9 Km^2 excluding 65 Km^2 of water mass which is 200 nautical miles into the Indian Ocean. It borders Kilifi County to the North, Kwale County to the South West and the Indian Ocean to the East. The County lies between latitudes 30°56' and 40°10' South of the Equator and between longitudes 39°34'and 39°46'east of Greenwich Meridian. The County also enjoys proximity to an expansive water mass as it borders the Exclusive Economic Zone of the Indian Ocean to the East. Mombasa Island is also one of the sub-counties within Mombasa County housing the County Headquarters. Mombasa Island is shown in the figure below:

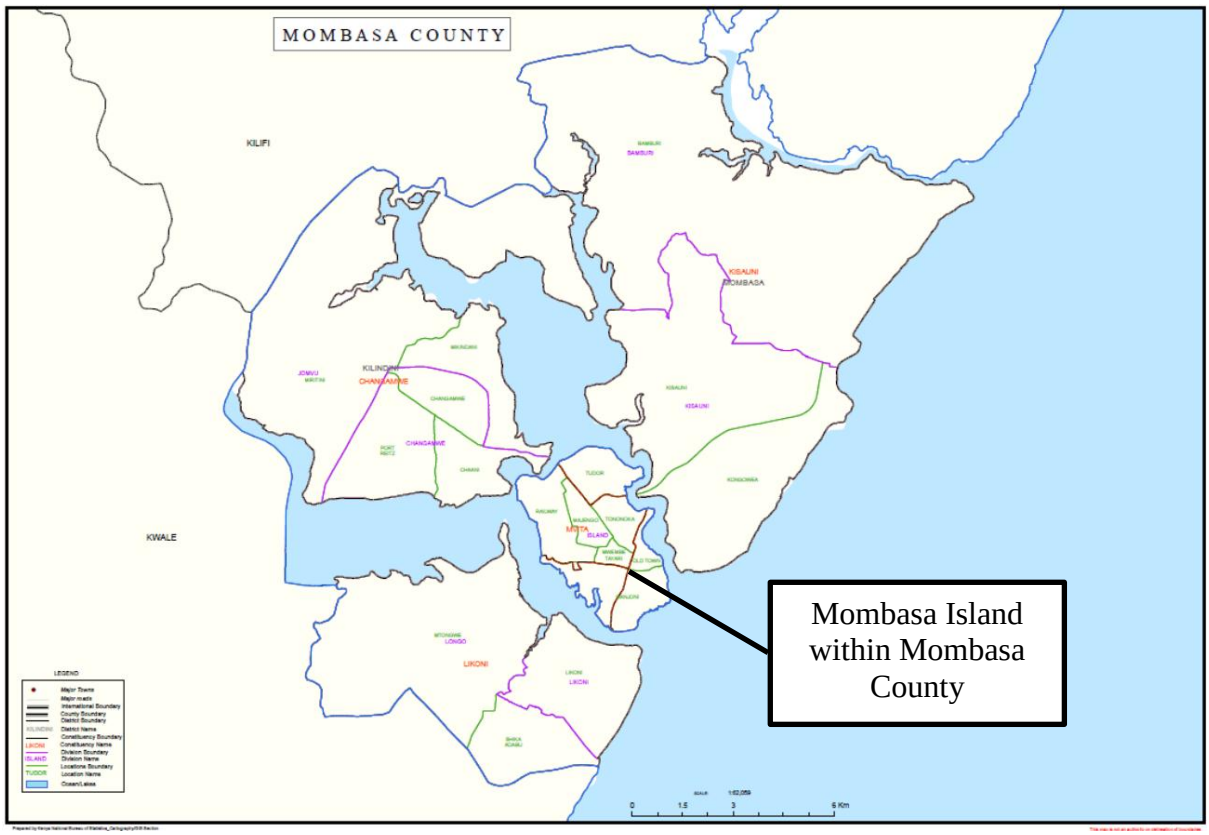

Figure 4-32: Location of Mombasa Island within Mombasa County

4.2.2 Topography

Mombasa County lies within the Coastal lowland which rises gradually from the sea level in the East to about 132m above sea level in the mainland. The terrain is characterized by three distinct physiographic features, which include the coastal plain, which is found along the shoreline, covering the project area location. The plain consists of an expansive flat land with raised beach terraces covered mainly by Coral limestone and back reef sand deposits that not only provide firm foundation for construction but also provide building materials.

The topography has evolved as a result of the lowering of the sea level over time leading to severe erosion by the storm water draining into the sea. In addition, the Subsequent rise in sea level led to the submergence of the valleys and the creation of Mombasa Island surrounded by deep natural creeks, ports and harbors such as Kilindini, Tudor, Makupa, and Old Port creeks.

4.2.3 Climate

Mombasa County has a monsoon type of climate, with the rainfall pattern is characterized by two distinct long and short seasons corresponding to changes in the monsoon winds. The long rains occur in April – June with an average of 1,040mm and correspond to the South-Eastern Monsoon winds. The short rains start towards the end of October lasting until December and correspond to the comparatively dry North-Eastern Monsoons, averaging 240mm. The annual average rainfall for the county is 640mm.

The annual mean temperature in the county is 27.9°C with a minimum of 22.7°C and a maximum of 33.1°C. The hottest month is February with a maximum average of 33.1°C while the lowest temperature is in July with a minimum average of 22.7°C. Average humidity at noon is about 65 per cent.

4.2.4 Geology

Close to the Indian Ocean the area is underlain by coral limestone of Pleistocene age. Further inland are the Magarini sands and Mazeras sandstones of the Tertiary and Triassic ages respectively. Study sites were selected to be within the dominant lithologies of coral limestone and sandstone.

4.2.5 Biodiversity

Mombasa Island is surrounded by the Indian Ocean by means of the Kilindini, Tudor, Makupa, and Old Port creeks. The Indian Ocean is home to a wide range of flora and fauna, including plankton, seaweed, various species of fish including parrot fish, snapper, white snapper, cod and zebra fish, molluscs including squid and octopus. The various flora and fauna within the Indian Ocean are shown in the figures below

Figure 4-33: Some of the fish species within the Indian Ocean

The major vegetation located within the project areas are tree species common along the Kenyan coast, which include Indian Ashok, Palms and Coconut trees as shown in the figure below:

Figure 4-34: General Vegetation in the Project Sites

Of great importance are the few mangrove trees which are located along the Indian Ocean, particularly in Tudor and Ganjoni areas.

The bio-diversity, particularly the marine biodiversity including fish are negatively impacted by the discharge through the storm water into the Indian Ocean, which also negatively impacts the fishing activities in the area.

4.3 SOCIO ECONOMIC INFRASTRUCTURE

4.3.1 Administration

The project area is located within Mombasa Island Sub-county of Mombasa County with the project sites being located within the following administrative units (locations)

i. Tudor
ii. Tononoka
iii. Ganjoni
iv. Old Town
v. Railways

4.3.2 Population

The population data for the project area was taken in accordance to the 2009 census and is summarized in the table below:

Area	**2009**		**Projection 2017**	
	Population	**Density**	**Population**	**Density**

Mombasa Island (Mvita Constituency)	143,128	9,671	193,977	13,396

Mombasa Island is the county headquarters, in addition, it houses the port which is a major hub for the country, this among other cultural, socio-economic activities results in the high population in the area. This entire population is currently served by the water and sanitation network within Mombasa Island. However, within the informal settlements, there is no water and sanitation infrastructure.

This population stands to benefit from the proposed project.

4.3.3 Health

Mombasa Island is the headquarters of the County being home to the Coast General Hospital, which is the second largest government hospital in Kenya and serves as the tertiary referral centre for the entire coast region. In addition, the County is also home to private hospitals including Aga Khan Hospital.

Being a coastal city and a hub for tourism, the prevalence of HIV/AIDS is relatively high with the National Aids Control Council reporting that 54,670 people currently live with HIV/AIDS 6,870 of whom are women and children, however the prevalence of rate within Mombasa Island is 3% which is lower than that of the other sub-counties within Mombasa.

4.3.4 Transport and Communication

Being a major City in Kenya, the area is served by a wide network of roads. In addition, Mombasa is home to the Moi International Airport which is the second largest airport in the Country. Thus the area is well served by a transport network. The only area that has not progressed with the provision of a modern transport network is the Mombasa Old town which is still reminiscent of the Swahili town architecture characterized by narrow streets.

4.3.5 Commerce and Industry

Mombasa Island is a hub of tourism and commerce housing a large number of beach hotels and the major port at Kilindini. The area is a major tourist destination particularly during the summer and winter breaks from European Countries. Of additional interest in Mombasa Island is Mombasa Old Town which houses sites such as Fort Jesus which was declared a world heritage site by UNESCO in 2011. Care must be taken into account during the project implementation to ensure that the project does not adversely affect any cultural sites. The debris that is currently making its way into the Indian Ocean currently affects tourist activities due to the unsightly floatables within the ocean along the beaches and within the ocean.

In addition to the tourism, the Indian Ocean provides a fishing ground for the local fishermen, who supply fresh fish to the beach hotels in the area. With the increase in population within Mombasa Island pollution has increased which makes its way to the Indian Ocean as part of the storm water. The pollutants to the Indian Ocean include, plastics from the town, grit, which fish ingest and are negatively affected.

4.3.6 Local Communities

The project area is a cosmopolitan area made up of various communities, but majority of the residents are the waswahili people. The Tudor, Railways, Makupa and Mbaraki outlets are located in low income areas known locally as “Moroto” which are densely populated. The

outlets located at the existing pump stations are located within Mombasa Old town housing densely populated houses in the true Swahili culture characterized by narrow streets.

Figure 4-35: Project Areas showing areas that are densely populated

4.3.7 Water and Sanitation Services

Mombasa County receives its water from four sources namely Baricho Wellfields, Mzima Springs, Marere and Tiwi. It is proposed to increase the water supply via the construction of Mwache Dam.

Sanitation services are not as widely spread as the water supply services. Only Mombasa West Mainland and parts of Mombasa Island are served by sewerage services, with the Kipevu treatment works serving Mombasa West Mainland and Kizingo Treatment works serving Mombasa Island. The Kipevu Treatment plant is not fully functional with some of the mechanized components being out of service. The Kizingo Treatment plant is not working all

together, which has led to several illegal connections to the storm water network. The poor sanitation in Mombasa Island has led to high plastic content, suspended solids, waste water with BOD/COD making its way into the Indian Ocean.

The figure below shows one of the outlets at a CSO showing the storm water, with floatables and grit, contaminated by waste water

Figure 4-36: Storm Water showing floatables and waste water making its way into the Indian Ocean via the CSOs

Figure 4-37: Storm Water with floatables and grit making its way into the Indian Ocean

Figure 4-38: Solid Waste at some of the settlements at the project area

According to KEMFRI studies of the receiving water at Fort Jesus, the Indian Ocean has a concentration of 35mg/l of suspended solids . the floatables and grit are just physically seedn and should be completely removed from the storm water before entering the Indian Ocean. These suspended flows will be removed during the preliminary treatment proposed at the headworks. The BOD for the area is approximately 565mg/l. However the major baseline that will be looked into will be the removal of floatables and grit from the ocean as the major indicator of improvement.

1) Main Authorities in the Project Area

Mombasa is under the jurisdiction of the Mombasa water and Sewerage Company (MOWASCO) which is mandated to manage the water and sewerage services within Mombasa. MOWASCO is in charge of the operation and maintenance of the water and sewage facilities in Mombasa. In addition, WSP carries out billing for services within Mombasa. the WSP makes use of WASREB's tariff policy for providing sustainable and affordable water supply and sanitation services to the poor to cover basic human need while at the same time ensuring financial viability of the services provided. The block tariff structure of MOWASCO incorporates the "pro-poor" policy through the provision of a lifeline tariff for poor households. This is done by charging for water and wastewater services way below the cost coverage level for the consumption of up to 6m³ per month and connection. MOWASCO's current social lifeline tariff for the poor households for the lowest consumption block 0-6 m^3 per month is only 53 percent of the weighted average tariff. This ratio, which is within the range set by WASREB, will be maintained during project implementation. MOWASCO's wastewater tariff is currently 75 percent of the water supply tariff. By pegging the wastewater tariff to the water tariff, the cost for wastewater discharge for the consumption block 0-6 m^3 per month is also very low. In addition it needs to be notices that almost exclusively the middle income and upper

middle income families are connected to the sewage system while low income families use on-site sanitation.

It should be noted that the investment will be recovered after the achievement of the long term goals from which the project sum will be recovered. This project can be termed as a social uplifting project.

5 RELEVANT LEGISLATIVE/ REGULATORY FRAMEWORK

There are many laws and regulations governing issues of environmental concern in Kenya. The principal National legislation is the Environmental Management & Coordination (Amended) Act of 2015. The Act empowers stakeholders to participate in sustainable management of the natural resources. It calls for Environmental and Social Impact assessment (ESIA) to guide the implementation of environmentally sound decisions. Other local laws and regulations looked into include but are not limited to, the Constitution, the Water Act of 2002 among others.

In addition to the local legislation, the Consultant has identified some World Bank Policies of relevance to the project.

The following is an outline of the legislative, policy and regulatory framework for which the Proponent shall observe and implement in an effort to comply with Environmental Sustainability.

