Environmental and Social Impact Assessment(ESIA) Study Report for the Proposed Gas Exploratory Drilling in Blocks L4 and L13 in Lamu County













Prepared for



Prepared by



1C Suite 1st Floor | Woodlands Office Park |
Woodlands Road | Off Lenana Road |
Park. P.O Box 7745 00100, Nairobi Kenya |
Cellphone. +254 736 100 204/5/6 |
www.esfconsultants.org
Your Environmental Partner

DECLARATION

The Environmental and Social Impact Assessment (ESIA) Study Report for Zarara Oil and Gas, for the proposed Gas Exploratory Drilling in Blocks L4 and L13 in Lamu County, is submitted by Environnementalistses Sans Frontieres (ESF) Consultants, a firm of Environmental Experts, NEMA Registration Number 0204. To our knowledge, all the information contained in this report is accurate and a true reflection of the planned activities in the proposed project.

ON BEHALF OF ZARARA OIL AND GAS

Signed:

ZARARA OIL & GAS LTD.

Dated: 21/11/2016

ON BEHALF OF ESF CONSULTANTS

Signed

Datad:

25/11/20/6

ESF CONSULTANTION OF FICE *

ABBREVIATION

2D two-dimensional

3D three-dimensional

BMU Beach Management Units

BOP Blow-out Preventer

CRS Comments Registration Sheets

CSR Corporate Social Responsibility

EHS Environmental, Health and Safety

EIA Environmental Impact Assessment

EMCA Environmental Management and Coordination Act

EP Equator Principles

ESIA Environmental and Social Impact Assessment

ESF Environnementalistses Sans Frontieres

ESMP Environmental and Social Management Plan

FGD Focused Group Discussions

IFC International Finance Corporation

MSDS Material Safety Data Sheets

NADF Non-Aqueous Drilling Fluids

NEMA National Environment Management Authority

NGO Non-Governmental Organization

NOCK National Oil Corporation of Kenya

OBM Oil Based Mud

OSH Occupational safety and health

PPE Personal protective equipment

PSC Production Sharing Contract

SOHI SwissOil Holdings International Ltd

SBM Synthetic Based Mud

UNESCO United Nations Educational, Scientific and Cultural Organization

WBM Water Based Mud

UNITS

Km Kilometres

m Metres

m³ cubic metres

ng/J nanograms per joule

ppb parts per billion

ppm parts per million

μg microgram

TRANSLATIONS

Baraza Public Community Meeting

Boda Boda Motobike used for Public Transportation

Kaskazi Northern Monsoon

Kusi Southeast Monsoon

Mashua Dhows

Table of Contents

ABBI	REVIATIO	DN	i
UNIT	-S		ii
TRAI	NSLATIO	NS	ii
LIST	OF FIGU	RES	vii
LIST	OF TABL	ES	ix
EXEC	CUTIVE S	UMMARY	xi
Pr	oject Ba	ckground	xi
Er	vironme	ental and Social Impact Assessment (ESIA)	xii
	ESIA Stu	dy Objectives	xii
	ESIA Me	thodology	xii
Pι	ıblic Con	sultation	xiii
Le	gal Fram	nework	xiv
Pr	oject im	pacts and mitigation measures	xiv
Pr	oject alt	ernatives	xix
Er	vironme	ental and Social Management Plan (ESMP) and Project Monitoring	xix
Co	nclusion	and recommendations	xix
1.0.	INTRO	DDUCTION	1
1.	1 Pro	eject Background	1
1.	1. The	e ESIA Study	3
1.	3 ESIA M	lethodology	4
1.	4 ESIA Te	eam	6
1.	5 Report	Structure	7
2.0.	PROJI	ECT DESCRIPTION	8
2.	1. Pro	eject Background	8
2.	2. Pro	eject Location	8
2.	3. Exp	ploratory Drilling Components	10
	2.3.1.	Accessibility and Transportation	10
	2.3.2.	Well Pad Layout	13
	2.3.3.	Water Requirements	15
	2.3.4.	Power and storage requirement	15

2	2.3.5.	Labour Requirements	15
2.4.	. We	ll Drilling and Operation	15
2	2.4.1.	Drilling Process	15
2	2.4.2.	Well Control	18
2.5.	. Wa	ste Generation	19
2	2.5.1.	Solid waste	19
2	2.5.2.	Wastewater	21
2	2.5.3.	Produced Water	21
2.6.	. App	oraisal Drilling and Well Evaluation/ Testing	21
2.7.	. Dec	commissioning	22
2.8.	. Pro	ject Schedule and Cost	22
3.0.	PROJE	ECT ALTERNATIVES	24
3.1	Alte	ernative Well Location	24
3.2	Alte	ernative Drilling Technology	24
3.3	Alte	ernative project inputs	25
3	3.3.1.	Drilling fluids	25
3	3.3.2.	Water requirements	25
3	3.3.3.	Power requirements	26
3.4	The	No-Project Option	26
3.5	Pro	ceeding with the proposed project with mitigation measures	26
4.0.	POLIC	Y, LEGAL AND INSTITUTONAL FRAMEWORK	28
4.1	Nat	ional Legal Framework	28
4	1.1.1.	Environmental Compliance Standards	48
4	1.1.2.	Institutional Framework and Permitting	54
4.2	Nat	ional Policies and Plans	57
4.3	Inte	ernational Agreements and Conventions	58
4.4	IFC	Performance Standards	61
4.5.	. The	Equator Principles (EPs)	68
5.0.	BASEL	INE CHARACTERISTICS	70
5.1.	. Env	vironmental Baseline	71
5	5.1.1.	Climate and Meteorology	71
5	5.1.2.	Noise Environment	82

	5.1.3.	Geomorphology	83
	5.1.4.	Soils	86
	5.1.5.	Hydrology	88
	5.1.6.	Flora and Fauna	95
	5.1.7.	Flora of Pate Island	98
	5.1.8.	Fauna spotted in Pate Island	102
5	5.2. Soc	io Economic Baseline	103
	5.2.1.	Administrative Units	104
	5.2.2.	History and Culture	106
	5.2.3.	Demography and Social determinants	109
	5.2.4.	Welfare	116
	5.2.5.	Economic Activities	119
	5.2.6.	Financial services	127
	5.2.7.	Employment and Livelihoods	127
	5.2.8.	Transport	128
	5.2.9.	Communication	131
	5.2.10.	Energy	133
	5.2.11.	Water	134
	5.2.12.	Sanitation	140
	5.2.13.	Housing and dwelling	142
	5.2.14.	Land and Land Use	145
	5.2.15.	Security	148
	5.2.16.	Health Access	149
6.0	. PUBLI	C AND STAKEHOLDER CONSULTATION	157
6	5.1. Obj	ectives of Public Consultation	157
6	5.2. Nat	ional and International Regulations and Requirements for Stakeholder Engagement	157
	6.2.1.	National Requirements for Stakeholder Engagement	157
	6.2.2.	International Best Practices for Stakeholder Engagement	157
6	5.3. Stal	keholders Identification	158
6	5.4. Too	Is and Methods of Engagement	158
	6.4.1.	Tools	158
	6.4.2.	Methods of Stakeholder Engagement	158

6.5.	Stakeholders Consulted	159
6.5.1	Primary Stakeholders Consulted	159
6.5.2	2. Secondary Stakeholders Consulted	161
6.6.	Summary of the Key Issues, Concerns and Comments raised during the Stakeholder	
Engage	ment Exercise	163
6.6.1	L. Environmental	163
6.6.2	2. Socio-Economic	164
6.6.3	3. Other Concerns	166
7.0. IN	1PACT IDENTIFICATION AND ASSESSMENT	167
7.1.	Methodology	167
7.2.	Positive Impacts	169
7.2.1	Design Phase	169
7.2.2	2. Construction Phase	170
7.2.3	3. Operational Phase	171
7.2.4	L. Decommissioning Phase	172
7.3.	Negative Impacts	174
7.3.1	Design Phase	174
7.3.2	2. Construction Phase	175
7.3.3	3. Operation Phase	181
7.3.4	L. Decommissioning Phase	192
8.0. ENVI	RONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)	195
8.1. De	sign Phase	195
8.2.	Construction Phase	196
8.3.	Operation Phase	205
8.4.	Decommissioning Phase	220
CONCLUS	ION AND RECOMMENDATIONS	226
REFEREN	CES	228
APPENDI	CES	231
Appendix :	Background Information Document (BID) in both English and Swahili	
Appendix 2	2 Meeting Presentation	
Appendix :	Stakeholder Meeting Register	
Appendix 4	4 Comments Registration Sheets (CRS)	

Appendix 5 Public and Stakeholder Meeting Pictures

Appendix 6 Issues and Response

LIST OF FIGURES

Figure 0.1: Location of Block L4 and L13 in Lamu County	xi
Figure 0.2: EISA Process	xiii
Figure 1.1: Location on Block L4 and L13 in Lamu County	1
Figure 1.2: Location of Pate 1 - Shell Well	2
Figure 1.3: Zarara proposed business plan in a phased approach	3
Figure 1.4: ESIA Process	5
Figure 2.1: Oil Blocks Coordinates	9
Figure 2.2: Location of the three islands in Lamu County	10
Figure 2.3: Map showing location of Mtangawanda Jetty and Main roads in Pate Island	11
Figure 2.4 Mtangawanda Jetty	12
Figure 2.5: Adjacent beach to Mtangawanda Jetty	12
Figure 2.6:Road leading into Pate Island from Mtangawanda Jetty	13
Figure 2.7: Well pad Layout	14
Figure 2.8: Drilling rig	16
Figure 2.9: Example of casing used in the drilling process	17
Figure 2.10:How cement and casing is placed in drilling well	17
Figure 2.11: Blowout Preventer and how it works	19
Figure 3.1: Types of drilling technologies	24
Figure 5.1: Location of Lamu County	70
Figure 5.2: Islands in Lamu County	71
Figure 5.3: Average Temperature (°C) Graph for Lamu County	72
Figure 5.4: Monsoon winds and ocean currents	73
Figure 5.5: Rainfall Distribution	75
Figure 5.6: Air sampling collection sites	76
Figure 5.7: Projected future climate model	80
Figure 5.8: Wind speed in Lamu County	81
Figure 5.9: Location of Coral Reefs in Pate Island	85
Figure 5.10: Soil map extract of the project area	88
Figure 5.11: Rivers in Lamu	
Figure 5.12. Approximate alignment of the three beach ridges in the Lamu $-$ Tana Delta area \dots	91
Figure 5.13. Total dissolved solids (TDS) distribution on the island	92
Figure 5.14. Open dumping of domestic solid waste	95
Figure 5.15: Map of National reserves in the project Area	96
Figure 5.16: Mangroves ecosystem as viewed from Pate social hall	99
Figure 5.17: Neem tree (Azadirachta indica) spotted in areas of Mbwajumwali Location	100
Figure 5.18: Banana Plantation spotted at Pate location	101
Figure 5.19: Coconut trees spotted in Faza location	102

Figure 5.20: Cattle Roaming on roads in Pate Island	103
Figure 5.21: Donkey Spotted in Pate	103
Figure 5.22: Socio-economic Methodology	104
Figure 5.23: Wards Located in Lamu County	105
Figure 5.24: Important historical, cultural, and burial sites in Pate as identified by the communities	107
Figure 5.25: Customary practices among communities in Pate Island	108
Figure 5.26: Population demographics (number of people) per location in Pate Island	112
Figure 5.27: population demographics (number of households)	112
Figure 5.28: Age distribution of the 76 households interviewed	113
Figure 5.29: Nature of participants interviewed	113
Figure 5.30: Distribution of Ethnic Groups in Lamu County	114
Figure 5.31: Number of clans within the locations in Pate Island	115
Figure 5.32: Reasons for increased population in the last 10 years in Pate Island	115
Figure 5.33: Level of Education of the 76 participants in the socio-economic survey	
Figure 5.34: Distribution of learning institutions per locations in Pate Island	117
Figure 5.35: Average percentage of learning institutions in the project area	117
Figure 5.36: Vulnerable groups in the society	118
Figure 5.37: Crop Farming Response per Location	119
Figure 5.38: Main markets for crops	119
Figure 5.39: Livestock keeping trends per location	121
Figure 5.40: Source of pasture for livestock	122
Figure 5.41: Livestock products in the project area	122
Figure 5.42: Distribution of Fishing Activities per Location	123
Figure 5.43: Common types of fishing vessels	124
Figure 5.44: Vessel propulsion mode among fishermen in Pate Island	124
Figure 5.45: Equipment for Fishing among fishermen in Pate	125
Figure 5.46: Distribution of Experiences among the Fishermen	125
Figure 5.47: Areas of Fishing	125
Figure 5.48: Income Status	128
Figure 5.49: Mtangawanda jetty in Pate Island	129
Figure 5.50: Common means of transport	131
Figure 5.51: Major transport challenges in Pate Island	131
Figure 5.52: Orange mobile boosters observed in Faza	132
Figure 5.53: common means of communication in Pate Island	133
Figure 5.54: Source of lighting among communities in Pate Island	134
Figure 5.55: source of heating/cooking energy among communities in Pate Island	134
Figure 5.56:Djabias spotted in areas of Mbwajumwali location	135
Figure 5.57. Water well drilling at Siyu	136
Figure 5.58: Siyu village well	137
Figure 5.59: Abubakar Khalifa well	137
Figure 5.60:Tchundwa village well	137
Figure 5.61: A well at Pate	137

Figure 5.62: Well at Rasini, note proximity to house	137
Figure 5.63: Desalination Machines at Kizingitini location	138
Figure 5.64: Distribution of water sources in Pate Island	139
Figure 5.65: Main sources of drinking water in Pate Island	140
Figure 5.66: Major problems in water access in Pate Island	140
Figure 5.67: Waste water discharge method in Pate Island	141
Figure 5.68: Methods of solid waste disposal	142
Figure 5.69: Distribution of housing types in the project area	143
Figure 5.70: Occupancy tenure in Pate Island	143
Figure 5.71: Wall material for houses in Pate Island	144
Figure 5.72: Roofing materials for houses in the project area	144
Figure 5.73: Floor materials for houses in the project area	145
Figure 5.74: Land use distribution in Lamu County	146
Figure 5.75: Modes of land acquisition in Pate Island	147
Figure 5.76: Land ownership structure in Pate Island	147
Figure 5.77: Land allocation structure among communities in Pate Island	148
Figure 5.78: Main security threats in Pate Island	149
Figure 5.79: Suggested measures to reduce security threats in Pate	
Figure 5.80: Common diseases in Pate Island	155
Figure 5.81: Hospitals where community's in Pate seek medication	156
Figure 6.0.1: Locations of Communities Consulted	160
LIST OF TABLES	
Table 0.1: Summary of Project Impacts	xv
Table 1.1: Current shareholding interest for oil blocks L4 and L13	
Table 1.2: ESIA Team Members	6
Table 2.1: Oil Blocks Coordinates	
Table 2.2: Summary of waste type, source, and disposal options	20
Table 2.3: Project Implementation schedule	22
Table 2.4: Budget Cost Estimate Breakdown	23
Table 3.1: Difference between the three drilling fluids	25
Table 4.1: Effluent discharge standards criteria for NEMA and World Bank/IFC Standards \dots	48
Table 4.2: A Petrol powered motor vehicle emission standards	49
Table 4.3: Ambient Air Quality at Property Boundary for General Pollutants	
Table 4.4: Ambient Air Quality Tolerance Limits6	51
Table 4.5: Emission from Onshore Oil and Gas Production (milligrams per normal cubic met	er, unless
otherwise specified)	53
Table 4.6: Key Institutions relevant to the development, their roles and requirements	54
Table 4.7:The summary of Ten EPs:	
Table 5.1: Salinity Levels in Lamu	73

Table 5.2: Average Rainfall for Lamu County	74
Table 5.3: Air quality measurements in Pate Island	77
Table 5.4: Wind speed in Lamu	81
Table 5.5: EMCA Noise Regulation, 2009 levels	82
Table 5.6: Recorded Ambient Noise Levels from Pate Island	82
Table 5.7. Volatile hydrocarbon compounds analysis results	92
Table 5.8. Total hydrocarbon analysis results	93
Table 5.9: Religious Affiliation in Lamu Couty	109
Table 5.10: Population Census Results	109
Table 5.11: Population Projections for Lamu County	110
Table 5.12: Literacy Levels	116
Table 5.13: Employment Distribution	127
Table 5.14: Income Source Percentages	127
Table 5.15: Summary of key findings for the traffic survey	130
Table 5.16: Health Services in Lamu County	151
Table 5.17: Average distances that locations seek medical services	156
Table 6.0.1: Public and Stakeholder Consultation Team	159
Table 6.0.2: List of Communities Consulted	160
Table 7.0.1: List of criteria used to assess significance	167
Table 7.0.2: Likelihood of occurrence criteria	169
Table 7.0.3: Impact Assessment Matrix	169

EXECUTIVE SUMMARY

Project: Hydrocarbon exploration drilling programme on Blocks L4 and L13 in Lamu County

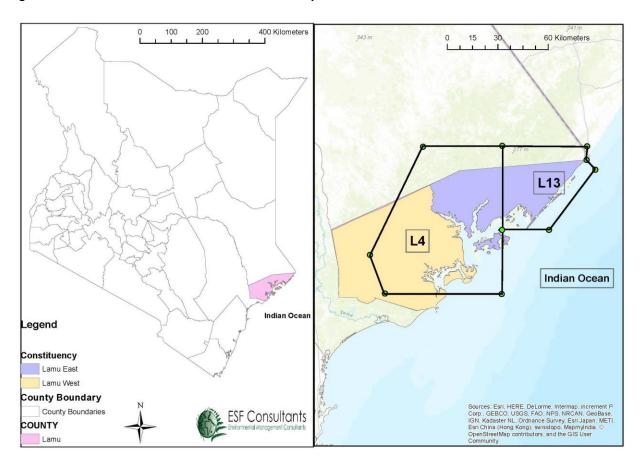
Proponent: Zarara Oil and Gas Limited

Location: Blocks L4 and L13 are in Lamu county, special focus on Pate Island

Project Background

The proposed project aims at carrying out a hydrocarbon exploration drilling programme on Blocks L4 and L13 in Lamu County, with specific focus on Pate Island (See Figure 0.1 below). Zarara Oil and Gas Limited (Zarara), a wholly owned subsidiary of Midway Resource International with a 75% working interest in Blocks L4 and L13 is the operator of the blocks and will be implementing the proposed project.

Figure 0.1: Location of Block L4 and L13 in Lamu County



Source: ESF Consultants

Environmental and Social Impact Assessment (ESIA)

The ESIA has been prepared by Environnementalistes Sans Frontieres (ESF) Consultants Limited of Kenya, working in cooperation with the proponent "Zarara". ESF Consultants has performed a number of ESIAs in the Oil and Gas sector in Kenya according to the requirements and procedures of the Environmental Impact Assessment and Audit Regulations and International Best Practise; and is registered with National Environment Management Authority (NEMA) as a firm of consultants (Registration Number 0204) to perform ESIA.

This ESIA has been structured such as to cover the requirements under the Environment Management and Coordination Act (EMCA, 1999) through the Environmental Impact Assessment (EIA) regulations as stipulated under the Gazette Notice No. 56 of 13th June 2003. Under Schedule II of the Act such projects are required to develop an ESIA to avert the potential adverse impacts of the proposed project and propose recommended mitigation measures.

The scope covered by this ESIA includes exploration drilling activities with specific focus on Pate Island in Lamu County. The ESIA relies on information already available concerning environmental and socio-economic conditions in the area through literature review; information learned through engagement of the public and relevant stakeholders; and primary sources of information such as socio-economic survey, ecological survey, noise assessment and hydrological survey undertaken by ESF.

ESIA Study Objectives

The aim of this ESIA Report is to examine both the positive and negative effects that the proposed exploratory drilling project is likely to have on both the physical and the socio economic environment. Early identification of possible impacts promotes environmental sustainability in that, anthropogenic factors do not interfere with natural environment but blends with it creating harmony.

ESIA Methodology

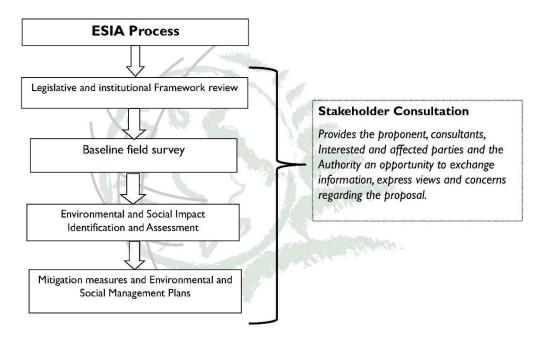
The ESIA Study covered the following aspects:

- 1. Establishing the existing environment (Environmental, socio-economic and health baseline) where the project falls
- 2. Defining the legal, institutional and policy framework of the proposed project
- 3. Analysing the potential impacts of the proposed project
- 4. Analysing the alternatives to the proposed project
- 5. Developing accurate and practical mitigation measures for the significant negative impacts
- 6. Developing an Environmental and Social Management Plan (ESMP) for the significant negative impact
- 7. Identifying, consulting and involving all stakeholders to facilitate all study objectives

To achieve these objectives, the study collected baseline data firstly through desktop studies on a: national level; regional, and then finally scoping down to the study area and its immediate environs. This is done using detailed study, information from previous similar studies, developed checklist, and professional knowledge. The checklist focused on information gained from the screening process and other cross-sectorial issues such as: health and safety, biodiversity, air pollution, noise, among others.

Several methods and processes were undertaken to enable the achievement of the study's objectives. The ESIA process used in this study is illustrated in Figure 0.2 below:

Figure 0.2: EISA Process



Public Consultation

As required by regulations, stakeholders were identified and engaged as part of this ESIA Study Report. The groups are those generally considered to be most likely to be potentially adversely impacted by the Project. Public consultation and participation ensures that the views of the affected and interested parties are incorporated as early as possible in the project development: at planning, implementation and operation phase and thereby minimize the potential for unexpected opposition of the proposed development and potential for adverse effects to the environment. It is also very beneficial in incorporating the views of the public into the design process for the adoption of the best workable models and systems.

Stakeholders identified were grouped into two categories:

 Primary Stakeholders - Those directly affected by the project such as members of the public and various surrounding institutions • **Secondary Stakeholders** – Those indirectly affected by the project but who influence development as part of its project implementation. These include the responsible agencies of both the County and National Government and civil organisations.

Below are some of the key issues, concerns and comments raised during the stakeholder consultation exercise:

- Concerns on the project's impact on biodiversity through the drilling process.
- Concerns on waste generation and the methods that will be used to dispose of waste.
- Concern on how the project will benefit the community such as jobs, social investment projects and infrastructural development
- Concerns on sharing of resources such as water sources for the project.
- The issue of compensation was raised by the communities in all locations

Legal Framework

This ESIA has been prepared in accordance with the national and international laws applicable to oil and gas exploration and development. All activities will be undertaken in accordance with Kenyan legal and regulatory requirements, International Best Practices/Standards and Zarara's standards and policies. The legal framework review involved the following:

- 1. National legislations
- 2. National policies and plans
- 3. National institutional framework and permits
- 4. International agreements and conventions
- 5. IFC Performance Standards/ World Bank Group EHS Standards
- 6. Equator Principles

Project impacts and mitigation measures

The potential impacts (positive and negative) associated with the proposed development were identified from their sources that include: projects activities; equipment; processes; materials against their main receptors that includes the baseline environmental and social condition all with respect to the four phases of the project cycle which include the Design, Construction, Operation and Decommissioning phase. The evaluation approach implemented in this study is a Receptor-Specific Analysis approach addressing the various sources of impacts from the project's different implementation phases.