5.1 THE ENVIRONMENTAL MANAGEMENT AND COORDINATION (AMENDED) ACT OF 2015

This Act is an amendment of the Environmental Management and Co-ordination Act of 1999. The amended Act covers virtually all diverse environmental issues which require a holistic and coordinated approach towards its protection and preservation for the present generation without compromising the interests of the future generation to enjoy the same. Consequently, the amended act provides for the legal regime to regulate, manage, protect and conserve biological diversity resources and access to genetic resources, wetlands, forests, marine and freshwater resources and the ozone layer to name a few.

The Environmental Management and Coordination (Amended) Act, 2015 harmonizes the various requirements of the other existing laws and regulations by stipulating that where the provisions of any existing law conflicts with itself, then the provisions of the Environmental Management and Coordination (Amended) Act, 2015 shall prevail. This way, the act is able to minimize any conflicts in enforcement of the various environmental laws and regulations as applied to the relevant sectors. The Environmental Management and Coordination (Amended) Act, 2015 represents the culmination of a series of initiatives and activities coordinated by Government and stakeholders. It accentuates the right of every person in Kenya to live in a clean and healthy environment and obliges each and every one to safeguard and enhance the environment. It is the master plan for the environment in Kenya and contains a National Environment Policy, Framework Environmental Legislation and Environmental Strategy.

The Act gives power to the National Environment Management Authority (NEMA) which is a semi-autonomous government agency mandated to exercise general supervision and coordination over all matters relating to the environment and to be the principal instrument of the Government of Kenya in the implementation of all policies relating to the environment. NEMA is the body in charge of ensuring developments adhere to the policies and frameworks set out by the Authority.

The amended act highlights the need for an ESIA which is presented in this report.

5.2 THE ENVIRONMENT MANAGEMENT AND COORDINATION AMENDED ACT 2015 AND ITS TOOLS

The Act has several regulations that aid in its implementation the relevant regulations are highlighted in the sections below:

5.2.1 Environmental (Impact Assessment and Audit) Regulations 2003

These Regulations stipulate the importance of conducting an ESIA as well as the procedure necessary. The Regulations highlight the various reports and their contents to be submitted to NEMA for licensing. The regulations highlight the ESIA process which includes:

- Paying a fee of 0.1% of the project cost to facilitate licensing.
- Submission of a ESIA project report to NEMA for review or licensing
- In some cases the Authority will request for a full study report for some projects for which the applicant will be required to prepare a Terms of Reference and submit a study report.

The project and study reports will be conducted before the implementation of the development in question, the reports will be subject to approval by NEMA, which will provide a license after the payment of 0.1% of the project cost.

The regulations also calls for Environmental auditing and monitoring that will be carried out during the construction or operation of the enterprise, the regulations provide the format of the audit report which will be provided to NEMA.

5.2.2 Water Quality Regulations (2006)

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. Different standards apply to different modes of usage. These regulations provide for the protection of lakes, rivers, streams, springs, wells and other water sources.

These regulations provide the standards for effluent discharge into receiving water sources, which will be important for this project as a combination of waste water and storm water will be discharged into the Indian Ocean from the various discharge points within Mombasa Island. Of particular importance is the suspended solids concentration requirements which is a maximum of 30 mg/L. The IFC standards provide a maximum suspended solids quantity of 50mg/l, this is higher than the local standards, as such the local standards will take precedence.

The effluent from the improved storm water outlets will have to meet the above regulations during its operation. The design has been carried out to meet these standards.

In addition, these regulations require the application for a license for each of the outlets to discharge the water into the ocean, for which the proponent will have to make an application.

5.2.3 The Environmental Management and Coordination (waste management) Regulation, 2006

The Waste Management Regulations are meant to streamline the handling, transportation and disposal of various types of waste. The aim of the Waste Management Regulations is to protect human health and the environment. The regulations place emphasis on waste minimization, cleaner production and segregation of waste at source.

These regulations will be of great importance particularly during the construction and operation phases of the project. During the Construction, the Contractor will have to meet the requirements of the regulations, by providing solid waste sorting and transportation using a licensed transporter who will dispose of the solid waste to the designated receptacle. In addition, during the operation, the Proponent will shall have to take the initiative to ensure that

the solid waste generated from the site will be transported by a licensed transporter as well as being disposed into an acceptable receptacle.

5.2.4 EMCA (Noise and Excessive Vibration Pollution Control) Regulations, 2009

These Regulations determine the level of noise that will permissible in particular during the construction of the improvements, the following factors will be considered:

- Time of the day;
- Proximity to residential area;
- Whether the noise is recurrent, intermittent or constant;
- The level and intensity of the noise;
- Whether the noise has been enhanced in level or range by any type of electronic or mechanical means; and,
- Whether the noise is subject to be controlled without unreasonable effort or expense to the person making the noise.

The Contractor will have to meet the requirements of these regulations particularly during the construction process, where some of the construction activities are bound to make some level of noise. These regulations are summarised in the table below:

Table 5-1: Table showing Permissible Noise Level for a Construction Site

Facility		**Local Maximum Noise Level Permitted in Decibels**	
		Day	**Night**
1.	Health facilities, educational institutions, homes for disabled etc.	60	35
2.	Residential areas	60	35
3.	Areas other than 1 and 2 above	75	65

In addition, the IFC regulations for permissible noise levels are summarized in the table below:

Facility		**Maximum Noise Level Permitted in Decibels**	
		Day	**Night**
1.	Residential; institutional; educational	55	45
2.	Industrial; commercial	70	70

Comparatively both regulations are relatively similar, as such the local regulations will be used.

5.2.5 Draft Environmental Management and Coordination (Air Quality) Regulations, 2009

The objective of the Regulations is to provide for prevention, control and abatement of air pollution to ensure clean and healthy ambient air. It provides for the establishment of emission standards for various sources such as mobile sources (e.g. motor vehicles) and stationary

sources such as the improvements made to the storm water outlets. The Contractor will have to ensure all his machinery do not exceed the emissions made in the regulations (presented in the first schedule of the regulations). In addition, the operation of the improvement works will not exceed the requirements set in the third schedule of the regulations. (Nitrogen Oxides NH_3 – 100-400 mg/Nm^3, Hydrocarbons – 400 – 2000 mg/Nm^3 and Hydrogen Sulphides 50 – 200 mg/Nm^3). The design of the improvements has incorporated these standards into the design.

5.2.6 The Environmental Management and Co-Ordination (Wetlands, River Banks, Lake Shores and Sea Shore Management) Regulations, 2009

These regulations identify wetlands as areas permanently or seasonally flooded by water where plants and animals have become adapted and incorporates riparian and coastal zones. Its main purpose is to ensure the conservation and sustainable use of wetlands. The regulations identify the need for an EIA for any development that may cause harm to the wetland. The project will be located along the coastline, and within its riparian, thus the need to carry out the ESIA study presented in this report.

5.3 WATER ACT 2016

This Act is an update of the Water Act of 2002. It makes provision for the provision of clean and safe water in adequate quantities and to reasonable standards of sanitation for all citizens.

The Act gives power to Water Works Development Agencies which are charged with:

a) Undertaking the development, maintenance and management of the national public water works within its area of jurisdiction.
b) Operating the waterworks and providing water services as a water service provider, until such time as responsibility for the operation and management of the waterworks are handed over to a county government, joint committee, authority of county governments or water services provider within whose area of jurisdiction or supply the waterworks is located.
c) Providing a reserve capacity for purposes of providing water services where pursuant to section 103, the Regulatory Board orders the transfer of water services functions from a defaulting water services provider to another licensee.
d) Providing technical services and capacity building to such county governments and water services providers within its area as may be requested; and
e) Providing to the cabinet secretary technical support in the discharge of his/her functions under the constitution of this Act.

In accordance to Article 152 of the Act, CWSB under whose jurisdiction the project falls, will transition into a Water Works Development Agency. However, this transition has not yet occurred, as such the Consultant will still report to the CWSB and one of its service providers MOWASCO under whose jurisdiction the project falls.

5.4 THE PUBLIC HEALTH ACT (CAP. 242)

Part IX Section 8 & 9 of the Act states that no person/institution shall cause nuisance or condition liable to be injurious or dangerous to human health. Any noxious matter or waste water flowing or discharged into a water course is deemed as a nuisance. Part Xll Section 136 states that all collections of water, sewage, rubbish, refuse and other fluids which permits or facilitates the breeding or multiplication of pests shall be deemed nuisances The Act addresses matters of sanitation, hygiene and general environmental health and safety. This Act will govern the Contractor's activities on site including ensuring the health and safety of employees

including providing health services when it comes to venereal diseases. In addition, this law justifies the need for the improvements needed on the storm water outlets, due to the free flowing of waste water into the Indian Ocean that is currently occurring. The improvements made to the storm water outlets will provide treatment to the waste water before being discharged into the Indian Ocean.

5.5 THE CONSTITUTION OF KENYA 2010

Article 42 states that every person has the right to a clean and healthy environment. The constitution provides guidance on steps that may be taken in case any of any infringement on these rights. In addition, the constitution provides for the establishment systems for carrying out environmental impact assessment, environmental audit and monitoring of the environment.

In addition to the protection of the environment, the constitution states that the land in Kenya belongs to the people of Kenya collectively as a nation. The constitution classifies the land in Kenya into different categories. These categories will dictate whether compensation will be required for the acquisition of a way leave. The categories include: public (including oceans, land between high and low water marks, all roads and thoroughfares).

The Constitution is critical in identifying the need for this project, since it intends to improve the general environment of the Indian Ocean and it will govern the means to ensuring the method in which the project is carried out, by providing an EIA which is provided in this report.

5.6 THE PREVENTION AND CONTROL OF MARINE POLLUTION ACT, 2014

This Act protects the Indian Ocean from pollution from ocean plying vessels or facilities that deposit waste into the Indian Ocean. This act mainly applies to ocean plying vessels, however chapter 5 of the Act states that all vessels must have holding tanks to prevent the flow of untreated sewage into the ocean, as such these vessels must make use of the facilities at Mombasa, thus sensitizing the importance of having a working waste water system. This project will go a long way in ensuring untreated sewage does not make its way into the Indian Ocean.

5.7 THE LAND ACT, 2012

This Act applies to all land declared as public land in Article 62 of the Constitution and all private land as declared by Article 64 of the Constitution.

The Act identifies all public land, of importance to this project will be riparian land where the improvements to the storm water outlets and their access roads in some sites will be located. The Survey Act (CAP 299) identifies this reserve as 60m from the high-water mark.

The enactment of the Land Act, Sec 157(2), criminalized encroachments on public land as follows:

i. Unlawful occupation of public land is an offence which attracts fines of up to KES 500,000 and if a continuous offence, a sum not exceeding KES 10,000 for every day the offence is continued;
ii. Wrongful obstruction of a public right of way is an offence and attracts a fine of up to KES 10,000,000 and if a continuous offence, a sum of up to KES 100,000 for every day the offence is continued; and
iii. In addition to these criminal sanctions, any rights over land that were obtained by virtue or on account of an offence may be cancelled or revoked.

5.8 CITIES AND URBAN AREAS ACT 2011

This act identifies Mombasa as a city due to its integrated urban area. The city is under the jurisdiction of boards which carry out the duties of the County Government. The various boards within the city are charged with:

a) exercise executive authority as delegated by the county executive;
b) ensure provision of services to its residents;
c) impose such fees, levies and charges as may be authorised by the county government for delivery of services by the municipality or the city;
d) promote constitutional values and principles;
e) ensure the implementation and compliance with policies formulated by both the national and county government;
f) make bye-laws or make recommendations for issues to be included in bye-laws;
g) ensure participation of the residents in decision making, its activities and programmes in accordance with the Schedule to the Act; and
h) exercise such other powers as may be delegated by the county executive committee.

This Act identifies the importance of consulting with the county council and its departments for the proposed project in order to get opinions and recommendations for the successful implementation of the project. In addition, the County Council will be part of the operation of the proposed project, as well as being a key stakeholder in the resettlement of PAPs.

5.9 PHYSICAL PLANNING ACT (CAP 286)

The act state that while giving due considerations to the rights and obligations of landowners, there shall be compensation whenever a materials site, diversion or realignment results into relocation of settlement or any change of user whatsoever of privately owned land parcels.

Under the physical planning act, physical development activities are supposed to be carried out according to the physical plans. Accordingly, the processes of physical planning involve two stages; the plan making stage and the development control stage. The former involves drawing up the actual plan to indicate the various activities and zones whereas the later involves the process of determining applications by developers to carry out specific development activities. Section 36 states "if in connection with a development application a local authority is of the opinion that proposals for the outlets or any other development activity will have injurious impact on the environment, the applicant shall be required to submit together with the application an environment impact assessment report". This ESIA covers the proposed outfalls.

5.10 OCCUPATIONAL HEALTH AND SAFETY ACT

This legislation provides for protection of workers during construction and operation phases of the project. This act will provide some of the mitigation measures for any negative impacts in particular those concerning the workers within the site.

5.11 THE HIV AND AIDS PREVENTION AND CONTROL ACT

This is an Act of Parliament to provide measures for the prevention, management and control of HIV and AIDS, to provide for the protection and promotion of public health and for the appropriate treatment, counseling, support and care of persons infected or at risk of HIV and AIDS infection, and for connected purposes.

This Act will ensure that the Contractor makes provision for VCT services for employees and locals, as well as promotes public awareness. This will go a long way in ensuring stigmatization of HIV and AIDS is reduced as well as managed during the construction period.