Assessment of the identified potential impact was done by developing a criterion that was used to determine the severity of the impact identified in terms of significance, duration, reversibility, likelihood of occurrence and geographical extent.

Some of the impacts identified and mitigation measures are summarized in Table 0.1 below

Table 0.1: Summary of Project Impacts

Environmental and	Mitigation Measures
Social Impact	
Biodiversity (Flora, Fauna, Soil Characteristics)	 Rapid regeneration of plant cover must be encouraged by setting aside topsoil during earthmoving and replacing onto areas where the reestablishment of plant cover is desirable to prevent erosion if it was necessary. Implement a tree planting program within the well site boundary to offset loss of trees due to the construction phase Work areas should be clearly defined and demarcated, where necessary to avoid unnecessary disturbance on areas outside the development footprint Ensure protection of important resources by establishing protective buffers to exclude unintentional disturbance Providing soil erosion control structures on the steeper areas of the site & controlling activities during the rainy season Manage storm and flood flash water effectively to avoid movement of loss soils. Vehicles coming into the site must use designated roads Education on the importance of flora and fauna in the areas, including the appropriate regulatory requirements Develop a plan for control of noxious weeds and invasive plants that could occur as a result of new surface disturbance activities at the site. The plan should address monitoring, weed identification, the manner in which weeds spread, and methods for treating infestations If possible, schedule operations during least sensitive periods such as species migration periods, nesting and mating seasons. March to August is the peak turtle nesting season in Lamu. Throughout a nesting season females may come back to nest up to five to eight different clutches of eggs on the same beach with up to 150 eggs in each clutch, with 12-15 days apart. They then migrate back to their feeding grounds after this to come back for the same experience two to three years later. However, the proposed drilling programme will be
carried out onshore. Water Water Consumption	
	There are several options in sourcing freshwater to reduce impact of sourcing freshwater in the island: 1. Filling barges with water from water stations or rivers on the main land (e.g. Tana River), Malindi or Mombasa; and transporting to Pate Island.
	 Building a storage pit which can be filled with freshwater before commencement of the project, which can act as an available reserve to minimize possible over abstraction with the local supply Drilling a bore hole to tap in to aquifer of Vumbe wells in the mainland Locating a local source that is acceptable with the local community Treating sea water through a reverse osmosis process

	Waste Water
	 Wastewater can be recycled and used in the drilling process, domestic effluent can also be treated and recycled and sludge from site for safe disposal at a designated disposal site. In the management of black and grey water, the proponent can dispose of the waste using the three methods below: Use of a septic tank of sufficient capacity to accommodate anticipated crew numbers Kitchen waste water will be channelled through a grease trap before going into the septic tank Kitchen sinks, wash basins and drains shall be permanently equipped with gratings to retain soils and avoid conduction line clogging Where possible rain water can be used in the drilling process. If pit water is deemed uncontaminated it can be pumped offsite or reused as irrigation water for restoration of the site perimeters.
Waste Generation	 Establishing a waste management plan such as: Terms on waste collection schedule and disposal by waste handler credited by NEMA Training of site personnel in proper waste management and chemical handling procedures Provision of suitable facilities for the collection, segregation and safe disposal of the wastes. Waste should be segregated in terms of recyclable, reusable, biodegradable, non- biodegradable and providing equipment for handling waste Regular cleaning and maintenance programme for drainage systems, sumps and oil interceptors
Air Quality	 Sprinkling water periodically when operations are under way to prevent raising of dusts Impose and enforce speed limits and provide driving guidelines for vehicle operators Sensitize truck drivers to avoid unnecessary racing of machinery engines at loading, offloading sites, and parking areas and encourage them to keep the vehicle engines off at these points. Use of low sulphur fossil fuel. Regular maintenance and services of machines and engines Educate and raise awareness to construction workers on emission reduction and emissions that are likely to occur. Provide workers with appropriate Personal Protective Equipment (PPE) such as dust masks.
Noise and Vibration	 Inform local residents beforehand, via notices and advisories, of pending noisy periods and solicit their tolerance well before the commencement of any activities

Machinery should be maintained regularly to reduce noise resulting from friction during operations Using modern machinery equipment with noise suppressing technologies in order to reduce the noise-rating as much as possible Locate all stationary construction equipment (i.e. compressors and generators) and exploratory wells as far as practicable from nearby residences and other sensitive receptors Provision of warning signs should be made at the gate warning of construction activity and heavy machinery turning A grievance procedure will be established whereby noise complaints by neighbours are recorded and responded to Workers to be provided with PPE such as earmuffs and be trained on how to use them when operating in noisy environment. Occupational, Provide workers with appropriate PPE such as goggles, gloves, hard hats, **Health and Safety** overalls, ear muffs, dust mask among others Employing an Occupational safety and health (OSH) plan that will outline all OSH risks and provide a strategy for their management Maintain on site a record of incidents and accidents Placing signs around where there are risks. Signs should meet international standards and should be in English and Kiswahili for easy understanding The well pad should be cordoned off and there be security in and around the site to control the movement of unauthorized personnel and thereby protect the general public from dangers associated with the operations Provision of warning signs warning of construction activity and heavy machinery turning. Providing firefighting equipment, in easily accessible areas and ensuring site personnel are well trained to use them as well as maintaining them regularly Raising awareness, educating workers on risks and use of equipment; animal species and habitats found in the area and their risks; first aid training. Have a malaria management plan in place Providing safe and secure storage for equipment and materials in the site and maintaining Material Safety Data Sheets (MSDSs) Establishing emergency procedures against hazards and ensuring the workers stay aware/educated on following them and commensurate to the magnitude and type of emergency, by conducting regular drills and involving the neighbours. **Social Impacts** Grievance Mechanism will be in place to resolve any employment and local supplier-related grievances. Where feasible look into vocational training programs for the local workforce to promote development of skills required by the oil and gas industry Develop and implement a Health Risk Assessment and a workforce management plan for the local workforce.

Traffic Issue notices/advisories of pending traffic inconveniences and solicit tolerance by local residents before the commencement of construction works Flagmen/road marshals should be employed to control traffic and assist mobilization vehicles as they enter and exit the project site Ensuring that all drivers for the project comply to speed regulations Ensure all vehicles and machinery used for the project are in good working conditions both legally and are commensurate to the intended use. Prepare an access road siting study and management plan to guide road design, construction, and maintenance standards, and to allow for successful interim and final reclamation. (For example, require operators to coordinate closely with the local governments responsible for maintaining roadways providing access to the project area. Compare the number, size, and weight of loads to service projects to the existing road infrastructure to determine if roads and bridges are adequate to support intended loads. Consider routing project traffic to minimize impacts on local residents.) **Visual Impact** During construction of the well pads, existing vegetation around the perimeter of the site should be maintained to minimize views into the site. Following construction, natural vegetation should be restored in none operational areas of the site and/or additional landscape planting with local indigenous species used to improve views into the site Consider site-specific landscaping in selected area to provide screening for resident whose property abuts the project Ensure good housekeeping of the site in order to create a positive image in the eyes of the public External lighting shall be as unobtrusive as possible and shall be shielded and directed downwards to prevent side spill. The use of tall mast lights shall be carefully assessed before being used due to proximity of fauna and residential areas Consider site-specific landscaping in selected area to provide screening for resident whose property abuts the project Chemical, waste or Requirements of oil spill and emergency plans must be met before operations oil spill commence. Apply spill prevention practices and response actions in refuelling and vehicleuse areas to minimize accidental contamination of habitats and soil. Address spills immediately per the appropriate spill management plan, and initiate soil clean-up and soil removal if needed. Containerize spent oils and lubes for appropriate disposal or recycling. Containerize contaminated soils that cannot be treated in situ and remove offsite for treatment

Project alternatives

A "No Action" alternative was determined to be unwarranted because the proposed program, which is required by agreement between Zarara Oil and Gas Limited and the Government of Kenya and is consistent with national economic development objectives into attaining vision 2030, can clearly be executed with little measurable environmental impact. Other alternatives such as site location, layout, project inputs and design were also considered.

Environmental and Social Management Plan (ESMP) and Project Monitoring

An environmental and social management plan (ESMP) has been developed to manage the identified potential impacts and to keep the impacts at an acceptable level throughout the projects lifecycle.

Conclusion and recommendations

The study finds the project is acceptable if the identified and developed management plans and practises are implemented accordingly. It also recommends appropriate monitoring of the project development and operational activities to ensure that adverse impacts that were unforeseen are identified and addressed in a timely fashion. Subsequent projects that might arise as a result of this project should undergo environmental assessment and permitting with NEMA as a prerequisite for any development undertaking. NEMA is advised to license the project since it is a viable project.

1.0. INTRODUCTION

1.1 Project Background

Zarara Oil and Gas Limited (Zarara) is wholly owned subsidiary of Midway Resource International and operator with a 75% working interest in Blocks L4 and L13 (as illustrated in Figure 1.1 below).

400 Kilometers 343 m 60 Kilometers L13 Indian Ocean Indian Ocean egend Constituency Lamu East Lamu West County Boundary Sources: Esri, HERE, DeLorme, Intermap, increment F Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase County Boundaries **ESF** Consultants GIS, GESCO, 1993, Pro, NPS, NECKI, GESDASS, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI. Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User COUNTY Lamu

Figure 1.1: Location on Block L4 and L13 in Lamu County

Source: ESF Consultants

Zarara is the Operator of Blocks L4 and L13, with a shareholding with two other companies as represented in Table 1.1. Two Production Sharing Contracts (PSC) were signed on the 3rd December 2008 with SOHI-Gas Lamu Limited for a 90% interest in Block L4 and SOHI-Gas Dodori Limited for a 90% interest in Block L13, collectively SOHI with the balance of 10% being a carried interest for the Government of Kenya through to commerciality. The PSCs were for an initial three-year exploration period, which have been extended on two occasions through to 3rd June 2017. The PSCs contain minimum work programmes of two-dimensional (2D) and three-dimensional (3D) seismic, together with a high resolution ground magnetic and gravity survey over the Pate structure and the drilling of one exploratory well to a minimum vertical depth of 4,500 m. On 4th April 2011, SOHI farmed out its interests to Zarara Oil and Gas Limited

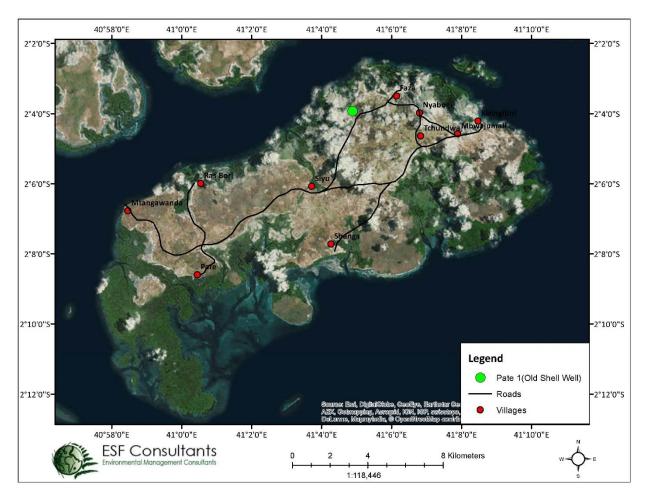
(Zarara), whereby Zarara, committed to fund the minimum work programme for a 75% interest in the blocks from SOHI.