5.12 NATIONAL GENDER AND DEVELOPMENT POLICY

The National Gender and Development Policy provide a framework for advancement of women and an approach that would lead to greater efficiency in resource allocation and utilisation to ensure empowerment of women.

The National Policy on Gender and Development is consistent with the Government's efforts of spurring economic growth and thereby reducing poverty and unemployment, by considering the needs and aspirations of all Kenyan men, women, boys and girls across economic, social and cultural lines. The policy is also consistent with the Government's commitment to implementing the National Plan of Action based on the Beijing Platform for Action (PFA).

The overall objective of the Gender and Development Policy is to facilitate the mainstreaming of the needs and concerns of men and women in all areas in the development process in the country. This law will be of relevance to the contractor in ensuring that all genders are given an equal opportunity during recruitment during the construction phase and operation phase of the project. The employers will also provide adequate facilities for all genders within the project site.

5.13 THE SEXUAL OFFENCES ACT, 2006

This Act protects people and employees from any unwanted sexual attention or advances by staff members. This act ensures the safety of women, children and men from any sexual offences which include: rape, defilement, indecent acts. This law will govern the code of conduct of the Contractor's staff and provide repercussions of any wrong doing.

5.14 THE CHILDREN ACT, 2001

This Act protects the welfare of children within the Country. The Act identifies Children as a person below the age of 18 years old and protects them from exploitation. Of importance to this project, is section 10, which protects the child from:

- Economic exploitation.
- Any work that interferes with his/ her education, or is harmful to the child's health or physical, mental, spiritual, moral or social development.

5.15 THE COUNTY GOVERNMENTS ACT, 2012

The promulgation of the 2010 Constitution brought about County Governments. This Act highlights the role of the County Government. The County Government will oversee all development activities within the County, as such will be a major stakeholder for the proposed project.

5.16 WORLD BANK SAFEGUARD POLICIES

5.16.1 Operational Policy (OP) 4.01: Environmental Assessment, 2001

Environmental Assessment is used in the World Bank to identify, avoid, and mitigate the potential negative environmental impacts associated with Bank lending operations. The

purpose of Environmental Assessment is to provide guidance for environmental assessment of the WB financed projects, improve decision making, to ensure that project options under consideration are sound and sustainable, and that potentially affected people have been properly consulted. The improvements on the storm water outlets are considered EA Category B, as the project impacts are anticipated to be specific to the project site and reversible with implementation of the proposed mitigation measures.

5.16.2 Operational Policy 4.04: Natural Habitats, 2001

The policy seeks to ensure that World Bank-supported infrastructure and other development projects consider the conservation of biodiversity, as well as the numerous environmental services and products which natural habitats provide to human society. The policy strictly limits the circumstances under which any Bank-supported project can damage natural habitats (land and water areas where most of the native plant and animal species are still present). The Construction activities of the improvements to the outlets should be carried out in a way that doesn't negatively affect the marine biodiversity. The operation of the treatment works at the outlets, will go a long way in reducing the pollution of the Indian Ocean hence maintaining the natural habitats for trees and ocean creatures.

5.16.3 Operational Policy (OP/BP) 4.11: Physical Cultural Resources

The objective of this policy is to assist countries in preserving physical cultural resources and avoiding their destruction or damage. PCR are defined as movable or immovable objects, sites, structures, groups of structures, and natural features and landscapes that have archaeological, paleontological, historical, architectural, religious (including graveyards and burial sites), aesthetic, or other cultural significance. PCR may be located in urban or rural settings, and may be above ground, underground, or under water. The cultural interest may be at the local, provincial or national level, or within the international community. This policy applies to all projects requiring a category A or B environmental assessment, project located in, or in the vicinity of recognized cultural heritage sites. Physical cultural resources are important as sources of valuable scientific and historical information, as assets for economic and social development, and as integral parts of a people's cultural identity and practices. For projects involving substantial civil works a set of "chance find" procedures is to be developed and included into the contracts to be used in case of accidental discovery of cultural objects during construction. Mombasa Island is home to Mombasa Old town which is a heritage recogonised by UNESCO. The existing pump stations which will be improved under this project are located within the old town. Although the improvements will not affect any cultural site, the fact that the site is located within the old town, care must be taken to ensure construction methods do not affect cultural sites within the area. Most of the outlets were located near areas a few mangrove trees, which will have if possible can be avoided during the construction. In addition, the Baxton Outlet is located near a Hindu burial site however no graves will be affected by the project, there may be "chance finds" during construction for which measures will be provided in this report.

5.16.4 The Bank's Operational Policy 4.12: Involuntary Resettlement

This is triggered in situations involving involuntary taking of land and involuntary restrictions of access to legally designated parks and protected areas. The policy aims to avoid involuntary resettlement to the extent feasible, or to minimize and mitigate its adverse social and economic impacts.

It promotes participation of displaced people in resettlement planning and implementation, and its key economic objective is to assist displaced persons in their efforts to improve or at least restore their incomes and standards of living after displacement.

The policy prescribes compensation and other resettlement measures to achieve its objectives and requires that borrowers prepare adequate resettlement planning instruments prior to Bank appraisal of proposed projects.

Some of the outlets will be located within informal settlements within the Ocean riparian, for which resettlement will have to occur.

5.16.5 World Bank Policy on Access to Information, 2010

The World Bank policy on access to information sets out the policy of the World Bank on public access to information in its possession. This Policy supersedes the World Bank Policy on Disclosure of Information, and took effect on July 1, 2010.

This Policy is based on five principles:

- Maximizing access to information.
- Setting out a clear list of exceptions.
- Safeguarding the deliberative process.
- Providing clear procedures for making information available.
- Recognizing requesters' right to an appeals process.

In disclosing information related to member countries/borrower in the case of documents prepared or commissioned by a member country/borrower (in this instance, safeguards assessments and plans related to environment, resettlement, and indigenous peoples, OP/BP 4.01, Environmental Assessments, OP/BP 4.10, Indigenous Peoples, and OP/BP 4.12 Involuntary Resettlement); the bank takes the approach that the country/borrower provides such documents to the Bank with the understanding that the Bank will make them available to the public.

5.17 INTERNATIONAL FINANCE CORPORATION AND WORLD BANK ENVIRONMENTAL, HEALTH AND SAFETY (EHS) GUIDELINES

These are technical reference documents with general and industry-specific examples of Good International Industry Practice (GIIP). When one or more members of the World Bank Group are involved in a project, these EHS Guidelines are applied as required by their respective policies and standards. These General EHS Guidelines are used in addition to the local guidelines in order to provide mitigation measures for the various environmental and social impacts that will be identified in this report.

6 PUBLIC CONSULTATIONS

6.1 LEGAL REQUIREMENTS

6.1.1 Government Policy on Public Consultation

The overall objective of the Government is to involve communities in policy formulation and implementation at the local level. More specifically, the Community Action Planning Programme objective is to put in place a durable system of intra-community co-operation through collective action, which creates communal discussion forums for the implementation of development activities.

6.2 PERSONS OR AGENCIES CONSULTED

The key issues associated with the establishment of the treatment works at the outlet sites will often relate to land-take, biodiversity, pollution, disruption of livelihoods, community safety, traffic management, communicable diseases and employment and trade opportunities.

Effort was not spared to contact all with information on the following issues:

- Assessment of the baseline environmental and social conditions
- Consideration of feasible and environmentally &socially preferable alternatives
- Requirements under Kenya country laws and regulations, applicable international treaties and agreements
- Protection of human rights and community health, safety and security (including risks, impacts and management of project's use of security personnel)
- Protection and conservation of biodiversity
- Sustainable management and use of renewable natural resources (including sustainable resource management through appropriate independent certification systems)
- Use and management of dangerous substances and major hazards assessment
- Labour issues (including the four core labour standards), and occupational health and safety
- Socio-economic impacts & fire prevention and life safety
- Land acquisition and involuntary resettlement
- Impacts on affected communities, and disadvantaged or vulnerable groups
- Cumulative impacts of existing projects, the proposed project, and anticipated future projects
- Consultation and participation of affected parties in the design, review and implementation of the project
- Efficient production, delivery and use of energy
- Pollution prevention and waste minimization, pollution controls (liquid effluents and air emissions) and solid and chemical waste management.

As such a cross-section of persons were consulted in Mombasa County as indicated by the following consultation registers in tables 5-1.

Table 6-1: Persons met during the ESIA study in planning the Improvements on the Storm Water Outlets

No.	Name	Office	Designation	Contacts
1	Mr. Francis Kombe	Mombasa County Water, Environment, and	Officer	+254721820335

		Natural Resources Office		
2	Abdi Ibrahim Abdi	Mombasa County Lands, Planning and Housing Department	County Executive Member	+2547250190
3	Mr William Opiyo	Mombasa County NEMA offices	EIA officer	+254726537061
4	Mr. Juma Sudi	MOWASCO	Sanitation Officer	+254712287666

6.2.1 Overview from the Officer – Mombasa County Government Water, Environment and Natural resources Office.

The Environmental officer made recommendations for consultations with key stakeholders within the County, to ensure that all stakeholders were aware and had accepted the project. He added that projects that would displace people would have to be treated following the correct procedures to ensure seamless transitions and resettlement. The Consultant noted their recommendations and would include them in the ESIA report.

6.2.2 Overview from the County Executive Member Mombasa County Lands, Planning and Housing Department.

The County Executive Member presented copies of the County Financial Plan to the Consultant, stating that all the development projects were summarized in the plan, including improvements to the sanitation within the County.

6.2.3 Overview from the EIA Officer NEMA.

The EIA officer stated that, the consultant could prepare a comprehensive ESIA report for all 12 sites, which could be submitted at the County level for approval and licensing, and one license was adequate for all the sites.

6.2.4 Overview from the Sanitation Officer MOWASCO.

The officer expressed the need for the project stating that the Indian Ocean was getting extremely polluted due to illegal connections to the storm water system. he pointed out that the Kizingo Treatment works had broken down, as such raw sewage was making its way into the Indian Ocean. He took the Consultants on a tour of the existing storm water facilities showing the areas where raw sewage was making its way to the Indian Ocean. He added that the residents near the outlet locations, were suffering due to the pollution of the Indian Ocean. He concluded, stating that the project was extremely important, and expressed hope that the project would be implemented as soon as possible to improve the current conditions.

6.3 PUBLIC CONSULTATION

The Consultant carried out public consultation in the form of a consultative meeting where, the Consultant presented the project to the local community, comprised of stakeholders, including representatives of the current residents of the project areas among others. The Consultant held

a meeting on 16th December 2016 at the chief's office in Railways Location, minutes, photos and an attendance sheet of the meeting are presented in appendix 12.2. The meeting was attended by 30 participants from all the affected project locations. The participants were made up of village elders, women representatives, youth representatives, a CWSB representative and the local administration.

6.3.1 Findings of the meetings

The meetings included a presentation by the Consultant on the proposed works, the various environmental and social impacts that may arise from the project including resettlement at some of the sites. The consultant however pointed out that the Designers had tried their very best to minimize resettlement and that the proposed improvements would be located within the Ocean's riparian. She highlighted the mitigation measures for all the impacts in accordance to the RAP. She also disclosed the features of the RAP including cut off dates.

Being a public consultation meeting, feedback from the stakeholders was obtained with majority of the stakeholders approving of the project however the needs of the residents in the projects area be looked after due to the fact that most of them were low income earners and would have nowhere to move to. In addition, the residents were all of the opinion that the project was long overdue with many residents complaining of deficiencies in the storm water system. The meeting was successful, with the public accepting the project.

6.4 CONSULTATION DURING THE PROJECT DURATION

The Consultant also proposes that continuous consultation be carried out throughout the construction phase of the project using focus group discussions to ensure interested stakeholders are aware of construction procedures and provide a forum for feedback and recommendations for implementation in the construction, the consultation will occur during the eenvironmental supervision, monitoring, and evaluation which will be carried out every four months. In addition, there is a grievance redress procedure which is provided in chapter 9.4 of this report.

7 ENVIRONMENTAL AND SOCIAL EFFECTS OF THE PROPOSED PROJECT

This chapter presents the general environmental and social impacts which may result from the proposed project. The emphasis will be initially on the specific impacts that are likely to result from the nature of works including excavation and concrete works.

The construction of the improvements at the existing storm water outlets will greatly benefit the environment, however some of the project activities will have negative effects on the environment.

In general, successful implementation of the project will have high environmental and socio economic benefits to the people and will contribute to the health and wellbeing. Overall, expected negative impacts are related to the improvements to the existing storm water outlets including construction of the inlet chamber, fine and coarse screens and grit removal chamber, as well as the general operation of the treatment works. These impacts are localized and not considered significant and long-lasting and can be mitigated through appropriate mitigation measures. The severity and duration of these impacts can be minimized by ensuring that the excavation and construction works are limited to short working sections, and that works are carried out rapidly and efficiently. Table 6.1 presents a characterization of expected impacts.