Table 1.1: Current shareholding interest for oil blocks L4 and L13

Company	Equity (%)
Zarara (Operator)	75
SOHI	15
Government of Kenya	10

Zarara plans to undertake a hydrocarbon exploration drilling programme on Blocks L4 and L13 in Lamu County to further explore and appraise the gas discoveries made by Shell in the 1970s (see Figure 1.2), which encountered high-pressure gas, but in an unknown quantity and quality as the well did not fully penetrate the reservoir section and was neither logged nor tested due to technical problems whilst drilling.

Figure 1.2: Location of Pate 1 - Shell Well



Source: ESF Consultants

In 2012, Zarara conducted a 6,200 kilometres (km) high resolution airborne magnetic and gravity survey in order to produce a regional map of the main depocentres where hydrocarbons may be generated thereby permitting a more optimised location and orientation of the 2D seismic lines over prospective structures in the blocks. In 2013, Zarara acquired 400 km of 2D seismic, interpretation of which enabled more detailed maps to be produced. These surveys together with past seismic, well log and past geological interpretations have been integrated by Zarara, as Operator, to estimate the potential resource and define the drilling targets for the drilling campaign.

Zarara plans to commercialize the prospect in a phased approach as illustrated in Figure 1.3. In this regard, Zarara has appointed Environnementalistses Sans Frontieres (ESF) Consultants Ltd, to conduct an Environmental and Social Impact Assessment (ESIA) to cover Phase 1 of the project; that is, Exploratory Drilling Programme.

Figure 1.3: Zarara proposed business plan in a phased approach

Phase 1:

Drilling programme covering the drilling and testing wells to explore and appraise the development.

Phase2:

The construction of a gas processing plant and installation and commissioning on Pate Island of a temporary electricity generating facility of 20-100MW of gas powered single cycle reciprocal engine generators. The electricity would be transported by cable across the island and along the seabed to the Lamu Port area where it would be connected in to the national electricity grid.

Phase 3:

Drilling of additional wells, expansion of gas processing facilities and piping of the gas across the island and along the seabed to the Lamu port area in order to feed a 300-900MW Combined Cycle Gas Turbine power station depending on the size of the resource.

1.1. The ESIA Study

This ESIA study was undertaken under requirements of Environmental Management and Coordination Act (EMCA) of 1999 schedule II as stipulated by National Environment Management Authority (NEMA) through the Environmental Impact Assessment (EIA) regulations.

The ESIA was also conducted in accordance to international agreements and conventions; International Best Practices such as International Finance Corporation (IFC) Performance Standards on Environmental and Social Sustainability 2012, Equator Principles III 2013; and World Bank Groups Environment, Health and Safety General Guidelines and on Onshore Oil and Gas Development.

The aim of this ESIA study is to examine both the positive and negative effects that the proposed project is likely to have on both the physical and the socio economic environment. Early identification of possible

impacts promotes environmental sustainability in that, anthropogenic factors do not interfere with natural environment but blend with it creating harmony. This study is important because it plays the following roles:

- 1. Acts as a planning and management tool: the ESIA is an important planning and management tool for the project proponent as it will state any significant project effects and clearly defined mitigation measures to avoid or curb adverse impacts.
- 2. **Acts as a reconciliatory tool**: the ESIA process helps to bring together various lead agencies, which can shed some light on a proposed activity and possible conflicts or conflict situations and give a forum for dealing with such situations in advance before a project is implemented.
- 3. Acts as an advisory tool: the ESIA process helps to advise any project proponent on whether or not a project is viable enough to be implemented while relying on the environmental base as the foundation for its existence.

1.3 ESIA Methodology

The ESIA Study will cover the following aspects:

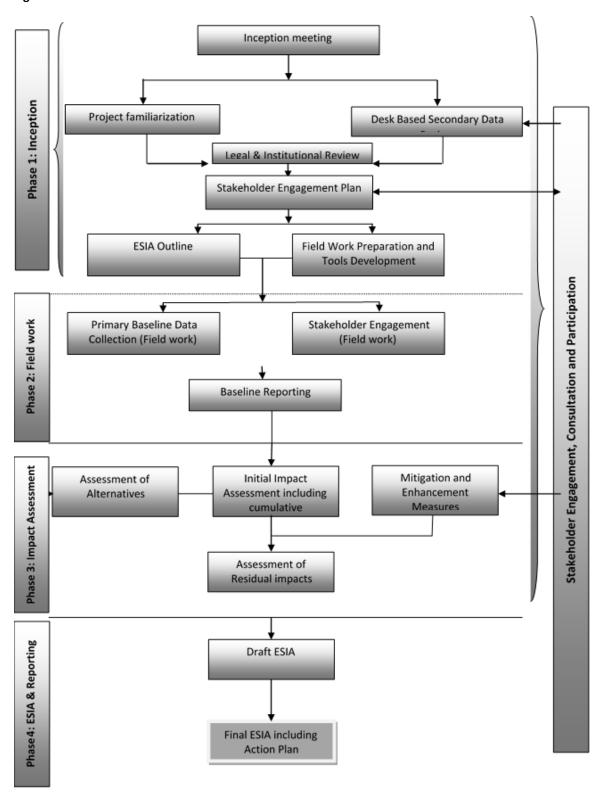
- 1. Establish the existing environment where the project falls
- 2. Define the legal, institutional and policy framework of the proposed project
- 3. Analyse the potential impacts of the proposed project
- 4. Analyse the alternatives to the proposed project
- 5. Develop accurate and practical mitigation measures for the significant negative impacts
- 6. Develop an Environmental and Social Management Plan (ESMP) for the significant negative impact
- 7. Identify, consult and involve all stakeholders to facilitate all study objectives

To achieve these objectives, the study collected baseline data firstly through desktop studies on a: national level; regional and then finally scoping down to the study area and its immediate environs. This is done using detailed study, information from previous similar studies, developed checklist and professional knowledge. The checklist focused on information gained from the screening process and other cross-sectorial issues such as: health and safety, biodiversity, pollution etc.

Several methods and processes were undertaken to enable the achievement of the study's objectives. The ESIA process that was employed is depicted in

Figure 1.4.

Figure 1.4: ESIA Process



Some of the specialist studies that were carried out during the field baseline survey include:

- Ecological Survey
- Socio-economic Survey
- Hydrogeological Survey
- Ambient Air Quality Assessment
- Traffic Survey
- Noise Assessment

1.4 ESIA Team

ESF Consultants is registered by NEMA (Registration Number 0204). The ESIA team members who took part in the study comprised of the following:

Table 1.2: ESIA Team Members

Name	Position	Qualification	NEMA Registration Number
James Kambo	Team Leader /	MSc in Environmental	0713
	Projects manager	Planning and Management	
Duncan Oyaro	ESIA Specialist	MSc in Environmental	0159
		Planning and Management	
Dorothy Suleh	Environmental Consultant	MSc Environmental	7066
		Assessment and Management	
		-	
Linet Mbova	Public Consultation and	BSc Environmental Science	6374
	Participation Specialist		
Dan Odera	Hydrogeologist	Msc Hydrogeology	
Godfrey Wafula	Air Quality Assessment	Msc Environmental Chemist	
Anthony Kiovi	Environmental Consultant	BSc Environmental Science	7324
Lameck Okeyo	Environmental Consultant	BSc Environmental Planning and Management	6970
Michael Kiboi	GIS Specialist	BSc Environmental Science	7435

1.5 Report Structure

The structure of this ESIA Report is as follows:

- Executive Summary
- Introduction (Chapter 1)
- Project Description (Chapter 2)
- Analysis of Alternatives (Chapter 3)
- Policy, Institutional and Legal Framework (Chapter 4)
- Environmental and Socio-economic Baseline (Chapter 5)
- Public and Stakeholder Consultation (Chapter 6)
- Impact Assessment and Mitigation Measures (Chapter 7)
- Environmental and Social Management and Monitoring Plan (Chapter 8)
- Conclusion and Recommendations (Chapter 9)
- Reference
- Appendices

2.0. PROJECT DESCRIPTION

This Chapter provides a description of the key Project components and details regarding activities throughout the life of the Project.

2.1. Project Background

Zarara's business plan is to commercialise the prospect in a phased approach. Phase I is a drilling programme covering the drilling and testing of wells to explore and appraise the resource potential. Zarara plans to undertake a hydrocarbon exploration drilling programme on Blocks L4 and L13 in Lamu County to further explore and appraise the gas discoveries made by Shell in the 1970s which encountered high-pressure gas, but in an unknown quantity and quality as the well did not fully penetrate the reservoir section and was neither logged nor tested due to technical problems whilst drilling.

In 2012 Zarara conducted a 6,200 km high resolution airborne magnetic and gravity survey in order to produce a regional map of the main depocentres where hydrocarbons may be generated thereby permitting a more optimised location and orientation of the 2D seismic lines over prospective structures in the block. In 2013, Zarara acquired 400 km of 2D seismic, interpretation of which enabled more detailed maps to be produced. These surveys together with past seismic, well log and past geological interpretations have been integrated by Zarara, as Operator, to estimate the potential resource and define the drilling targets for the drilling campaign.

2.2. Project Location

Figure 2.1 and Table 2.1 show the coordinates for Blocks L4 and L13.

Figure 2.1: Oil Blocks Coordinates

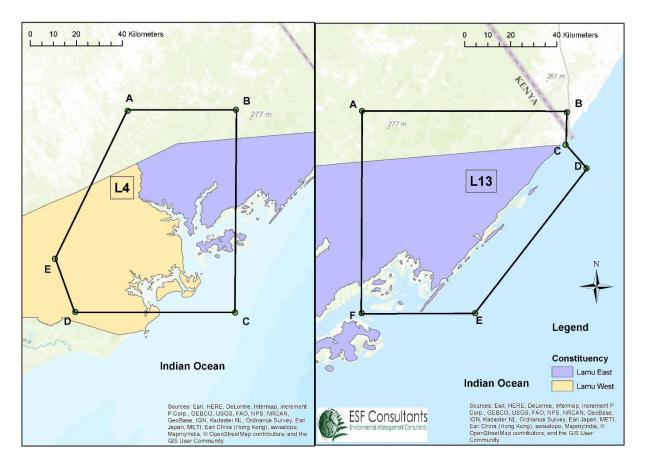


Table 2.1: Oil Blocks Coordinates

Oil Block	Point	Oil Blocks Coordinates
Block L4	Α	1°35'14"S, 40°42'2"E
	В	1°34'57.30"S, 41° 7'22.62"E
	С	2°22'41.40"S, 41° 7'16.68"E
	D	2°22'36.97"S, 40°29'49.68"E
	E	2°10'7.7"S, 40°25'0.3"E
Block L13	Α	1°34'57.30"S, 41° 7'22.62"E
	В	1°35'5.19"S, 41°34'38.33"E
	С	1°39'26.86"S, 41°34'27.79"E
	D	1°42'35.9"S, 41°37'15.9"E
	E	2°2'0"S, 41°22'26.6"E
	F	2° 2'1.02"S, 41° 7'21.22"E

The location of the exact drill site in the focus areas depends on the characteristics of the underlying geological formations as shown by seismic data. It is generally possible to balance environmental considerations with logistical needs and the need for efficient drilling. However, it is known that the hydrocarbon exploration drilling programme will concentrate in Pate Island as shown in Figure 2.2. The

scope of work will cover the drilling of two wells on Pate Island, with the option to drill up to two additional wells to further appraise the prospect.