Table 7-1: Characterization of Impacts

Aspect	Predicted Impact	Characterization of Impacts								
		Nature		Effect		Time Range			Reversibility	
		Positive	Negative	Direct	Indirect	Short Term	Medium Term	Long Term	Reversible	Irreversible
Traffic	Increased traffic along the project routes		X	X		X		X		X
Ambient Air Quality	Increased local pollutant emissions and trace constituents such as VOCs Increased GHG emissions such as CH_4 and CO_2		X	X		X			X	
	Increased levels of dust and particle emissions from construction vehicles and equipment		X	X			X		X	
soil/water pollution	Contamination of ocean from oil spills during construction		X	X			X	X		X
	Surface water pollution from construction wastes		X	X			X	X	X	
Noise and vibrations	Increase of noise and vibration levels due to construction activities and traffic		X	X		X			X	

Aspect	Predicted Impact	Characterization of Impacts								
		Nature		Effect		Time Range			Reversibility	
		Positive	Negative	Direct	Indirect	Short Term	Medium Term	Long Term	Reversible	Irreversible
Health & Safety	General construction related health and safety risks for workers		X	X		X			X	X
	HIV/AIDS and increased disease risks.		X	X	X	X	X	X		X
	Improvement in public health and sanitation through reduced pollution of the Indian Ocean.	X		X		X	X	X		
Socio-economics	Improvement of local and regional socio-economy	X			X			X		
	Employment and job creation during construction and operation phases	X		X		X	X	X		
solid and liquid waste	generation of both solid and liquid waste at the construction camps and at outlet sites		X	X		X	X	X	X	
Impacts on Flora and Fauna	Loss of flora and fauna within the project site		X	X			X		X	

Aspect	Predicted Impact	Characterization of Impacts								
		Nature		Effect		Time Range			Reversibility	
		Positive	Negative	Direct	Indirect	Short Term	Medium Term	Long Term	Reversible	Irreversible
Loss of Structures/ cultural sites	loss of livelihood demolition of structures Loss of Domicile Potential loss of cultural sites		X	X				X		X
Gender	Increased harassment of females within and around the site		X	X		X			X	
Crime Management	Increased insecurity around the project sites		X		X		X		X	
Child Labour and Protection	Potential for exploitation of child labour		X	X		X			X	
Labour influx	Risk of social conflict as a result of increase in influx population		x	x	x		x		x	

7.1 IMPACT CATEGORIES

First the likely significance of the potential issues of concerns has been determined and ranked according to the following:

- Potential environmental impacts which are deemed to be highly significant and need thorough investigation in the ESIA
- Potential environmental impacts that are deemed to be moderately significant, and will require reasonable investigation in the ESIA
- Potential environmental impacts that are deemed unlikely to be significant, and will need to be listed, and addressed in some way, but which will not require detailed assessment in the ESIA.

Secondly, the following characteristics have been defined for each impact:

Nature:

- Positive: applies to impacts that have a beneficial economic, environmental or social result, such as additional economic activity or enhancement of the existing environmental conditions.
- Negative: applies to impacts that have a harmful or economical aspect associated with them such as economical cost, loss or degradation of environmental resources.

Effect:

- Direct: applies to impacts which can be clearly and directly attributed to a particular impacting activity.
- Indirect: applies to impacts which may be associated with or subsequent to a particular impacting activity, but which cannot be directly attributed to it.

Time Range:

- Short Term: applies to impacts whose effects on the environment will disappear within a 1 year period, or within the construction phase.
- Medium Term: applies to impacts whose effects on the environment will disappear within a 5-year period following the construction phase.
- Long Term: applies to impacts whose effects on the environment will disappear in a period greater than 5 years following the construction phase.

Reversibility:

- Reversible: applies to impacts whose significance will be reduced and disappear over time (either naturally or artificially), once the impacting activity ceases.
- Irreversible: applies to impacts whose significance will not be reduced nor disappear over time (either naturally or artificially), once the impacting activity ceases.

7.2 IMPACTS EMANATING FROM THE PROPOSED PROJECT

The impacts are identified at three stages: -

- pre- construction/Planning Phase Impacts
- during construction and
- post-construction (operation phase)

7.2.1 Planning Phase Impacts

The impacts during this phase will be negative and will mainly be the displacement of project affected persons living in the project area. A few of the outlets are located in informal settlements where some domiciles will be negatively affected. Majority of the outfalls will be located within the ocean riparian, including the access roads that will be required for the Tudor, Buxton and Railway outfalls.

Mitigation measures
The Outfalls will be located within the ocean riparian, as such is deemed as public land, however there is encroachment of squatters. These squatters' own structures, trees, crops, and fences, who will become project affected persons.
Project affected persons to be identified by type of loss through a detailed resettlement action plan, which has been prepared and submitted to the Client alongside this report.
The affected persons to be compensated for loss of houses and ancillary buildings, land, trees, livelihood productivity, and land improvements
MOWASCO and CWSB to agree with the local community on the form of compensation for loss of structures, trees, crops, and livelihood (such as alternative and affordable housing.). Once the community is fully compensated the contractor may move to site
The mitigation measures for social impacts are to ensure that the affected persons' living standards are improved or at least restored to previous levels before the construction after implementation of the project.

7.2.2 Construction Phase Impacts

Most of the potential environmental and social impacts associated with the construction phase will be negative and temporary, and can be mitigated with the use of standard environmental management procedures. The potential social impacts or nuisance will be those typically associated with construction activities involving vehicles, equipment, and workers. The predicted impacts include the following:

1) Traffic Congestion

Traffic congestion is anticipated from site related traffic from Contractor vehicles. The project sites are located in residential and industrial areas where there is bound to be an increased conflict between the project vehicles and residents of these areas.

Mitigation measures
The Contractor should provide temporary road signs or notices to indicate ongoing works;
The Contractor should effect traffic controls to avoid congestion and accidents on roads;

- The Resident Engineer and Contractor should choose traffic routes to reduce the impact in the neighborhood avoiding, as far as practical any sensitive areas;
- For the site traffic the Contractor has to ensure that they

  Only park in designated parking areas;
  Don't block pedestrian routes;
  Don't block traffic routes;
  Obey the speed limit
  The resident Engineer has to ensure that the Contractor:
  i) Introduces segregated pedestrian walkways;
  ii) Introduces speed limits particularly in the residential areas;
  iii) Reduces the need for reversing vehicles, by introducing a one way system;
  iv) Uses a qualified BANKSMAN to control deliveries and reversing vehicles;
  v) Designates loading/unloading areas.

2) Site Related Oil Spills

During construction, oil spills may result from construction site equipment and storage, which can make its way into the Indian Ocean which is located nearby.

Mitigation Measures

- The Contractor should ensure that the employees on site are aware of the company procedures for dealing with spills and leaks from oil storage tanks e.g. using dispersants or adding biological agents to speed up the oil breakdown for the construction machinery though induction and safety training (the contractor will propose a method of cleanup which will be subject to approval);
- If the oil spill makes its way to the ocean, the Contractor can make use of a boom and skimmer to contain the oil spill
- In case of spillage the Contractor should isolate the source of oil spill and contain the spillage to the source of leakage before it makes its way into the ocean, using sandbags, sawdust, absorbent material and/or other materials approved by the Resident Engineer;
- The Resident Engineer and the Contractor should ensure that there is always a supply of absorbent material such as saw dust on site during construction, readily available to absorb/breakdown spill from machinery or oil storage, this can be incinerated after use;
- All vehicles and equipment should be kept in good working order, serviced regularly in accordance to the manufacturers specifications and stored in an area approved by the Resident Engineer;
- The Contractor should assemble and clearly list the relevant emergency telephone contact numbers for staff, and brief staff on the required procedures.

3) Soil-Related Impacts

All construction activities have some minor impacts on the soil. However, these are localised and restricted locally to each site. It is expected that these impacts are also short-lived during construction and mitigation measures are recommended. The key impacts will revolve around soil erosion, contamination, disturbance of the natural soil structure and thus reducing the ecological function of the soil.

Mitigation Measures
In cases where it is identified that during construction there is a danger of increased run-off or at the project site, temporary drainage channels or holding ponds can be employed After completion of the construction works, restoration of the ground by sowing adequate grass cover and planting of trees will be followed, therefore the impact is temporary and reversible. In areas prone to erosion, provision of soil stabilization in form of a retaining wall or planting of trees, subject to approval by the Resident Engineer Plan emergency response measures in case of accidental oil spills.

4) Impacts on Water Resources

The various construction activities may have a negative impact on the Indian Ocean. Solid as well as liquid waste if not properly disposed of, will make its way into the ocean, thus affecting the ocean ecosystem.

Mitigation Measures
Ensure proper solid and liquid wastes disposal mainly from the construction camps, sites and offices. Ensure proper measures are in place for collection and disposal of spilled oils and lubricants.

5) Socio - Economic Impacts

During construction the project will have clear benefits with regard to local employment opportunities. The project will additionally require various skills and services which may not be available on the local level but certainly on the regional level, e.g. masonry workers, concrete workers, metal workers, etc. for which appropriate personnel will be contracted.

The increase in employment will temporarily lead to an overall increase of income directly and indirectly (through increased demand of other local services). Consequently, food vendors will have new opportunities to sell their commodities to the construction workers.

The major negative impact in will be that the in migration of people from different regions may have social risks which include but not limited to; increased illicit behaviour and crime, increased risk in the spread of diseases such as HIV/AIDS and communicable diseases, etc.

Mitigation

- Unskilled construction and skilled (if available) labor to be hired from the local population as far as possible to minimize on influx of foreigners into the community.
- Use of manual labor during excavation and construction works where possible to ensure more employment of locals and hence ensure project support throughout the construction process.
- Ensure effective and matching contractual provisions for contractor to manage labour influx
- Sensitize workers and the surrounding community on awareness, prevention and management of HIV / AIDS through staff training, awareness campaigns, multimedia, and workshops or during community Barazas.
- Use of existing clinics to provide VCT services to construction crew and provision of ARVs for vulnerable community members
- The Contractor should enforce and maintain a code of conduct for his employees

6) Air Quality

Construction activities of materials delivery, excavation of foundations, concrete works and construction traffic will generate a lot of noise and dust especially during the dry seasons.

Vehicular traffic to the proposed sites is expected to increase especially during delivery of raw materials. Vehicular traffic emissions will bring about air pollution by increasing the fossil fuel emissions into the atmosphere. The new access routes before completion will be to earth/murram standards, which is bound to cause an increase in dust emissions to the neighbouring areas.

Mitigation:

- Use protective clothing like dust masks on construction crew.
- Construction sites and transportation routes (those that are murram and earth standards) will be water-sprayed on regularly up to three times a day, especially if these sites are near sensitive receptors, such as residential areas or institutions (hospitals, etc.).
- All the vehicles and construction machinery should be operated in compliance with relevant vehicle emission standards and manufacturer's specification to minimize air pollution.

7) Noise Pollution

Noise and vibration generated during construction by heavy construction machinery, such as excavators, bulldozers, concrete mixers, and transportation vehicles.

Generally, construction noise exceeding a noise level of 70 decibels (dB) has significant impacts on surrounding sensitive receptors within 50m of the construction site. These sensitive receptors include, the Hindu burial site at the Baxton Outlet, the Coast General Hospital at the Coast General Site.

Mitigation:
Avoid night time construction when noise is loudest. Avoid night-time construction using heavy machinery, from 22:00 to 6:00 near residential areas. No discretionary use of noisy machinery within 50 m of residential areas and near institutions. Good maintenance and proper operation of construction machinery to minimize noise generation. Where possible, ensure non mechanized construction to reduce the use of machinery

8) Impacts on Flora and Fauna

The project runs the risk of contamination of the ocean via cement and oil spills that could possibly occur during the construction. These leaks will have a negative impact on the ocean flora and fauna.

The clearing of the project site(s), will also lead to the loss of biodiversity through the removal of vegetation which will affect the various fauna that have their habitats in the cleared vegetation.

Mitigation:
Re-plant the indigenous vegetation as much as possible once work is completed. Spare the vegetation that must not necessarily be removed such as trees. Minimize the amount of destruction caused by machinery by promoting non-mechanized methods of construction. Ensure protection of the ocean ecosystem by proper handling of cement during civil works. The Contractor should ensure that the employees on site are aware of the company procedures for dealing with spills and leaks from oil storage tanks e.g. using dispersants or adding biological agents to speed up the oil breakdown for the construction machinery though induction and safety training (the contractor will propose a method of cleanup which will be subject to approval); If the oil spill makes its way to the ocean, the Contractor can make use of a boom and skimmer to contain the oil spill

9) Public Health and Safety

Construction staff and the general public will be exposed to safety hazards arising from construction activities. Most of the project sites will be located within informal settlements, as such there is a risk of injuries from locals accessing the site during construction.

The project works will expose workers to occupational risks due to handling of heavy machinery, construction noise, electromechanical works etc.

Construction activities of vegetation clearing, excavation, materials delivery and concrete mixing and construction traffic will generate a lot of dust and this may affect the respiratory system.

The high temperatures in the area will expose the workers to difficult working conditions.

Construction sites may be a source of both liquid and solid wastes. If these wastes are not well disposed these sites may become a breeding ground for disease causing pests such as mosquitoes and rodents.

At the concrete mixing plant, the exposure of human skin to cement may lead to damage of the skin.