Pate Island

Pate Island

Manda Island

Matondoni Damu

Lamu Island

Dalisio-NOAA U S Navy NGA CEBCO
2016 Google
Lamu Bay

Pate Bay

Coogle earth
Lamu Bay

Coogle earth
Lamu Bay

Coogle earth
Lamu Bay

Coogle earth
Lamu Bay

Coogle Pate Bay

Coogle earth
Lamu Bay

Coogle Pate Bay

Coogle earth
Lamu Bay

Coogle Pate Bay

Coogle

Figure 2.2: Location of the three islands in Lamu County

2.3. Exploratory Drilling Components

Exploratory drilling is a temporary and short duration activity and includes site preparation, equipment assemblage, well site and drilling pad construction, erection of the rig, drilling, testing and restoration of the well site. In the event that potentially commercial volumes of hydrocarbons are discovered additional exploration wells and/or appraisal wells are likely to be drilled in the future to provide greater information on the likely nature and scale of the hydrocarbon resources.

Mobilization and establishment will involve transportation to the project site of the drilling rig, drill pipe, casing, camp and other supporting equipment, drilling materials and consumables including fuel, drilling mud, among others.

2.3.1. Accessibility and Transportation

During this phase the drilling rig and ancillary drilling equipment will be transport by ship or barge from the ports of Mombasa to Pate Island. Consumables and ancillary equipment will be sourced locally to the extent possible. These equipment and materials will be landed on Pate Island by barge using the Jetty at Mtangawanda or on the adjacent beach and transported to the drill site by road using truck. Figure 2.3 below shows the locations of Mtangawanda Jetty and the road systems in Pate Island.

Figure 2.3: Map showing location of Mtangawanda Jetty and Main roads in Pate Island

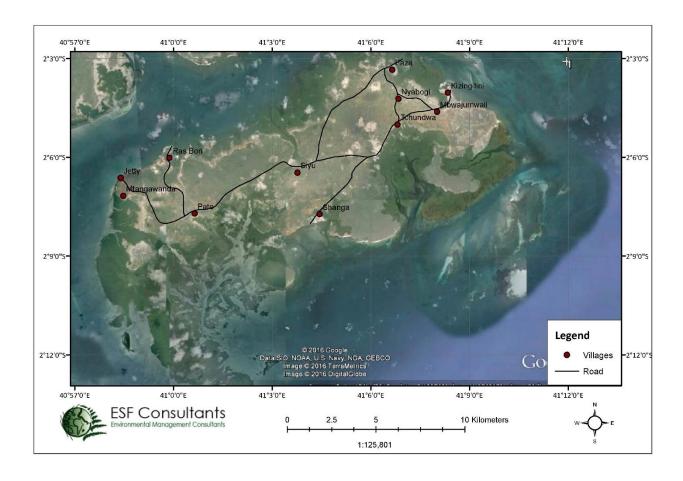


Figure 2.4 shows the current jetty in Mtangawanda. This jetty is small and can be used to offload the light loads at the right tide. The heavier cargoes will be offloaded at the adjacent beach (Figure 2.5).

Figure 2.4 Mtangawanda Jetty

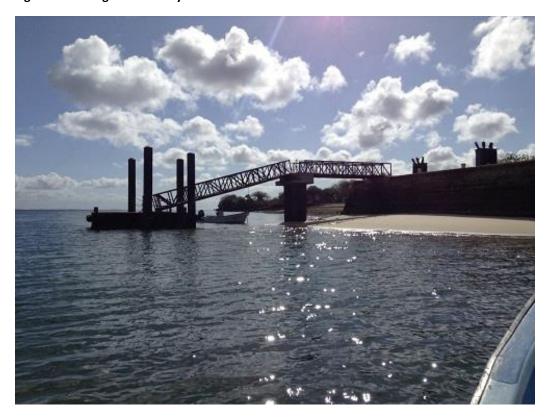


Figure 2.5: Adjacent beach to Mtangawanda Jetty



There is one main road connecting Mtangawanda to Faza and Kizingitini. Some of the access roads in Pate Island were created during the seismic period, which the community members requested to be left. There will be approximately 5 – 10 trucks transporting material to and from Mtangawanda Jetty to the project

site. The trucks will carry approximately 150-200 truckloads of equipment: carrying loads weighing approximately 20-40 tonnes. Due to the heavy nature of the equipment, where necessary roads will be upgraded and jetties, bridges and drainage and culverts will be strengthened and reinstated. Figure 2.6 below shows the current status of the road from Mtangawanda Jetty, which is an earth road.

Figure 2.6:Road leading into Pate Island from Mtangawanda Jetty



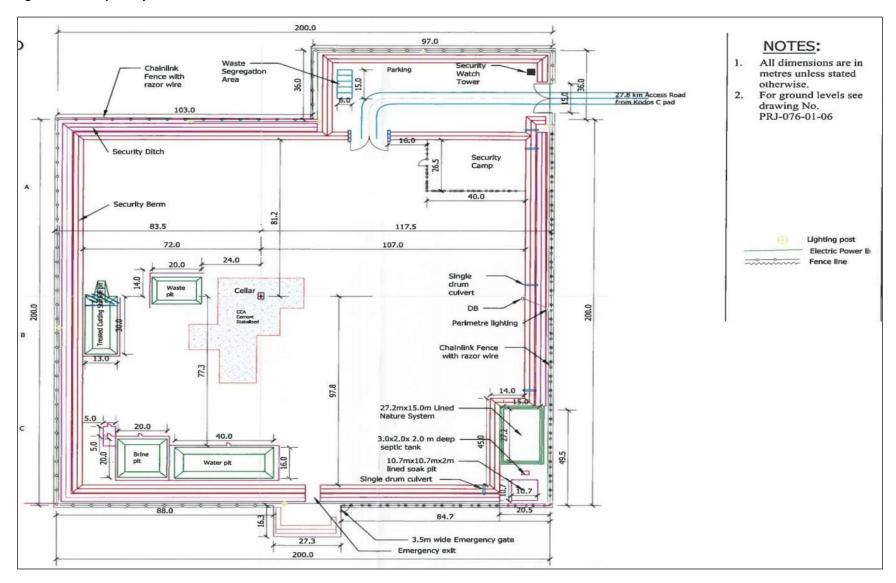


2.3.2. Well Pad Layout

A well pad will be constructed at the drilling site to accommodate the following, but not limited to: the rig, ancillary drilling equipment, accommodation and offices, among others and it will cover an area of approximately 200 metres (m) by 200m. The camp will hold approximately 120 people, both workers and contractors. The mobilisation and establishment phase is expected to last up to 60 days.

Figure 2.7 below shows a typical layout of a well pad. The type of well pad to be contracted will depend on terrain, soil conditions, and seasonal constraints.

Figure 2.7: Well pad Layout



2.3.3. Water Requirements

A land well is normally drilled with freshwater; however, this is dependent on the abundance of fresh water supply in the area. Maximum expected water usage for each well is 3,180,000 litres.

There are several options in sourcing freshwater:

- 1. Filling barges with water from water sources or rivers on the main land (e.g. Tana River, Malindi or Mombasa) and transporting to Pate Island.
- 2. Building a storage pit which can be filled with freshwater before commencement of the project, which can act as an available reserve to minimise possible over abstraction with the local supply.
- 3. Locating a local source that is acceptable with the local community.
- 4. Drilling a bore hole to tap in to aquifer of Vumbe wells in the mainland

The best options we would recommend to be used during this project would be sourcing water from Malindi or Mombasa and transported to Pate Island via barge.

2.3.4. Power and storage requirement

The drilling process requires rotation of a drill bit through the draw works which requires power. This power will be provided by generators (Caterpillar SR4 1500KVA x 4 or equivalent). A major part of the fuel will be consumed by the Rig and the rest by the base camp. A temporary fuel storage facility at the site will be constructed with a maximum storage capacity of 100m³.

Other chemicals and equipment used in the site such as cement and drilling mud will also require safe storage.

2.3.5. Labour Requirements

The camp will hold approximately 120 people. The drilling contractor and Zarara are expected to employ and train residents from the island or immediate areas. The locals will be contracted to undertake manual work throughout the project cycle. Initially, local personnel will be involved in the functions requiring little previous experience. However, as the drilling program progresses, locals will be trained to undertake more skilled activities.

2.4. Well Drilling and Operation

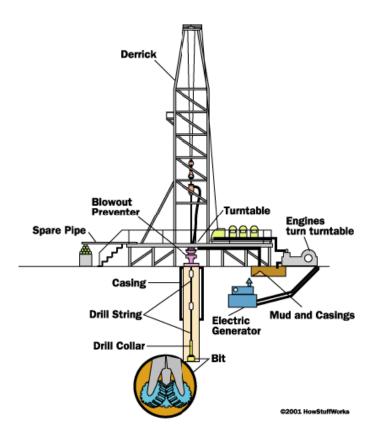
The initial well will be a vertical well to a target depth of 4,600 metres and broadly twin the exploration well Pate -1 drilled by Shell in 1971. Assuming identification of the expected levels of hydrocarbons, a further 1 to 4 appraisal wells will be drilled as part of this campaign. These will use deviated drilling to a vertical sub surface depth of between 4,000 and 4,500 metres or vertical wells from separate well pads. The drilling process of one well is expected to take 3 months.

2.4.1. Drilling Process

Once the land has been prepared, several holes are dug to make foundations for the rig and the main well hole. A rectangular pit, called a cellar, is dug around the location of the actual drilling hole, which provides a work space for the workers and drilling accessories. Drill bits, attached on a drill string, that vary in size

are used to drill the hole in the ground. When these holes are finished and the Derrick (rig mast) erected, the rig equipment can be brought in and set up. The first part of the hole is larger and shallower than the main portion, and is lined with a large-diameter conductor pipe. Figure 2.8 below shows a typical structure of a drilling rig.

Figure 2.8: Drilling rig



Once the hole extends to a reasonable depth the drill pipe is removed and replaced with steel pipe called, surface casing (Figure 2.9 shows an example of a casing used in the drilling process). Cement is then added around the sides of the well to permanently set the casing in place: this process has been illustrated in Figure 2.10 below. Casing will be used to provide structural support and isolate underground rock formations to prevent natural gas or other substances from leaking out into any surrounding freshwater aquifers, and to facilitate movement of equipment up and down the hole.

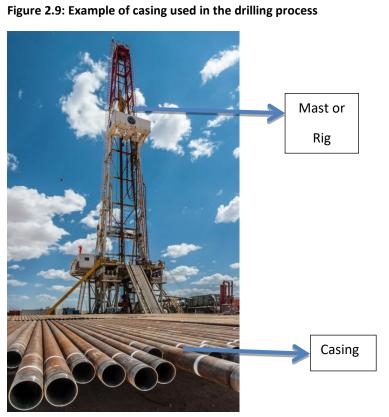
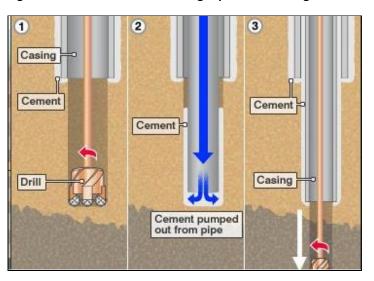


Figure 2.10:How cement and casing is placed in drilling well



2.4.2. Well Control

Primary Well Control: Drilling Mud

Primary well control is the control of pressure in the rock by using the weight of the drilling mud that is pumped into the well. The drilling mud prevents gas and fluids from the rocks from flowing into the well, it lubricates the drill bits and moves broken rock (cuttings) out of the way.

During drilling, drilling mud will be continuously circulated down the drill pipe and back to the surface to¹:

- a. Facilitate the drilling process by suspending cuttings
- b. Balance underground hydrostatic pressure
- c. Providing buoyancy
- d. Cool the bit
- e. Flush out cuttings

The drilling mud is mixed and stored in the mud tanks on the surface. Large, powerful mud pumps will suck the mud from the surface and pump it down in the drill string and out through the nozzles in the drill bit. The mud jetting out from the nozzles of the drill bit will then be pumped back to the surface through the annular space between the wellbore and the drill string. Back at surface, the mud flows from the well, via the flow line, to the shale shakers where the pieces of rock cut by the drill bit ("drilled cuttings") are separated from the mud, the mud is then further treated through other 'solids control equipment' to remove fine solids from the well and remove any gas. After this process the clean mud is then passed back into the mud storage tanks ready to be recirculated back into the well.