Mitigation:
- Ensure that all construction machines and equipment are in good working conditions and to manufacturer's specifications to prevent occupational hazards. - Establish a Health and Safety Plan (HASP) for both civil and electromechanical work. - Appoint a trained health and safety team for the duration of the construction work. - Provide workers with appropriate personal protective equipment (PPE). - Provide workers with adequate drinking water and breaks. - Provide workers training on safety procedures and emergency response such as fire, oil and chemical spills, pipe bursts and other serious water loss risks. - Roads passing through population centers will be water sprayed to reduce dust. - Work to minimize or altogether eliminate mosquito breeding sites. - Provide appropriate human and solid waste disposal facilities e.g. Toilets and dustbins at strategic points - Fence off the site with security to avoid unauthorized access to the project site(s) and hence potential injuries. - Provide clean toilets for workers, these toilets will be to World Health Organisation standards.

10) HIV & AIDS Impacts

In migration of people from different regions may lead to behavioural influences which may increase the spread of diseases such as HIV/AIDS.

Mitigation:
- Sensitize workers and the surrounding communities on awareness, prevention and management of HIV/AIDS through staff training, awareness campaigns, multimedia and workshops or during community Barazas. Provide information, education and communication about safe uses of drinking water.

Use of existing clinics to provide VCT services to construction crew and provision of ARVs for vulnerable community members

11) Gender Empowerment Impacts

There is need to promote gender equality in all aspects of economic development and more so in construction. Women roles in construction are mainly confined to supply of unskilled labour and vending of foodstuffs to the construction workers. Where available skilled women will be used.

Mitigation:
Ensure equitable distribution of employment opportunities between men and women
Provide toilets and bathrooms for both male and female workers on site

12) Impacts on Cultural Heritage

Some of the project sites are located within Mombasa Old town which is home to several cultural sites, in addition, the Baxton site is located near a Hindu burial site. Although none of these cultural sites will be affected, provisions must be made in case the Contractor discovers archeological sites, historical sites, remains and objects, including graveyards and/or individual graves during excavation or construction.

Mitigation:
Use of "chance find" procedures by the contractor _ See Appendix 12.3 for "Chance Find" procedures

13) Crime Management

Some of the project sites are located within slums which are prone to a few incidences of crime including, stealing of construction materials or individual property, fighting, drug abuse and alcoholism among others.

Mitigation:
Fencing around project area.
Working with local committees (e.g. "nyumba kumi) to provide security within the site in addition to the Contractor's own security.
Removing any employee who persists in any misconduct or lack of care, carries out duties incompetently or negligently, fails to conform to any provisions of the contract, or persists in any conduct which is prejudicial to safety, health, or the protection of the environment.
Taking all reasonable precautions to prevent unlawful, riotous or disorderly conduct by or amongst the contractor's personnel, and to preserve peace and protection of persons and property on and near the site.
Prohibiting alcohol, drugs, arms, and ammunition on the worksite among personnel.

- The contractor and Supervision Consultant should register in a log all events of a criminal nature that occur at the worksite or are associated with the civil works activities.
- The contractor and Supervision Consultant should report all activities of a criminal nature on the worksite or by the contractor's employees (whether on or off the worksite) to the police and undertake the necessary follow-up. Crime reports should include nature of the offense, location, date, time, and all other pertinent details.

14) Child Labour and Protection

The Children Act of Kenya prohibits contractors from "employing children in a manner that is economically exploitative, hazardous, and detrimental to the child's education, harmful to the child's health or physical, mental, spiritual, moral, or social development. It is also important to be vigilant towards potential sexual exploitation of children, especially young girls. The contractor should adopt a 'Child Protection Code of Conduct'; that all staff of the contractor must sign, committing themselves towards protecting children, which clearly defines what is and is not acceptable behaviour.

Mitigation:

- Ensure no children are employed on site in accordance with national labor laws
- Ensure that any child sexual relations offenses among contractors' workers are promptly reported to the police

15) Gender Equity, Sexual Harassment

Construction workers are predominantly younger males. Those who are away from home on the construction job are typically separated from their family and act outside their normal sphere of social control. This can lead to inappropriate and criminal behavior, such as sexual harassment of women and girls, exploitative sexual relations, and illicit sexual relations with minors from the local community. A large influx of male labor may also lead to an increase in exploitative sexual relationships and human trafficking whereby women and girls are forced into sex work

Mitigation:

- The works contractor should be required, under its contract, to prepare and enforce a No Sexual Harassment and Non-Discrimination Policy, in accordance with national law where applicable.
- The contractor should prepare and implement a gender action plan, to include at minimum:
  - Gender mainstreaming in employment at the worksite with opportunities provided for females to work, in consonance with local laws and customs
  - Gender sensitization of workers (this could be done by the HIV/AIDS services provider; see above)

- Provision of gender disaggregated bathing, changing, sanitation facilities
- Grievance redress mechanisms including non-retaliation.

16) Liability for loss of life, injury or damage to private property

Some of the Construction activities may lead to accidents that may be mild or fatal depending on various factors. During the implementation of the proposed project, accidents could be due to negligence on part of the workers, machine failure or breakdown or accidental falls into the Indian Ocean. These incidents can be reduced through proper work safety procedures.

In addition, during Construction, there may be damage to private property that may not be foreseen by the RAP.

Mitigation:

- Provision of PPE.
- The workers should receive requisite training especially on the operation of the machinery and equipment
- There should be adequate warning and directional signs.
- Ensuring that the prepared code of conduct for staff is followed to prevent accidents.
- Develop a site safety action plan detailing safety equipment to be used, emergency procedures, restriction on site, frequency and personnel responsible for safety inspections and controls.
- Cordon off unsafe areas
- Provide first Aid kit within the construction site.
- Recording of all injuries that occur on site in the incident register, corrective actions for their prevention are instigated as appropriate.
- Contractor to ensure compliance with the Workmen's Compensation Act, ordinance regulations and union agreements.
- The Contractor to repair any damage done to private property.

7.2.3 Impacts during Operation & Maintenance

During the operation of the improved storm water outlets, the positive impacts greatly outweigh the negative impacts, and with proper maintenance, potential negative impacts can be mitigated.

1) Positive Environmental and Socio-Economic Impacts

The several positive impacts are summarized below:

- Reduced pollution of the Indian Ocean in the short and long term due to the removal of floatables and grit from the Indian Ocean, the suspended solids will be reduced to a maximum of 30mg/l.

- ❖ The improved conditions of the Indian Ocean will lead to habitable conditions for ocean flora and fauna.
- ❖ The increased flora and fauna will have socio-economic benefits, in that fishermen will have access to fish.
- ❖ Tourism will increase due to increased beach activities due to the improved beach activities as a result of removal of unsightly debris making its way into the Indian Ocean.

Other potential impacts typically associated with operation and maintenance activities are such as:

2) Generation of solid waste

The coarse and fine screens as well as the grit removal chambers will generate solid waste which will have to be disposed of in an environmentally friendly way.

The coarse and fine screens will have a collection skip from where all debris will be collected and loaded to lorries for transport to the existing approved landfills. The sludge collected from the grit removal chambers will also be collected periodically and transported to the existing sludge management facilities.

Mitigation measures:
Sorting of all debris collected by the screens before transport to the relevant facilities, currently the local dumpsite at Kibarani will be used, however Mombasa is in the process of establishing a landfill.
Continuous removal of solid waste to prevent overloading of the system to ensure efficiency in the cleaning of the combined storm and waste water.
All transporters used should have a license from NEMA.

3) Noise Pollution

Noise Pollution may occur due to the various hauling trucks that will be used to transport the solid waste, particularly at the sites that are close to residential areas, and sensitive areas e.g. Coast General Hospital.

Mitigation measures:
All transportation vehicles should be kept in good working order, serviced regularly in accordance to the manufacturers specifications.
All transportation vehicles should be licensed by NEMA

4) Air Quality

There is bound to be some smell at the inlet chamber for the improvement works.

Mitigation measures:
Continuous removal of debris from the screening will improve the overall efficiency of the system thus reducing any foul odours. Foul odours will be a system that is not efficiently functioning.

5) Increase in tariffs

There is the potential for an increase in the tariffs of water and sanitation services, which will negatively affect the poor in society.

Mitigation measures:
MOWASCO incorporates the “pro-poor” policy in its billing

7.2.4 Impacts during De-commissioning

De-commissioning of the Project is not envisaged. Project components however will be rehabilitated over time having served their useful life.

8 ENVIRONMENTAL MITIGATION COST ESTIMATES

The cost of some of the proposed mitigation measures will have been included in the main engineering Bills of Quantities and therefore need not be included in the Environmental mitigation costs. These costs will also include cost of supervision for implementation of mitigation measures. These costs will be added to the Bill of Quantities as the Environmental Mitigation Costs.

Table 7 1 shows cost estimates for environmental mitigation. The brief description of the items is for identification purposes and does not supersede or modify the detailed descriptions of works in other sections of this report.

Table 8-1: Cost Estimates for Environmental Mitigation

S/No.	Item description	Unit	Quantity	Unit Price (K.Shs.)	Item Cost per Site (K.Shs.)	Item Cost For all 12 sites (K.Shs.)
1	Emergency measures in case of accidental oil spill	LS	1	50,000.00	50,000.00	600,000.00
2	Emergency measures in case of accidental water contamination	LS	1	50,000.00	50,000.00	600,000.00
3	On completion of construction works, reinstatement of ground for vegetation regeneration	Ha	0.012	50,000.00	600.00	7,200.00
4	Provide waste collection bins at strategic points and ensure that all solid wastes e.g. disposable water bottles, empty cement bags, etc. are transported to a place of safe disposal	No.	5	2,000.00	10,000.00	120,000.00
5	Provide Personal Protective Equipment (PPE) to the construction crew – helmets, overalls, gum boots, earplugs and dust masks.	set	10	3,000.00	30,000.00	360,000.00

S/No.	Item description	Unit	Quantity	Unit Price (K.Shs.)	Item Cost per Site (K.Shs.)	Item Cost For all 12 sites (K.Shs.)
6	Sensitize workers and the surrounding community on awareness, prevention and management of HIV/AIDS and other STDs through staff training, awareness campaign, media, and sign boards in local languages, workshops and during public Barazas.	Item	1	200,000.00	200,000.00	2,400,000.00
7	In collaboration with the Ministry of Health provide VCT that carry out site visits and testing regularly	No.	1	150,000.00	150,000.00	1,800,000.00
8	Provide condom dispensers at appropriate locations	LS	1	50,000.00	50,000.00	600,000.00
9	Provide both male and female toilets at strategic points within the site	No.	2	50,000.00	100,000.00	1,200,000.00
10	Provide signage at construction sites to control traffic to avoid accidents	LS	1	50,000.00	50,000.00	600,000.00
11	Formulate a Healthy and Safety Management Plan, train workers on health and safety procedures and emergency response in case of a fire outbreak, and other risks	LS	1	40,000.00	40,000.00	480,000.00
12	Environmental supervision, monitoring, and	Months	4	150,000.00	600,000.00	7,200,000.00

S/No.	Item description	Unit	Quantity	Unit Price (K.Shs.)	Item Cost per Site (K.Shs.)	Item Cost For all 12 sites (K.Shs.)
	evaluation over a period of 4 calendar months					
13	Provisional sum to be spent as directed by the Engineer on miscellaneous environmental issues like sampling and testing	LS	1	75,000.00	75,000.00	900,000.00
14	Funds set aside in case of interference with cultural sites "chance find"	LS	1	25,000	25,000	300,000
	TOTAL				**2,005,600.00**	**17,167,200.00**

9 ENVIRONMENTAL AND SOCIAL MITIGATION AND MANAGEMENT PLAN (ESMMP)

By design, the potential positive impacts of the project can readily be optimised while the potential majority of the negative environmental and social impacts are mostly restricted to the planning and construction period, with the negative impacts experienced during the operation phase of the project mitigated by continuous maintenance of the system. These are assessed and considered as minor to medium, being reversible and short-term and can be managed through well-defined mitigation and monitoring measures.

9.1 POSSIBLE ENHANCEMENT MEASURES

Possible enhancement measures of beneficial impacts would include the following:

- Construction should adhere to recommended best construction practices that make effective and economical use of locally available resources including materials, expertise and labour.
- Operation of the project should adhere to the operations and maintenance specifications prepared with the design
- Ensure that the poor and other vulnerable in the project area will be catered for by the project under the RAP.
- Ensure that social services provide education on appropriate hygienic conditions and taking into consideration gender particular roles and responsibilities.

9.2 MITIGATION MEASURES

Mitigation measures for negative environmental impacts include the following:

- Construction site environmental and social management plans, prepared by the contractor, will be required for all works. This plan will include a waste management plan for all activities during the construction period.
- Water bowsing at regular intervals to minimize dust.
- Avoid pollution of the Indian Ocean during Construction.
- Construction activities should be scheduled appropriately to reduce high noise levels particularly at night from noisy activities.
- Avoid areas sensitive to erosion.
- At the end of construction works, allow for vegetation restoration where possible.
- Prevention of work place injuries during construction is taken care of by the contractors, e.g. by means of signs, signals, fencing, etc.
- Employ occupational Safety and Health measures as required by law. This health and safety management plan will be prepared by the contractor and approved by the supervising engineer to set out how they will deliver a safe and healthy working environment, and protect the local community from any harm.
- A code of conduct is required for the Contractor and his staff members and a complaints registry and redress in order to address any breach of the code.

Mitigation measures have already been discussed in Chapter 6. However, a brief summary is included in the Environmental and Social Mitigation and Management Plan (ESMMP) in Table 8 1. Also considered in this management and monitoring plan are the persons responsible for implementation.