There are three different types of drilling mud used in the drilling process, which are:

- 1. Water Based Mud (WBM)- Most basic water-based mud systems begin with water, then clays and other chemicals are incorporated into the water to create a homogeneous blend resembling something between chocolate milk and a malt (depending on viscosity).
- 2. **Oil Based Muds (OBM)** Oil-based mud is a mud where the base fluid is a petroleum product such as diesel fuel.
- 3. **Synthetic Based Muds (SBM)** Environmentally-friendly organic-based muds using a base fluid produced from natural gas, or processed base oil or natural (non-petroleum) oils which are non-toxic and quickly biodegradable, such as the synthetic-based mud.

This proposed project will be using WBM which has:

- a. less environmental impacts
- b. less costs associated with cuttings, contaminated fluid disposal and tank cleaning on rig
- c. The kick detection is easier as gas does not readily dissolve in water
- d. Easier to get good cement bonding to casing and formation

¹ International Union for Conservation of Nature (IUCN). 1993. *Oil and Gas Exploration and Production in Artic and Subartic Onshore Regions: Guidelines for Environmental Protection*. Oxford, UK: Words and Publications

Secondary Well Control: Blow-out Preventer (BOP)

This measure is used if pressure of the formation fluids exceeds the hydrostatic pressure of the drilling mud. To prevent the risk of uncontrolled flow from the reservoir, a BOP is used to reduce the risk by sealing the off the well. The BOP is normally installed on the well head on the top of the surface casing and other strings of the casing are suspended from the wellhead. When the pressure caused by the weight of the column of the drilling mud in the well is less than the pressure of the fluid in the pore space of the rock, then the drilling mud will be unable to hold back the pressure in the rock and the fluid will flow from the rocks into the well. When this happens the BOP will close to prevent the flow of the fluids from the well. The systems control panel keeps the valves open to allow flow from the well to rig. In case of an emergency the hydraulic valves close shut on the pipes, sealing it and preventing flow.

Blowout preventer

Control pod

Hydraulic valves/ shear rams

Pipe to well

Blowout preventer

Valves closed

Valves closed

Figure 2.11: Blowout Preventer and how it works

2.5. Waste Generation

2.5.1. Solid waste

The main sources of waste generated during the drilling campaign will be the drilling mud and cuttings; drilling rig waste; and domestic waste from the people living at the well site. From previous oil and gas exploration projects well pad with a depth of 4,500 and 5000 metres will generate approximately 300 skip loads of cuttings and drilling fluid. However, quantities of waste generated will vary depending on depth, geology, and drilling duration.

A summary of waste types, sources, and disposal options is presented in Table 2.2 below

Table 2.2: Summary of waste type, source, and disposal options

Waste Stream	Source	Additional Segregation	Disposal Procedure
Domestic waste (food, paper)	Well Pad (Camp facilities)	Food, paper	Sorted and transported by licensed waste handlers
Recyclable Materials	Well Pad	Glass, wood, cardboard, plastics, paper	Sorted and transported by licensed waste handlers or sold to recycling agents
Burnable waste	Drill rig and well pad	Oil waste, paint cans	Recycle oil where possible. Collect until sufficient inventory to be transported by licensed waste handlers.
Hazardous waste	Drill rig and well pad	Fluorescent tubes, PCB, batteries and lab chemicals	Collect until sufficient inventory to be transported by licensed waste handlers.
Scrap metal and metal drums	Drill Rig and well pad	Sorted, drums crushed	Sorted and transported by licensed waste handlers or sold to recycling agents
Spillage (fuel, oils & lubricants)		None	Collected and transported to an appropriate site for disposal.
Excess cement	Drill Rig	None	Stored to be used in other applications
Drill cuttings, mud residues, and residue from tank cleaning	Drill Rig	Drill Cuttings, Drilling mud	Treatment of the drilling mud to remove fine solids and any gases. The mud will then be stored in the mud storage tanks to be recycled in the drilling process. At the end of the drilling programme the cuttings may be used for road surfacing or construction materials. Before reuse it is necessary to ensure that the hydrocarbon content, moisture content, salinity, and clay content of the cuttings are suitable for the intended use of the material. Some cuttings, may need washing to remove dissolved salts prior to beneficial use.
Sludge	Lagoons at the well pad after treatment of grey water	None	Stored and transported to the nearest treatment works to the project site by licensed waste handlers.

The disposal method of cuttings to be used will be Potassium Acetate mud system, which limits chloride content of the disposed waste which makes it much more environmentally acceptable. The cuttings can then be dried on location and land farmed. Best management practices are as follows:

- The initial chloride concentration in the receiving soil must be less than 500 parts per million (ppm).
- The maximum chloride concentration in land-spread drilling waste must be less than 10,000 ppm.
- The waste loading rate is calculated to ensure that the final chloride concentration in the top 12 inches of soil does not exceed 900 ppm.
- No land-spreading may occur if the area is being irrigated with water containing chlorides above 350 ppm.

During the drilling of the well all drilling waste will be contained on the location A reserve pit, which is used to dispose of rock cuttings and drilling mud during the drilling process, will be constructed and lined with plastic to protect against any possible contamination. The liner will be removed at the end of the project after the residual liquids have been evaporated. The cuttings will be dried and dispersed/spread on roads.

All other domestic waste will be removed from the location and disposed in an approved disposal site.

2.5.2. Wastewater

In the management of black and grey water, the proponent will then dispose the waste using either of the three methods below:

- 1. Use of a septic tank of sufficient capacity to accommodate anticipated crew numbers
- 2. Kitchen waste water will be channelled through a grease trap before going into the septic tank
- 3. Kitchen sinks, wash basins and drains shall be permanently equipped with gratings to retain soils and avoid conduction line clogging

2.5.3. Produced Water

Oil and gas reservoirs contain water (formation water) that is produced when brought to the surface during hydrocarbon production. The produced water will contain a complex mixture of inorganic (dissolved salts, trace metals, suspended particles) and organic (dispersed and dissolved hydrocarbons, organic acids) compounds, and residual chemical additives (e.g. scale and corrosion inhibitors) that are added into the hydrocarbon production process.

Any produced water will be treated then trucked / piped to approved disposal ponds. The water can be used to spray on unpaved roads for dust control and reused in the drilling process.

2.6. Appraisal Drilling and Well Evaluation/ Testing

During the drilling operations for different depths logging operations are undertaken to get information on the potential type and quantities of hydrocarbons present in the target formations.

If the results of logging indicate a potential for hydrocarbon/gas bearing formations, the well may be tested. The hydrocarbons will be flowed through a test package where the pressures, flow rates, and hydrocarbon types will be characterised and sampled, and excess hydrocarbons flared. The escaping gas will be flared or vented out in the open. The gas flaring or venting will create a flame and noise from the burning of the gas. Testing is important in order to determine the pressure, flow and composition of the gas in the well. Flaring is also done for safety during emergencies, maintenance, equipment repairs; where equipment or piping becomes over-pressured. This is done to avoid risk of fires and explosions. Flare gas systems are also used to manage waste gas that cannot be efficiently captured and returned to the system for processing.

Well testing is expected to last for between 1 and 2 months per well.

If the well is successful, Zarara will aim to evaluate the size and nature of the reservoir to determine the number of development wells that may be required and whether 3D seismic survey is necessary.

2.7. Decommissioning

In case Zarara drills a dry hole, (if the well is unsuccessful), the well will be plugged with cement and abandoned. The site will be deconstructed/demolished and the site will be restored to its original state through re-vegetation and continuous monitoring.

2.8. Project Schedule and Cost

Each well is expected to take 3- 4 months to drill and there may be a standby period between drilling of each well to analyse the data results from the previous well.

Table 2.3: Project Implementation schedule

Task	Period
Rig mobilisation and establishment phase	60 Days
Drilling Process period (for 1 well)	3-4 months

The estimated total project cost is estimated to be **United States Dollar (USD) Fifteen Million, Seven Hundred and Four Thousand, Four Hundred and Eleven (\$15,704,411).** The project cost breakdown is as follows:

Table 2.4: Budget Cost Estimate Breakdown

Budget Cost Estin			
Line Items	Cost Estimate (USD)	Cost Estimate in Kenya Shillings (Ksh)	
Civils	1,064,000	107,464,000	
Rig move	2,252,000	227,452,000	
Drilling Unit	2,125,530	214,678,530	
Drilling Tools and Services	1,402,200	141,622,200	
Mud and Cement	2,219,600	224,179,600	
Wireline and Mud Logging	945,720	95,517,720	
Fuel, water and lubricants	596,500	60,246,500	
Transportation	338,550	34,193,550	
Logistics	1,112,800	112,392,800	
Project Management	925,100	93,435,100	
Operations Support	1,272,700	128,542,700	
Tangibles - Casing and Wellhead	1,491,700	150,661,700	
Budget Cost:	\$15,746,400	Ksh 1,590,386,400	

As per the updated NEMA levies and processes hydrocarbon projects are classed as high risk projects, hence the EIA license fee will be 0.1% of the total cost of the project subject to a minimum of Kenya Shillings Fifty Thousand (Ksh. 50,000) and a maximum of Kenya Shillings Forty Million (Ksh. 40,000,000)

Hence, the 0.1% to be paid to NEMA is **USD Fifteen Thousand, Seven Hundred and Forty- Six (\$15,746)**. Equivalent to **Kenya Shillings One Million, Five Hundred and Ninety Thousand, Three Hundred and Eighty- Six (Ksh. 1,590,386)** using the exchange rate of 1 US DOLLAR: Ksh.101 (Central Bank of Kenya Rate on the 13th September 2016). **This fee needs to be paid to NEMA in Kenyan Shillings using the days exchange rate.**

3.0. PROJECT ALTERNATIVES

With a view of shedding light of the proposed project's impacts on the existing environment and at the same time achieve its objectives; available alternatives were sought in line with the requirements under EIA regulations and EMCA of 1999. In this analysis, alternatives were considered on the following basis:

- Alternative well location
- Alternative drilling technology
- Alternative drilling input
- The 'No' Project Option
- Proceed with the proposed project with Mitigation Measures

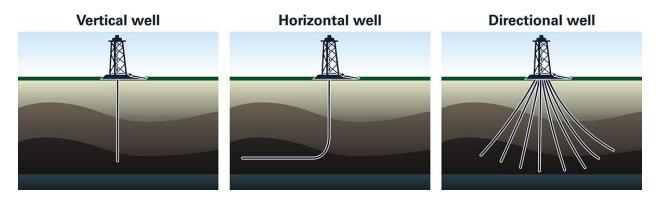
3.1 Alternative Well Location

The drilling area was determined by analysis of data obtained from the seismic survey. This data indicates areas where hydrocarbons are potentially trapped in geological structures. However, as in this case, without exploratory drilling, seismic data alone is not enough evidence of presence of oil or gas. Neither can it show whether the deposits are commercially viable nor the extent of the deposits. A number of potential well locations will be selected based on review and interpretation of geophysical data. The number of well targets is likely to be small and therefore the number of options for alternative surface well locations will be limited. In addition, the well's depth will depend on the location of the gas reservoir; which is approximately 4kms below ground and therefore, the location of the wells will not likely result in a significantly more negative or positive impact on the environment, no matter the location.

3.2 Alternative Drilling Technology

There are three types of onshore drilling technologies: vertical drilling, horizontal drilling and directional drilling as represented in Figure 3.1 below.

Figure 3.1: Types of drilling technologies



Horizontal wells begin with a vertical wellbore. But once the desired depth is reached, the well bore changes direction, arcing from a vertical trajectory to a horizontal one and extending for thousands of feet, allowing maximum exposure to the targeted reservoir rock.

Directional drilling techniques are applied for target well locations that lie in an environmentally sensitivities area and to potentially reduce duplication of surface infrastructure. This helps in avoiding sensitive surface areas, such as mangroves and to gain access to the reservoir from less sensitive surface areas.

3.3 Alternative project inputs

3.3.1. Drilling fluids

Drilling fluids is used to lubricate the drill bit and circulate drilled cuttings out of the well bore. There are three major types of drilling fluids:

1. Water Based Mud (WBM)

Most basic water-based mud systems begin with water, then clays and other chemicals are incorporated into the water to create a homogeneous blend resembling something between chocolate milk and a malt (depending on viscosity).

2. Oil Based Muds (OBM)

Oil-based mud is a mud where the base fluid is a petroleum product such as diesel fuel.

3. Synthetic Based Muds (SBM)

Environmentally-friendly organic-based muds using a base fluid produced from natural gas, or processed base oil or natural (non-petroleum) oils which are non-toxic and quickly biodegradable.

Table 3.1: Difference between the three drilling fluids

WBM	ОВМ	SBM			
Less environmental impact and less cost associated with cuttings and contaminated fluid disposal and tank cleaning on rig Kick detection is easier as gas does not readily dissolve in water Easier to get good cement bonding to casing and formation	Advantages include: increased lubricity, enhanced shale inhibition, greater cleaning abilities with less viscosity and can withstand greater heat without breaking.	Non-toxic and quickly biodegrades Unlike most water-based muds, the SBM can be reused from well to well which is an environmental advantage			

From the project description chapter, the project is supposed to use the water based mud. We recommend this would be the best alternative for this project.

3.3.2. Water requirements

A land well is normally drilled with freshwater; however, this is dependent on the abundance of fresh water supply in the area. Due to the scarcity of freshwater in and around the project area, the proponent

could opt to use seawater; however, this will have an impact on fluid and cuttings disposal due to the associated chlorides content. There are several options in sourcing freshwater:

- 1. Filling barges with water from a water source or rivers on the main land or transported from Malindi or Mombasa; and transporting to Pate Island.
- 2. Building a storage pit which can be filled with rain and other freshwater before commencement of the project, which can act as an available reserve to minimize possible over abstraction with the local supply.
- 3. Locating a local source that is acceptable with the local community
- 4. Drilling a bore hole to tap in to aquifer of Vumbe wells in the mainland

The best options we would recommend to be used during this project would be sourcing water from Malindi or Mombasa and transported to Pate Island via barge.

3.3.3. Power requirements

From the project description process, power will be provided by the generators. Other alternatives would be the use of renewable sources of energy such as solar and wind energy. However, these would require a substantial capital investment for the project.

3.4 The No-Project Option

This options means forfeiting the proposed exploratory drilling programme thus avoiding all the anticipated environmental challenges of the project since it maintains the status quo of the environmental conditions of the project area. However, it does not add value to the status of the project area under consideration. The only benefit of this option would be negative impacts would be avoided such as loss in flora and fauna habitats, waste generation etc.

However, if the project does not take place, the potential abundant gas reserves in Blocks L4 and L13 will remain untapped. The Nation, Lamu County and communities in the project area will forego the benefits that will arise as a result of project implementation. The benefits will include; development (infrastructure); employment of the local community both direct and indirect; improvement in the livelihood of the community and revenue for the area that could result if the exploration drilling program reveals that the targeted hydrocarbon reservoirs are commercially viable.

The availability of abundant local supplies of natural gas in the country will provide an effective additional energy source for the Kenyan market. A secure supply of natural gas will provide the country with an environmentally friendly source of energy of, as opposed to environmentally friendly sources such as wind and solar which are intermittent. Based on the benefits that will arise as result of the proposed project and also the fact that the potentially adverse impacts are manageable, the "No-Action" alternative is not warranted.

3.5 Proceeding with the proposed project with mitigation measures

This option is the preferred option and it entails carrying out the proposed exploratory drilling programme with mitigation measures to prevent, offset, or avoid any negative impacts thereby maximizing it gains.

This option would therefore lead to achieving the proposed objectives through drilling wells and contribute to the achievement of other sectoral and policy goals and objectives.

4.0. POLICY, LEGAL AND INSTITUTONAL FRAMEWORK

This chapter outlines the applicable international standards and relevant Kenyan regulatory framework that set the context within which the Project will operate. It also identifies applicable licensing and permitting requirements that the project will require upon successful implementation of the project.

This ESIA will be conducted in accordance with:

- IFC Performance Standards for Social and Environmental Sustainability, April 2012
- IFC's General Environmental, Health and Safety (EHS) Guidelines, and the EHS Guideline for Onshore Oil and Gas Development
- The Equator Principles
- Kenyan laws, regulations and permits applicable to the Project

4.1 National Legal Framework²

Legislation		Relevance to Proposed Project
The Constitution of Kenya, 2010	heritage and they are determined to sustain it for the benefit of future generations. • The constitution under article 42 states that every person has a right to a clean and healthy environment. Also every person has a duty to cooperate with state organs and other persons, to protect and conserve the environment and ensure ecologically sustainable development and use of natural	Zarara must ensure that during operations they follow the ESMP provided ensuring operations are working in a clean sustainable way.
	Article 70 deals with enforcement of environmental rights and everyone who feels their right to a clean and healthy environment has been depied has the obligation to go to court to seek redress.	This will ensure both workers and community members to operate in a

² Kenya Law. n.d. Laws of Kenya. [Date accessed 4th April 2016]. Available from: http://www.kenyalaw.org:8181/exist/kenyalex/index.xql

Legislation	Legislative Scope	Relevance to Proposed Project
	Section 63 states that any unregistered community land shall be held in trust by county governments on behalf of the communities for which it is held	healthy and clean environment.
The Environmental Management and Co- ordination Act (EMCA), 1999 (Amendments 2015)	 This is the principal law governing environmental protection. It contains various legal notices with regulations on environmental conservation and Management, while Part II confers the right of every person to a clean environment and therefore makes it mandatory to work in a clean environment and protect people living close to the project. Details mechanism and stipulation regarding environmental impact assessment. Sub-section (1) of section 58 The act also prohibits anyone from discharging or applying poisonous, toxic, noxious or obstructing matter, radioactive or any other pollutants into aquatic environment. Require that operators of projects which discharges effluent or other pollutants to submit to NEMA accurate information about the quantity and quality of the effluent. Prohibits discharge or dispose of any wastes, whether generated within or outside Kenya, in such a manner as to cause pollution to the environment or ill health to any person, Sections 90 through 100 outline more regulations on management of hazardous and toxic substances including oils, chemicals and pesticides. 	The Act requires Zarara to acquire an EIA license from NEMA before commencing of any development. The Act also requires that no one should pollute the environment by discharging or dumping of waste unless it meets the required standards for effluent, solid waste to be disposed of on designated dumping sites. Hence, Zarara should contract a NEMA registered waste handler to dispose of the waste.
Environmental (Prevention of Pollution in Coastal Zone and other Segments of the Environment)	 No ship or any other person in Kenya shall be allowed to discharge any hazardous substance, chemical, oil or oily mixture into the territorial waters of Kenya or any segment of the environment contrary to the provisions of these Regulations All ships in the territorial waters of Kenya shall off-load oil or oily mixture, sludge, bilge water, ballast water, waste and sewage to the certified Port Waste Reception Facility at the Port of Mombasa. 	Though the drilling operation will be conducted onshore, a barge will be used to transport equipments from the port of Mombasa to

Legislation	Legislative Scope	Relevance to Proposed Project
Regulations, 2003	 Every ship shall be required to carry an Oil Record Book, which shall detail entries on machinery space operations, cargo and ballast operations in accordance with the provisions of the Merchant Shipping Act (Cap. 389) All ships shall be required to obtain a certificate issued by a Certified Port Waste Reception Facility in accordance with MARPOL 	Pate Island (Mtangawanda Jetty). The proponent should ensure that the barge contracted to carry out the operations should adhere to regulations.
Environmental (Impact Assessment and Audit) Regulations, 2003	 Stipulates the mechanisms for undertaking an EIA. Project Proponent, upon consultation with NEMA shall appoint at their own cost lead expert/firm of experts registered under NEMA to undertake an environmental impact assessment. Provides ways in which environmental experts should conduct an EIA/EA. Requires during public participation, licensing procedure, inspection and any possible offences and penalties as part of EIA process 	The Act requires that project proponent to contract a licensed EIA expert to conduct an EIA. In this case Zarara has contracted ESF Consultants NEMA Registration No. 0204 to carry out the ESIA Study As per the regulation the public and stakeholders were consulted during the exercise.
EMCA (water quality) Regulations, 2006	 These regulations provide for the protection of lakes, rivers, streams, springs, wells and other water sources. Also address the challenges of pollution of water resources as well as their conservation. Provides guidelines for water use, and conservation for the proposed project, as well as effluent standards for discharge. 	The Regulation requires that water guidelines set to be adhered to and no water to be abstraction unless it meets standards required. Also it will be important to protect

Legislation	Legislative Scope	Relevance to Proposed Project
	Prohibits abstraction of water from natural water body unless such water meets the standards set out in schedule nine of the regulation in this legislation.	ground water sources and meeting standards for discharge of effluent, both National and International. One of the options in sourcing freshwater for the project is abstracting from rivers on the mainland. The client will need to adhere to guidelines set. The Regulation also requires Zarara to meet the effluent discharge standards in section 4.1.1.1 in this report.
EMCA (Waste management) Regulations, 2006	 Focuses on management of solid wastes, industrial wastes, hazardous wastes, pesticides and toxic substances and radioactive substances. Provides standards for handling, transportation, and disposal of different types of waste. Addresses concerns such as responsibility for waste generators and obligations for disposal. Prohibits disposal of any waste on a public highway, street, road, recreational areas or in any public place except in a designated waste receptacle. Requires that any persons whose activities generate waste will collect, segregate, and disposed by person who is licensed by NEMA. 	The waste generated in this project will include: domestic waste, drill cuttings and mud residues. For waste management there should exists proper contractual agreement with NEMA licensed solid waste handlers and that solid wastes are disposed of in designated sites approved by County

Legislation	Legislative Scope	Relevance to Proposed Project
	 Requires that any person granted a license to transport waste to ensure that does not cause scattering, escaping and/or flowing out of the waste. No owner or operator of a trade or industrial undertaking will discharge or dispose of any waste in any state into the environment, unless the waste has been treated in a treatment facility and in a manner prescribed by the Authority in consultation with the relevant lead agency. 	Government of Lamu. It will be good to segregate waste from the source and managed in line with the provisions of this regulation, and adhere to all the National and International guidelines for waste management.
EMCA (Fossil Fuel Emission) Control) 2007	Regulations gives direction on the emission limits expected from internal combustion engines of various engines include; Hydrocarbons (HCs), Volatile organic Compounds(VOC), Sulphur dioxide (SOx), Nitrogen oxides (NOx), Particulates (PM) and Carbon Monoxide (CO).	Zarara wishes to use approximately 5 – 10 trucks transporting material to and from Mtangawanda Jetty to the project site. The trucks will carry approximately 150-200 truckloads of equipments: carrying loads weighing approximately 20-40 tonnes Regulation requires that all emissions standards must observe as set out in on First schedule of this regulation. Also machines with internal combustion engines will be required to undergo annual