Table 9-1: The Proposed Environmental and Social Mitigation Plan (ESMP)

Project Phase	**Environmental / Social Impact**	**Mitigation Measure**	**Responsibility**
Pre-construction	Land acquisition for construction of the works	The project sites will be located within the Ocean Riparian which is public land as such there will be no land compensation.	CWSB/MOWASCO/County government/National Land Commission
Pre-construction	Loss of structures	As a first step, the owners, type of structures are identified. The compensation will be done in accordance to the RAP.	CWSB/MOWASCO/County government/National Land Commission
Pre-construction	Loss of livelihoods	Loss of livelihoods to be valued and compensated to in accordance to the RAP	CWSB/MOWASCO/County government/National Land Commission
Pre-construction	Loss of housing	Facilitation to move in accordance to RAP	CWSB/MOWASCO/County government/National Land Commission
Construction	Loss of flora and fauna	Re-plant the indigenous vegetation as much as possible once work is completed. Spare the vegetation that must not necessarily be removed such as trees. Minimize the amount of destruction caused by machinery by promoting non-mechanized methods of construction. Ensure protection of the ocean ecosystem by proper handling of cement during civil works. The Contractor should ensure that the employees on site are aware of the company procedures for dealing with spills and leaks from oil storage tanks e.g. using dispersants or adding biological agents to speed up the oil breakdown for the construction machinery though induction and safety training (the contractor will propose a method of clean-up which will be subject to approval); If the oil spill makes its way to the ocean, the Contractor can make use of a boom and skimmer to contain the oil spill	Contractor Supervising Engineer County Officer-Water Energy and Natural Resources
Construction	Air quality	Use protective clothing like dust masks on construction crew. Construction sites and transportation routes (those that are murram and earth standards) will be water-sprayed on regularly up to three times a day, especially if these sites are near	Contractor Supervising Engineer

Project Phase	Environmental / Social Impact	Mitigation Measure	Responsibility
		sensitive receptors, such as residential areas or institutions (schools, hospitals, etc.). All the vehicles and construction machinery should be operated in compliance with relevant vehicle emission standards and manufacturer's specification to minimize air pollution.	
Construction	Noise pollution	Avoid night time construction when noise is loudest. Avoid night-time construction using heavy machinery, from 22:00 to 6:00 near residential areas. No discretionary use of noisy machinery within 50 m of residential areas and near institutions such as schools Good maintenance and proper operation of construction machinery to minimize noise generation. Where possible, ensure non mechanized construction to reduce the use of machinery	Contractor Supervising Engineer
Construction	Site Related Oil Spills	The Contractor should ensure that the employees on site are aware of the company procedures for dealing with spills and leaks from oil storage tanks e.g. using dispersants or adding biological agents to speed up the oil breakdown for the construction machinery though induction and safety training (the contractor will propose a method of clean-up which will be subject to approval); If the oil spill makes its way to the ocean, the Contractor can make use of a boom and skimmer to contain the oil spill In case of spillage the Contractor should isolate the source of oil spill and contain the spillage to the source of leakage before it makes its way into the ocean, using sandbags, sawdust, absorbent material, and/or other materials approved by the Resident Engineer; The Resident Engineer and the Contractor should ensure that there is always a supply of absorbent material such as saw dust on site during construction, readily available to absorb/breakdown spill from machinery or oil storage, this can be incinerated after use;	Contractor Supervising Engineer

Project Phase	**Environmental / Social Impact**	**Mitigation Measure**	**Responsibility**
		All vehicles and equipment should be kept in good working order, serviced regularly in accordance to the manufacturers specifications and stored in an area approved by the Resident Engineer; The Contractor should assemble and clearly list the relevant emergency telephone contact numbers for staff, and brief staff on the required procedures.	
Construction	Soil Related Impacts	In cases where it is identified that during construction there is a danger of increased run-off or at the project site, temporary drainage channels or holding ponds can be employed After completion of the construction works, restoration of the ground by sowing adequate grass cover and planting of trees will be followed, therefore the impact is temporary and reversible. In areas prone to erosion, provision of soil stabilization in form of a retaining wall or planting of trees, subject to approval by the Resident Engineer Plan emergency response measures in case of accidental oil spills.	Contractor Supervising Engineers
	Impacts on Water resources	Ensure proper solid and liquid wastes disposal mainly from the construction camps, sites and offices. Ensure proper measures are in place for collection and disposal of spilled oils and lubricants.	Contractor, Supervising Engineer County Water Officer
Construction	Public Health & Safety	Sensitize workers and the surrounding communities on awareness, prevention and management of HIV/AIDS through staff training, awareness campaigns, multimedia and workshops or during community Barazas. Provide information, education and communication about safe uses of drinking water.	Contractor Supervising Engineer CWSB
Construction	HIV & AIDS Impacts	Sensitize workers and the surrounding communities on awareness, prevention and management of HIV/AIDS through staff training, awareness campaigns, multimedia	Contractor Supervising Engineer

Project Phase	**Environmental / Social Impact**	**Mitigation Measure**	**Responsibility**
		and workshops or during community Barazas. Provide information, education and communication. Use of existing clinics to provide VCT services to construction crew and provision of ARVs for vulnerable community members	CWSB
Construction	Socio-economic impacts	Unskilled construction and skilled (if available) labour to be hired from the local population as far as possible to minimize on influx of foreigners into the community. Use of manual labour during excavation and construction works where possible to ensure more employment of locals and hence ensure project support throughout the construction process. Ensure effective and matching contractual provisions for contractor to manage labour influx Sensitize workers and the surrounding community on awareness, prevention and management of HIV / AIDS through staff training, awareness campaigns, multimedia, and workshops or during community Barazas. Use of existing clinics to provide VCT services to construction crew and provision of ARVs for vulnerable community members The Contractor should enforce and maintain a code of conduct for his employees	Contractor Supervising Engineer
Construction	Traffic Congestion	The Contractor should provide temporary road signs or notices to indicate ongoing works; The Contractor should effect traffic controls and cleanliness to avoid congestion and accidents on roads; The Resident Engineer has to ensure that a traffic management plan is in place, e.g., one way entry and one way exit to prevent congestion; The Resident Engineer and Contractor should choose traffic routes to reduce the impact in the neighbourhood avoiding, as far as practical any sensitive areas;	The Contractor Supervising Engineer

Project Phase	**Environmental / Social Impact**	**Mitigation Measure**	**Responsibility**
		For the site traffic the Contractor has to ensure that they • Only park in designated parking areas; • Don't block pedestrian routes; • Don't block traffic routes; • Obey the speed limit • The resident Engineer has to ensure that the Contractor: i. Introduces segregated pedestrian walkways; ii. Introduces speed limits; iii. Reduces the need for reversing vehicles, by introducing a one way system; iv. Uses a qualified BANKSMAN to control deliveries and reversing vehicles; v. Designates loading/unloading areas.	
Construction	Gender empowerment	Ensure equitable distribution of employment opportunities between men and women Provide toilets and bathrooms for both male and female workers on site	The contractor The Supervising Engineer
Construction	Impacts on Cultural Heritage	Use of local customs to move the site.	Contractor and Local Administration
Construction	Crime Management	Fencing around project area. Working with local committees (e.g. "nyumba kumi) to provide security within the site in addition to the Contractor's own security. Removing any employee who persists in any misconduct or lack of care, carries out duties incompetently or negligently, fails to conform to any provisions of the contract, or persists in any conduct which is prejudicial to safety, health, or the protection of the environment. Taking all reasonable precautions to prevent unlawful, riotous or disorderly conduct by or amongst the contractor's personnel, and to preserve peace and protection of persons and property on and near the site.	Contractor Supervising Engineer

Project Phase	Environmental / Social Impact	Mitigation Measure	Responsibility
		Prohibiting alcohol, drugs, arms, and ammunition on the worksite among personnel. The contractor and Supervision Consultant should register in a log all events of a criminal nature that occur at the worksite or are associated with the civil works activities. The contractor and Supervision Consultant should report all activities of a criminal nature on the worksite or by the contractor's employees (whether on or off the worksite) to the police and undertake the necessary follow-up. Crime reports should include nature of the offense, location, date, time, and all other pertinent details.	
Construction	Child Labour and Protection	Ensure no children are employed on site in accordance with the law Ensure that any child sexual relations offenses among contractors' workers are promptly reported to the police	Contractor Supervising Engineer Local Administration
Construction	Gender Equity, Sexual Harassment	The works contractor should be required, under its contract, to prepare and enforce a No Sexual Harassment and Non-Discrimination Policy, in accordance with national law where applicable. The contractor should prepare and implement a gender action plan,	Contractor Supervising Engineer Local Administration
Construction	Liability for loss of life, injury or damage to private property	Provision of PPE. The workers should receive requisite training especially on the operation of the machinery and equipment There should be adequate warning and directional signs. Ensuring that the prepared code of conduct for staff is followed to prevent accidents. Develop a site safety action plan detailing safety equipment to be used, emergency procedures, restriction on site, frequency and personnel responsible for safety inspections and controls. Cordon off unsafe areas	Contractor Supervising Engineer

Project Phase	Environmental / Social Impact	Mitigation Measure	Responsibility
		Provide first Aid kit within the construction site. Recording of all injuries that occur on site in the incident register, corrective actions for their prevention are instigated as appropriate. Contractor to ensure compliance with the Workmen's Compensation Act, ordinance regulations and union agreements. The Contractor to repair any damage done to private property.	
Operation	Generation of solid waste	Sorting of all debris collected by the screens before transport to the relevant facilities. Continuous removal of solid waste to prevent overloading of the system to ensure efficiency in the cleaning of the combined storm and waste water. All transporters used should have a license from NEMA.	MOWASCO
Operation	Noise Pollution	All transportation vehicles should be kept in good working order, serviced regularly in accordance to the manufacturers' specifications. All transportation vehicles should be licensed by NEMA	MOWASCO
Operation	Air Quality	Continuous removal of debris from the screening will improve the overall efficiency of the system thus reducing any foul odours. Foul odours will be a system that is not efficiently functioning.	MOWASCO
Operation	Increased Tariffs	MOWASCO incorporates the "pro-poor" policy in its billing.	MOWASCO

9.3 ENVIRONMENTAL AND SOCIAL MANAGEMENT AND MONITORING PLAN

The purpose of the Environmental and Social Monitoring Plan (ESMP) for the proposed project is to initiate a mechanism for implementing mitigation measures for the potential negative environmental impacts and monitor the efficiency of these mitigation measures based on relevant environmental indicators. The Environmental and Social Mitigation and Management Plan in Chapter 8 identified certain roles and responsibilities for different stakeholders for implementation, supervision and monitoring. The objectives of the ESMP therefore are:

- To ensure that the recommendations in the approved ESIA report are adhered to by the various institutions

- To ensure that the environmental and social mitigation and their enhancement actions are well understood and communicated to all involved stakeholders.
- To ensure that the proposed environmental and social remedial measures are implemented during the project execution stage
- To evaluate the effectiveness of environmental and social remedial measures
- To evaluate the effectiveness of various evaluation techniques and procedures
- To provide the Proponent and the relevant Lead Agencies with a framework to confirm compliance with relevant laws and regulations.

Conversely, environmental monitoring provides feedback about the actual environmental impacts of the project. Monitoring results help judge the success of mitigation measures in protecting the environment.

They are also used to ensure compliance with environmental standards, and to facilitate any needed project design or operational changes. A monitoring program, backed up by powers to ensure corrective action when the monitoring results show it necessary, is a proven way to ensure effective implementation of mitigation measures. By tracking the project's actual impacts, monitoring reduces the environmental risks associated with the project, and allows for project modifications to be made where required.

Table 9-1 presents the indicators that will be used to monitor the implementation of the improvement project. The indicators are selected based on the project and major anticipated impacts.

Table 9-9-2: Proposed Environmental Monitoring Plan

Area	Environmental Component	Performance Indicators	Monitoring Requirements	Frequency of monitoring	Responsibility	Corrective Action
Construction Camp	Public health and safety	• Prevalence rates of common diseases. • Provision of condoms, contraceptives and mosquito nets. • Conduction of campaign meetings on transmission of diseases like HIV/AIDS and other STDs. • Availability of adequate solid waste bins. • System of safe disposal of both solid and liquid waste in place. • Availability of first aid facilities. • Outpatient attendance registers. • Compliance with the Health and Safety Act.	• Physical inspection • Documentation Number of complaints • Interview with residents	Monthly	Environmental Supervisor	Investigate non-compliance and make recommendations Implement recommendations
	Solid and liquid wastes	• Presence of scattered litter. • Signs of obstruction of water courses.	• Physical inspection • Number of complaints.	Monthly	Environmental Supervisor Contractor	Implement recommendations

Area	Environmental Component	Performance Indicators	Monitoring Requirements	Frequency of monitoring	Responsibility	Corrective Action
	HIV&AIDS	• Number campaign meetings on transmission of diseases like HIV/AIDS and other STDs. • Number of condom dispensers within the site. • Number of ARVs provided to vulnerable persons	• Inspection of HIV/AIDS prevention services within the site. • Number of condoms, ARVs provided.	Quarterly	Contractor Environmental Supervisor	Implement recommendations
Project Site	Solid and liquid wastes	• Scattered litter • Signs of obstruction of water ways. • Flow of wastewater on the ground surface. • Provision of sanitary facilities to the construction crews. • Pollution of the Indian Ocean	• Physical inspection • Number of complaints	Monthly	Environmental Supervisor Contractor	Implement recommendations
	Noise	• Level of noise generated. • Provision of PPE. • Compliance with existing noise standard issued by NEMA.	• Liaise with other stakeholders. • Documentation on complaints about noise	Monthly	Environmental Supervisor	• Implement recommendations
	Air pollution	• Level of dust generated. • Provision of PPE.	• Physical inspection	Monthly	Environmental Supervisor	• Implement recommendations

Area	Environmental Component	Performance Indicators	Monitoring Requirements	Frequency of monitoring	Responsibility	Corrective Action
			• Interview residents including workers • Liaise with other stakeholders			
	Flora and Fauna	• Amount of vegetation removed • Change in ocean biodiversity	• Documentation of uprooted trees • Physical Inspection	Quarterly	Environmental Supervisor	• Implement recommendations
	Gender Empowerment	• Number of female employees • Number of male and female toilets	• Review of company staff records. • Physical Inspection	Quarterly	Environmental Supervisor	• Implement recommendations
	Cultural Heritage	• Records of identified cultural sites	• Review of records	Monthly	Environmental Supervisor	• Implement recommendations
	Crime Management	• Number of reported crimes • Number of complaints	• Review of records • Interviews with staff and local community	Monthly	Environmental Supervisor	• Implement recommendations
	Child Labour	• Record of employees including IDs	• Review of records • Interviews with staff and local community	Monthly	Environmental Supervisor	• Implement recommendations
	Gender Equity and Sexual Harassment	• Number of complaints	• Review of grievance redress forms. • Interviews with local community	Monthly	Environmental Supervisor	• Implement recommendations

Area	Environmental Component	Performance Indicators	Monitoring Requirements	Frequency of monitoring	Responsibility	Corrective Action
	Loss of Life, Damage to Private property	• Record of accidents and damages done	• Review of records • Interviews with staff and local community.	Monthly	Environmental Supervisor	• Implement recommendations

9.4 GRIEVANCE REDRESS MECHANISMS

The table above, shows the performance indicators as part of the monitoring plan. Some of these indicators will be as a result of grievances raised by stakeholders. This section identifies the procedures in which stakeholders can present their grievances for redress.

The Consultant proposes that the Supervising Engineer's office be in charge of collecting and forwarding the grievances to the relevant authority of redress.

The filing of grievances for accurate record keeping is important. If the complainant is not able to express his/her complaint in writing, he/she can be assisted by a local leader (Area Chief) to file the complaint at the complaints desk in the project office. To ease follow-up, each complaint will be registered and assigned a unique reference number. The office will then evaluate the application and determine what implementing agency will resolve the issue. The figure below shows a sample of a complaint form:

Figure 9-1: Table Showing a Sample Grievance Form

Grievance Form					
Ref. No.	**Complainant's Name**	**Date**	**Description of Grievance**	**Proposed Redress Measure**	**Issue Resolved (Y/N)**

These records will be reviewed by the environmental supervisor who will ensure grievances have been redressed.

10 CONCLUSIONS AND RECOMMENDATIONS

As has been alluded in this report, the following can be said in summary.

The implementation of the proposed improvements to the storm water outlets will have the following benefits:

iii) Reduced Pollution of the Indian Ocean in the short term and long term.
iv) Improved socio-economic benefits via improved tourism opportunities and fishing grounds

The recommendations of the public consultation and participation was incorporated into the findings of this report.

The ESIA concludes that although the full positive environmental benefits will not be felt until the long-term projects under the waste water master plan are implemented, however the short-term benefits will also be beneficial in the removal of solid wastes from the storm water making its way into the Indian Ocean, which will have benefits on the flora and fauna of the ocean ecosystem.

MOWASCO will be in charge of the day to day running of the improved works and in meeting the goals of the short-term measures, there will be no need for a change in the institutional framework to meet the need.

The adverse impacts on the physical and natural environment will be "in sum total," not significant, and can be handled through the recommended mitigation measures. There are incremental costs required to achieve these. Compensation for direct land take, demolition of structures and livelihood will be done through a detailed Resettlement Action Plan which is provided under a separate report.

11 REFERENCES

Republic of Kenya, Environmental Management and Coordination Act (EMCA, Cap 387), Government Printer, Nairobi

Republic of Kenya, Water Act (2002), Government Printer, Nairobi

Republic of Kenya, Public Health Act, Cap 242, Government Printer, Nairobi.

Republic of Kenya, Environmental Impact Assessment/Audit Regulations 2003, (Legal Notice No.101) Government Printer, Nairobi

The Constitution of Kenya 2010

The Land Act, No. 6 of 2012

International Finance Corporation and World Bank Environmental, Health and Safety (EHS) Guidelines

Background of Selection of Measures for Immediate Measures by Mangat I.B. Patel

Detailed Design Report for Immediate Measures under the Waste Water Design Masterplan by Mangat I.B. Patel

World Bank Operational Policies

12 APPENDICES

12.1 APPENDIX A SURVEY QUESTIONNAIRE

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PROPOSED WORKS CONTRACTS UNDER COAST WATER SERVICES BOARD

ENVIRONMENTAL AND SOCIAL IMPACT ASSESMENT SURVEY QUESTIONNAIRE

An Environmental and Social Impact Assessment Survey is being carried out for the proposed **Improving the Existing Storm Water Outlets in Mombasa Island** on behalf of the Coast Water Services Board (CWSB). The aim of this survey is to form a realistic and up to date picture of the Environmental and Social situation in the area. We need your honest and accurate information during this discussion. Your inputs will assist in the understanding of your needs for improvement. The answers you provide will be kept confidential.

SECTION 1 DETAILS

1.1 Name of the Enumerator: .....

1.2 Signature of the Enumerator: .....

1.3 Name of the Respondent.....

1.4 Telephone number of the respondent..... ID Number of the respondent.....

1.5 Date: ..... Time of Interview: .....

1.4 Respondent place of resident: (1) Village..... (2) Location .....

(3)Sub-County -..... (4) County.....

SECTION 2 BASIC HOUSEHOLD SETUP

2.1 Name of the household head? .....

2.2 ID Number of the household Head..... Telephone Number of the Household Head.....

2.3 How many members do you have in this household.....

2.4 How many members of your household fall under each of the following age groups?

(1) 0 – 5yrs..... (2) 6 – 18yrs..... (3) 19-35yrs..... (4) 36-49yrs.....

(5) 50-65yrs..... (6) Over 66yrs .....

2.5 How many of your household members have attained each of the following education levels?

(1) None ..... (2) Primary ..... (3) Secondary ..... (4) College/university .....

2.6 What is the occupation /economic activity of the household head

(1) Crop farming ..... (2) Livestock farming ..... (3) Formal employment .....

(4)Business ..... (5) Fishing ..... (6) Mining ..... (7) Others (specify) .....

2.7 If crop farming what type of crops? (1) Maize..... (2) Cashew nuts ..... (3) Cassava.....

(4) Mangoes ..... (5) Beans..... (6) Coconut..... (7) Others.....

2.8 If livestock farming what animals?

(1) Cow..... (2)Sheep ..... (3)Goats..... (4) Donkeys ..... (5) Others .....

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2.9 If business what kind of business? (tick) (1) Shop ..... (2) Bodaboda (bicycle /motorbike).....

(3) M-Pesa..... (4) Jua kali ..... (5) Grocery ..... (6) Others (specify) .....

2.10 What is the average combined household income per month? (tick) (1)Less than 15,000.....

(2) 15,000-30,000..... (3)30,000-50,000..... (4) Above 50,000 .....

2.11 What's the religion of the Household Head? (tick) (1)Christian..... (2) Muslim.....

(3) Hindu..... (4) Traditionalist ..... (5) Others Specify .....

2.12 Type of fuel mostly used for cooking: (tick)

(1)Firewood ..... (2)Charcoal ..... (3) Kerosene ..... (4) LPG(Gas) .....

(5)Electricity ..... (6) Others (specify) .....

SECTION 3 WATER AND SANITATION

3.1 What is the common source of water in this area?

(1) Private tap ..... (2) Public Tap ..... (3) Bore hole ..... (4) Shallow well .....

(5) Protected spring /river ..... (6) Water pan ..... (7) Others (specify) .....

3.3 What is the general quality of the water? (Tick)

(1) Good ..... (2) Fair ..... (3) Bad .....

3.4 How often do you Fetch water?

(1) Every day ..... (2) Every alternate day of the week ..... (3) Once a week .....

3.5 Do you pay for water (1) Yes..... (2)No.....

3.6 If yes how much per 20 litre jerrican in Ksh.

(1) Ksh. 2..... (2) Ksh. 5 ..... (3) Ksh. 10..... (4) Above Ksh. 10 .....

3.7 What is the common mode of transporting water in this area?

(1) Carrying on the head ..... (2) Hand driven carts/wheelbarrow.....

(3) Bodaboda (bicycle/motorbike)..... (4) Pack animals (Donkeys/Camels) .....

(5) Animal drawn carts ..... (6) Trucks ..... (7)Others (specify) .....

3.8 How do you dispose of your household waste? (Tick)

(1)Compost pit/burying ..... (2) Collection by the council ..... (3) Recycling .....

(4) Burning ..... (5) Dumping in open areas ..... (6) Others (specify) .....

3.9 Does the household have a toilet?

(1)Yes ..... (2) No .....

3.10 If yes, type of toilet: (tick)

(1) Flush system connected to the sewer line ..... (2) Flush system with Septic tank .....

(3)Pit latrine ..... (4) Mobile toilet ..... (5)Any other (Specify) .....

3.11 Are you aware of the proposed Works under Coast Water Services Board?

(1) YES ..... (2) NO .....

3.12 How will proposed Works under Coast Water Services Board affect the community here? (Tick)

(1) Positively ..... (2) Adversely (negatively).....

3.13 If positively, in what way? (Tick)

(1) Overall improvement in sanitation due to proper wastewater management .....

(2) Reduced cases of waterborne diseases due to reduced contamination of water.....

(3) Improved hygiene..... (4) Improved business during construction..... (5) Improved sanitation will increase land values ..... (6) Employment opportunities during construction and operation of the plant ..... (9) Others (please specify)

.....

3.14 If negatively, in what ways? (Tick)

(1) Dust and noise during construction..... (2) Demolition of structures ..... (3) Loss of farm land/trees/crops ..... (4) odours during operation of the plant ..... (5) Proliferation of scavenger species, e.g. birds during operation ..... (6) Spread of diseases (STD, HIV/AIDS)..... (7) Interruption of services (road access, electricity, etc.) during construction (8) Others (specify) .....

3.15 What do you think should be done to minimize or mitigate these negative impacts?

(1) Inform the public about any interruption of services .....

(2) Proper maintenance of treatment works during construction ..... (3) Avoid night time construction ..... (4) Educate the public and the construction crew on health and safety.....

(5) Compensate the structure/Land /crop/trees owners..... (6)Others (specify).....

SECTION 4 HEALTH.

4.1 Which diseases have members of your household suffered from in the past six months? (Tick)

(1)Malaria ..... (2)Malnutrition ..... (3)Measles ..... (4)HIV/AIDS .....

(5)Eye problems ..... (6)Diarrhea ..... (7) Cholera ..... (8) Intestinal worms .....

(9)Respiratory infections ..... (10)Skin rashes ..... (11)Others (specify) .....

4.2 What do you do when you are sick?

(1)Seek medical attention from a health centre..... (2)Prayed for ..... (3)Take herbs.....

(4) Visit a traditional doctor..... (5)Others (specify) .....

4.3 What is the ownership status of the health facilities attended by your household members? (Tick)

(1)Public ..... (2) Private ..... (3) Faith based ..... (4) NGO ..... (5) Traditional .....

4.4 How far is the health facility visited by your household members in km?

(1) Less than 1km ..... (2) 1 -3km..... (3) 3 – 5km ..... (4) Above 5km.....

SECTION 5 KNOWLEDGE AND ATTITUDE ON HIV/AIDS

5.1 Have you ever heard of HIV/AIDS? (1) Yes ..... (2) No .....

5.2 If yes, what source did you hear it from? (Tick)

(1) Radio/TV ..... (2) Billboards ..... (3) Posters ..... (4) Religious leaders .....

(5) Relative/friend ..... (6) Health worker/Clinic..... (7) NGO/CBOs .....

(8) Newspaper ..... (9) Other (Specify) .....

5.3 Has any of your household members been affected by HIV/AIDS? (1)Yes..... (2)No .....

5.4 Do you think HIV (AIDS) can be prevented? (1)Yes ..... (2) No ..... (3) Do Not Know .....

5.5 Do you know where to go for voluntary counseling and testing for HIV/AIDS?

(1)Yes ..... (2) No .....

SECTION 6 ENVIRONMENTAL

6.1 What environmental issues are of concern to the people of this area?

(1) Water shortage ..... (2) Invasive species ..... (3) Overgrazing ..... (4) Extinction of endangered species ..... (5) Mosquitoes and malaria spread ..... (6) Solid waste ..... (7) Deforestation ..... (8) Drought ..... (9) Poor Sanitation (10) others (please specify).....

6.2 What are the environmental conservation initiatives in the area?

(1) Tree planting ..... (2) Educating the public ..... (3) Cleaning of mosquito breeding sites .....

(4) Collection of solid wastes..... (5) Construction of toilets (6) others (please specify) .....

6.3 Who are carrying out these activities?

(1) Women groups ..... (2) County council..... (3) Non-governmental organization .....

(4) Community based organizations..... (5) Youth groups..... (6) Others (please specify) .....

6.4 Will the completion of the proposed Works under Coast Water Services Board help in the conservation of the environment in the area? (1) Yes ..... (2) No .....

6.5 If yes in what ways? .....

12.2 SUMMARY OF PUBLIC CONSULTATION

12.2.1 Minutes of the Public Consultation meeting Held at Chief's Office Railway Location on 16th Dec 2016 at 2.45 pm

1) *Present*

- Marion Orina - Zamconsult Consulting Engineers (Consultant)
- Francis Moturi - Zamconsult Consulting Engineers (Consultant)
- Joyce Mutinda - CWSB representative
- Shaban N. Noor - Chief of Ganjoni Location
- Stephen K. Nyamu - Assistant Chief Tudor Location
- General Public

2) *Introductions*

The meeting started at 2.45pm and was chaired by the area chief, who introduced the Consultant to the attendees. He then invited the Consultant to give her presentation.

3) *Presentation on Project by the Consultant*

The Consultant gave a presentation of the proposed project, its scope, and the laws governing the Environmental and Social Process as well as the need to conduct public consultation meetings.

The consultant stated that the presentation would cover two projects being carried out, these were. the Mombasa Lot 2B pipelines and the improvements to the existing storm water outlets. She stated that CWSB intended to put up new pipelines as well as to replace some of the old lines within the Island as a way to rehabilitate and improve the existing water supply system. She further outlined the 12 outlets that are within the scope of the storm water outlets project to be at Mbaraki; Railways; Makupa; Tudor; Buxton; Nyali, Coast General, at the four existing pump stations and at the Kizingo treatment works.

The Consultant explained the various impacts associated with the project, throughout the project duration (planning, construction, operation and decommissioning, including possible resettlement of Project Affected Persons (PAPs). The Consultant explained that a Resettlement Action Plan had been carried out in order to identify all the PAPs. For the outlets project, the consultant stated the two critical storm water outlets would be have resettlement of households. These were Makupa and Tudor. It is within these regions that are made up of informal settlements that several households had been identified as PAPs. Fortunately, the pipelines project intended to stick within the road reserve hence very few people had been identified as PAPs since there was minimal encroachment within the road reserve area. She outlined that the cut-off date for the RAP exercise was 19th of December 2016. As such, any further developments within the project sites would not be considered for compensation.

The Consultant also explained that an ESIA activity had been carried out in the area to sensitize the public about the two proposed projects and now the meeting was being conducted so as to disseminate information on the findings of the ESIA. She further explained all the mitigation measures put in place in view of the anticipated disturbances and assured the public that in case the contractor failed to adhere with the regulations put in place, they could address their complaints to the resident engineer on the ground for relevant action to be taken.

4) Questions, Answers and Feedback

The Consultant then invited the attendees to raise whatever issues they had, in order to have full knowledge on the project.

The Consultant then invited the attendees to raise whatever issues they had, in order to have full knowledge on the project.

Q1. Douglas Kitema from Ganjoni pointed out that there were several open manholes along the roads of the main line. He inquired what could be done to correct the situation.

The consultant reiterated that she would relay the concerns to the relevant authorities and added that the storm water outlets aimed at improving the overall water and sanitation situation within Mombasa.

Q2. Antomatte Ambuga from Tudor pointed out that the storm water outlets were located within informal settlements and the residents there were low income earners, she recommended that the project should look into their wellbeing, including finding alternative housing for them.

The consultant agreed with the recommendation adding that the reason for carrying out the RAP was to ensure that the wellbeing of the residents was ensured, via compensation and resettlement. In addition she pointed out the measures of resettling the vulnerable in the community.

Q3. Ahmed Athman from Tononoka asked when the project was scheduled to begin.

The consultant stated that the project was still in the planning phase and that the World Bank was awaiting a successful completion of the Resettlement Action Plan before releasing the funds for the construction phase of the project.

Q4. Johnstone Omedi from Tudor inquired if those affected in the on-going water projects within the area were compensated accordingly. He further pointed out some water and sanitation issues of concern within the area such as the open trenches within the MOWASCO projects and some storm water holes within Burukenge at Buxtan posed great health danger to the public, asking how they could be dealt with. Also, he pointed out that the road in Tudor was flooded with storm water. He asked what could be done to correct the situation.

The CWSB representative responded by stating that the on-going projects were under a different entity, MOWASCO, and were being implemented by a contractor called Toddy. She stated that MOWASCO and CWSB operated differently since CWSB is a government parastatal while MOWASCO is under the county government.

The consultant added that any complaints regarding the on-going construction project can be addressed through the Chief, the resident engineer, the contractor's offices or MOWASCO in case the other channels do not bear fruit. In addition, she stated that she would include the grievances in the report and recommend that the issues be addressed by MOWASCO. Regarding the storm water issues in the area, the consultant stated that she would forward the recommendations to the relevant authorities.

Q5. Martin Mabinda inquired if the water sector was devolved. He further asked if the water from the ocean could be purified to meet domestic standards.

The consultant responded by outlining that the water act from the national government has all the guidelines of CWSB, the Ministry of Water and Irrigation and MOWASCO with various mandates. For instance, CWSB is for bulk water supply; MOWASCO is for distribution of water. MOWASCO further operates in conjunction with the county in implementing its duties.

With regards to the purification of ocean water, the consultant stated that there are various methods that can be used to desalinize ocean water such as reverse osmosis. However, they are capital intensive and were not within the scope of the project. She however acknowledged the recommendation and stated that she would include it in the final report.

5) Conclusion

The Consultant asked if the people were in support of the project. The locals, by a show of hands approved of the project, stating that their recommendations given in the meeting should be taken into account. The meeting ended at 4.20 pm with a word of prayer.

12.2.2 List of Attendance

Public participation Attendence list			
Mombasa County ;Railways Location on 16 december 2016			
Name	**Designation**	**Contact**	**Vilage**
Ahamed Athman	Youth Leader	72649600	Tononoka
James Oduor	Youth Leader	72544559	Tononoka
Antomatte Ambuga	Village Elder	728372904	Manyimbo Tudor
Eddah Charles	youth	720935378	Shimanzi
Munupi Japeth	Nyumba Kumi	737499115	Shimanzi
Thomas Weke	G.H.V	716328467	Shimanzi
Kifi Chisenga	Village Elder	723719470	Tononoka
Maunwa Garbell	Village Elder	725132302	Shimanzi
Otieno Walter	Youth	791007515	Shimanzi
Yvonne Otieno	Youth	791213748	Shimanzi
Benjamin Muringe	Village Elder	725897434	Shimanzi
Jonathan	Village Elder	728473410	Kiziwi
Douglas M Kitomoi	Village Elder	716265333	Tudor
Stephen Mwangi Manwa	Village Elder	721760996	Shimanzi
Simeon Magwaro	Village Elder	717226673	Shimanzi

Rodgers Mwatate	Village Elder	781215195	Shimanzi
Simon K Bett	Village Elder	723222156	Shimanzi
Scholastica Kadenge	youth	720935378	Shimanzi
Johnstone Omedi	Village Elder	71563535	Tudor
Martin Mwabinda	Village Elder	723267471	Tudor
Robert N Mwathi	Village Elder	703640265	Shimanzi
Brenda A Awiti	Youth	703962766	Shimanzi
Rashid Suleiman Bakari	Village Elder	727103416	Ganjoni
Shaban N Ndoro	Chief	721527702	Ganjoni
James Henry Omindo	Chief	722318729	Ganjoni
Christoper Wagila	Chief	721320168	Ganjoni
Silas Wamalwa	Chief	712069813	Ganjoni
Joseph Musyoki	Chief		Ganjoni
Matilda Akinyi	Village Elder	723215318	Shimanzi
Stephen K Nyamu	Assistant Chief	725403375	Tudor

CHIEF'S OFFICE

MOMBASA COUNTY

SUB COUNTY

MVITA CONSTITUENCY

ISLAND WARD

RAILWAY LOCATION

MEETING ATTENDANCE LIST

NO.	NAME	VILLAGE	DESIGNATION	CONTACT	SIGNATURE
1	AHMED ATHMAN	TONONOKA	YOUTH LEADER	0726496020	[signature]
2	JAMES ODUOR	TONONOKA	YOUTH LEADER	0725 441 559	[signature]
3	Antonnette Ambuga	Mwembe Tudor	V Elder	0728372904	[signature]
4	Scholastika Kadenge	SHIMANZI	YOUTH	0720935378	[signature]
5	EDDAH CHARLES	SHIMANZI	YOUTH	0704450767	[signature]
6	MUNUPI JAPHETH	Shimanzi	NYUMBA KUMI	0737499115	[signature]
7	THOMAS. WEKE	SHIMANZI	C.H.V	0716378467	[signature]
8	KIFI CHISHENGA	TONONOKA	V ELDER	0723719470	[signature]
9	MAUWA GABRIELL	SHIMANZI	V. ELDER.	0725732203	[signature]
10	OTIENO WALTER	SHIMANZI	YOUTH	0791007515	[signature]
11	YVONNE ATIENO	SHIMANZI	YOUTH	0701213748	[signature]
12	MARTIN MABINDA	TUDOR(KIZIWI)	BALOZI	0723267471	[signature]
13	JOHNSTONE OMEDI	TUDOR	V ELDER	0715563535	[signature]
14	BENJAMIN MORINGE	SHIMANZI	BALOZI	0725897434	[signature]
15	JOHN Mtie	Tudor	BALOZI	0728473410	[signature]
16	Douglas M. Kitonsi	Changamwe	V. elder	0716268333	[signature]
17	Stephen Mwangi Madza	Shimanzi KRW	BALOZI	0721760996	[signature]
18	SIMEON MAGWARO	V. Elder	V. Elder	0717226673	[signature]
19	RODGERS MWAIATE	SHIMANZI	BALOZI	0781215195	[signature]
20	SIMON R. BETT	Shimanzi	BALOZI	0722-222150	[signature]

BE PUNCTUAL ALWAYS.

CHIEF'S OFFICE

MOMBASA COUNTY

SUB COUNTY

MVITA CONSTITUENCY

ISLAND WARD

RAILWAY LOCATION

MEETING ATTENDANCE LIST

NO.	NAME	VILLAGE	DESIGNATION	CONTACT	SIGNATURE
1	ROBERT M MWANTHI	SHIMANZI	LIMAN BARRI SHZ	0703640265	[signature]
2	BRENDA A OWITI	SHIMANZI	YOUTH	0703962766	[signature]
3	Rashid Suleiman Bakari	GANJONI	V/ELDER	0727103416	[signature]
4	SHABAN N. [illegible]	GANJONI	CHIEF	0721527702	[signature]
5	JAMES HENRY OMINDE	"	"	0722318729	[signature]
6	Christopher Wangila	" "	"	0721320182	[signature]
7	SILAS WAMALWA			0712069812	[signature]
8	JOSEPH MUSYOKI				[signature]
9	MATILDA AKINYI	SHIMANZI KPA	V/ELDER	0723215518	[signature]
10	STEPHEN K. NYAMU	TUDOR LOC	ASS CHIEF	0725403375	[signature]
11					
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BE PUNCTUAL ALWAYS.

Figure 12-1: Public Consultation Meeting List of Attendance

12.2.3 Public Consultation Meeting Photos

Figure 12-2: Consultant giving a presentation on the various projects

Figure 12-3: Feedback from one of the participants

Figure 12-4: Feedback from one of the Participants

12.3 "CHANCE FIND" PROCEDURES

Chance find procedures are an integral part of the project ESMMP and civil works contracts. The following is proposed in this regard:

If the Contractor discovers archeological sites, historical sites, remains and objects, including graveyards and/or individual graves during excavation or construction, the Contractor shall:

- Stop the construction activities in the area of the chance find;
- Delineate the discovered site or area;
- Secure the site to prevent any damage or loss of removable objects. In cases of removable antiquities or sensitive remains, a night guard shall be arranged until the responsible local authorities or the Ministry of State for National Heritage and Culture take over;
- Notify the supervisor, Project Environmental Officer and Project Engineer who in turn will notify the responsible local authorities and the Ministry of State for National Heritage and Culture immediately (within 24 hours or less);

Responsible local authorities and the Ministry of State for National Heritage and Culture would then be in charge of protecting and preserving the site before deciding on subsequent appropriate procedures. This would require a preliminary evaluation of the findings to be performed by the archaeologists of the National Museums of Kenya. The significance and importance of the findings should be assessed according to the various criteria relevant to cultural heritage, namely the aesthetic, historic, scientific or research, social and economic values.

Decisions on how to handle the find shall be taken by the responsible authorities and the Ministry of State for National Heritage and Culture. This could include changes in the layout (such as when finding irremovable remains of cultural or archeological importance) conservation, preservation, restoration and salvage.

Implementation for the authority decision concerning the management of the finding shall be communicated in writing by relevant local authorities.

Construction work may resume only after permission is given from the responsible local authorities or the Ministry of State for National Heritage and Culture concerning safeguard of the heritage.