Legislation	Legislative Scope	Relevance to Proposed Project
		combustion inspection to ensure compliance to this regulation.
Environmental EMCA (Conservation of Biological Diversity and Resources, Access to Genetic Resources and Benefit Sharing) Regulations, 2006	This regulation sets that any activity that will lead to a. An adverse impact on any ecosystem b. Lead to the introduction of any exotic species c. Lead to unsustainable use of natural resources Will require an EIA license before commencement of any activity	The proposed project has the potential of having an impact on the biodiversity in the project area, hence it will require an EIA license before commencement of the project. Also as a requirement, the proponent will be required to monitor species count in the area, or to monitor if any exotic/ invasive species are introduced in the project site. This will be a requirement introduced in the ESMP.
EMCA (Controlled Substances) Regulations, 2007	The regulation seeks to control the production; consumption; and exports and imports of controlled/toxic substances. Such substances include of halogenated flourochemicals, hydrobromoflourocarbons and bromochloromethane, all with ozone depleting substances	The regulation will be adhered to ensure substances used in the exploration activities are free of toxic substances, also equipment and machines used on site with chemicals containing such

Legislation	Legislative Scope	Relevance to Proposed Project
		components are not imported for project use.
		Zarara will use substances for exploration activities which are free of toxic substances, also no equipment or machines will be used on site will contain chemicals stated in this regulation.
EMCA (Wetlands, River Banks, Lake Shores and Sea Shore Management) Regulation, 2009	 This regulation sets standards for the conservation, protection and sustainable use of wetlands. It also facilitates the sustainable utilization and conservation of resources on river banks, lake shores, and on the seashore by and for the benefit of the people and community living in the area; 	Subject to provisions of the act the proponent cannot carry out operations on the beach shore without an EIA license and authorisations from relevant authorities. The proponent will need to build a ramp at the adjacent beach to the jetty at Mtangawanda, in order to facilitate offloading of cargo from the barges.
EMCA (Noise and Excessive Vibration Pollution) (Control)	 These regulations prohibit any person from making or causing to be made any loud, unreasonable, unnecessary or unusual noise which annoys, disturbs, injures or endangers the comfort, repose, health or safety of others and the environment. It also prohibits excessive vibration which annoys, disturb, injure or endanger the comfort, repose, health or safety of others and the environment or 	The permissible noise levels set under this regulation and the IFC standards should be adhered to at all phases of

Legislation	Legis	lative Scope					Relevance to Proposed Project
Regulations, 2009	 excessive vibrations which exceed 0.5 cent boundary or 30 metres from any moving source. Part III provision relating to Noise. No. 12 on no a motor vehicle exceeds 84 dB(A) when acceled. To follow NEMA and World Bank/IFC standard. 			motor ve	ehicles, (1) No per	reprimanding from the NEMA officers. This could	
	Rec	Receptor		Maximum allowable noise in decibels		equipment and generators.	
			Day time	Night time	World Bank/ IF Day (0700-2200Hrs)	Night (22)	<u></u>
	Α	Silent Zone	40	35	,	,	site are as follows ³ :
	В	Places of worship	40	35			
	С	Residential: Indoor Outdoor	45	35	55	45	Typical compressor station 50dBA
	D	Mixed residential (with some commercial and places of entertainment)	55	35			(375 feet from property boundary)
	E	Commercial	60	35	70	70	Pumping unit 50 dBA (325 feet from well pad)
							Fuel and water trucks 68 dBA

³ Earth Works. *Oil and Gas Noise*. [Date accessed 20th May 2016] Available from: https://www.earthworksaction.org/issues/detail/oil and gas noise#.V0Kuob6M64b

Legislation	Legislative Scope	Relevance to Proposed Project
		(500 feet from source)
		Crane for hoisting rigs 68 dBA (500 feet from source)
		 Concrete pump used during drilling 62 dBA (500 feet from source)
		 Average well construction 65 dBA (500 feet from source)
Water Cap 372	 Provides for the management, conservation, use and control of water resources and for the acquisition and regulation of rights to use water; and to provide for the regulation and management of water supply and sewerage services. 	According to the Act, there will be need to apply for water permit from WRMA,
	 The proponent will require a licence for the following purpose: a) Any use of water from a water resource b) The drainage of any swamp or other land c) The discharge of a pollutant into any water resource d) Any purpose, to be carried out in or in relation to a water resource, which is prescribed 	for water abstraction from any water source (underground and surface water bodies) for use during drilling operations and any other uses.
		One of the alternative sources for freshwater is in the abstraction of water

Legislation	Legislative Scope	Relevance to Proposed Project
	 Licensee is to construct and maintain drains, sewers and other works for intercepting, treating or disposing of any foul water arising or flowing upon land for preventing pollution of water sources within his/her jurisdiction. Prohibits obstruction or pollution of watercourse or water resource. Requires authority from Water Resources Management Authority obstruct, interfere with, divert, or abstract water from any water course or any water resource, or negligently all any obstruction, interference, diversion, or abstraction. 	from rivers from the mainland and transported to Pate Island.
Energy Act Cap 314	 The Energy Act, amongst other issues, deals with all matters relating to all forms of energy including the generation, transmission, distribution, supply and use of electrical energy as well as the legal basis for establishing the systems associated with these purposes. Stipulates that the Energy Regulatory Commission shall, before issuing a permit under section 90, take into account all relevant factors including the relevant government policies and compliance with Environment Management and Coordination Act, 1999 and in particular EIA report as per Impact Assessment and Audit Regulations 2003, the Physical Planning Act, 1996 and the Local Government Act. ERC is mandated to protect the environment, conserve natural resources, and protect the health and safety of workers, service users and the public at large. 	The Act requires that before connecting to or installation of electric power to any site one must liaise with the Kenya Power and Lighting Company (KPLC) to ascertain the requirements required ensuring that the power to the site is adequate and doesn't affect the other users in the area. Zarara will use energy from generators for drilling activities; Pate Island is not served with KPLC. Installation of the generators will have to

Legislation	Legislative Scope	Relevance to Proposed Project
		consider the safety of employees onsite.
Petroleum (Exploration and Production) Act, Chapter 308	 No person can engage in any petroleum operation in Kenya without having previously obtained the permission of the Cabinet Secretary Section 4 (3) indicates the government may conduct petroleum operations either (a) through an oil company established by the government to conduct those operations or (b) through contractors in accordance with petroleum agreements; 	This Act regulates the scope of project contractor on the obligations expected as per the agreement on explorations. This regards the effective and sincere release of information pertaining to the discovery of petroleum products; employment and training of Kenya national in the petroleum sector; and provisions of exploration within the confines of the provision this Act. Zarara has acquired permits from the Ministry of energy for conducting gas exploration on Block L4 and L13.

Legislation	Legislative Scope	Relevance to Proposed Project
Climate Change Act, 2016	 This Act provides for a regulatory framework for enhanced response to climate change; to provide for mechanism and measures to achieve low carbon climate development, and for connected purposes. On behalf of the climate change council NEMA has been given the mandate to regulate, enforce and monitor compliance on levels of greenhouse gas emissions as set by the Council under this Act. 	 The project proponent, its contractors and clients must strive to minimize the use of equipment, materials and technology that emit ozone depleting fumes throughout the project cycle. The project designs must also take into account design and plans that embrace clean energy solutions to avoid emissions as much as possible
Standards Act Cap 496	The Act provides specifications for standardization of commodities and the codes of practice in the use of those commodities and their raw materials. In establishing Kenya Bureau of Standards, the Act seeks to consolidate control powers of the agencies that quality standard in the country.	All materials to be used for the exploration activities should have a mark showing accreditation as of quality from Kenya Bureau of Standard (KEBS).
County Government Act 2012	The law empowers the County Governments to control or prohibit all businesses, factories and other activities (including the proposed project which, by reason of smoke, fumes, gases, dust, noise or other cause may be or become a source of danger, discomfort or annoyance to the neighbourhood) and to prescribe conditions subject to which such activities shall be carried.	Zarara will observe all the regulations provided by Lamu County Government in respect to environment,

Legislation	Legislative Scope	Relevance to Proposed Project
	The legislation emphasizes on the right of citizens to participate to any development projects to their implementation.	health and safety of the locals.
Penal code cap 63	 It's an offence to make or vitiate the atmosphere in any place to make it noxious to health of persons/institution in dwellings or business premises in the neighbourhood or those passing along public way, commit an offence. It's the responsibility of every person who is in charge or has under control anything, that in the absence of care or precaution in its use or management, might endanger the life, safety or health of any person, to use reasonable care and take reasonable precautions to avoid the danger. 	The Act addresses the welfare of workers, to work and operate in a safe and healthy environment. Zarara must ensure that their safety policy is in line with the Act on site at all time.
Occupation Health and Safety Act, 2007	 Provides for the safety, health and welfare of workers and all persons lawfully present at workplaces, in all phases of the project. Prohibits any persons from engaging in improper activity or behaviour at work place which may create or constitute a hazard to that person or any other person. Gives powers to occupational safety and health officer to enter, inspect, and examine, by day and by night, a workplace, and every part thereof, when he has reasonable cause to believe that any persons is employed therein, and enter, inspect, and examine, by day, any place which has reasonable cause to believe to be part of a workplace and any building of which a workplace forms part and in which have has reasonable cause to believe that explosive, highly inflammable, or any other hazardous materials are stored or used 	The Act requires the employer to ensure a safe working environment for the workers, through provision of appropriate Personal protective equipment (PPE), adequately equipped first aid kits, fire safety apparatus, training on use of the above, emergency response mechanisms, and health schemes as required by the Act.
Occupation Health and	Factories (First-Aid) Order: Provides requirements of what needs to be included in a first aid box.	These regulations states that is the duty of the employer to provide the

goods in, on or at any dock, wharf or quay in any port or harbor. Equipment's used in lifting cargo must be inspected regularly to ensure maintenance of good quality materials. 3. Factories and Other Places of Work (Safety and Health Committees) Rules, 2004: Provides for health, safety and welfare of persons employed in factories and other places of work. Also it ensures measures to protect employees from dust, fumes or impurities originating from any process within the facility 4. Factories and Other Places of Work (Medical Examination) Rules, 2005: It shall be the duty of the employer to ensure that all persons employed in any of the occupations outlined in the Eighth Schedule to the Act undergo both pre-employment and periodic medical examinations by the designated health practitioner as outlined in the First Schedule. 5. Factories and Other Places of Work (Noise Prevention and Control) Rules, 2005: this provides regulations for activities that produce noise levels of the continuous equivalent of 90 dB(A) in 8 hours within any 24 hours' duration; and 140 dB(A) peak sound level at any given time. It states machinery should be well maintained, PPE provided such as ear muffs, placing o warning signs. 6. Factories and Other Places of Work (Fire Risk Reduction) Rules, 2007: This provides safety.	elevance to Proposed roject
requirements for at risk areas. Safety requirements include: good ventilation systems, good housekeeping, fire safety training/drills, fire fighting equipment on site 7. Factories and Other Places of Work (Hazardous Substances) Rules, 2007: this provides measure to limit/ protect employees from hazards.	ealth, safety, and welfare persons employed on te. The arran will provide a safe orking environment for laworkers, through rovision of appropriate PE (safety boots, safety boves, ear muffs, flective clothes, helmet mong other PPE). There will be no entry for nauthorised persons or restock on the well pad. The arran will have fully quipped First Aid Kit and ained first aider onsite at latimes to attend on mergency cases. Also will

Legislation	Legislative Scope	Relevance to Proposed Project
Work Injury Benefit Act, 2007	 Provides for compensation for work related injuries and diseases contracted in the course of their employment and for other purposes of protecting employees from occupational health and safety faults at work place. Provides for insurance for the employer. Provides for entitlement of benefits to an employee who is involved in an accident resulting in the employee's disablement or death Employer is liable to pay compensation in accordance with the provisions of this Act to an employee injured at work. 	The Act requires that Zarara should have a grievance policy to redress the social, security, health, and welfare grievances of the employees and local residence during the project implementation.
Public Health Act Cap 242	 This is an Act of Parliament to make provisions for securing and maintaining health. Sections include those dealing with notification of infectious diseases; inspection of infected premises and examination of persons suspected to be suffering from infectious diseases; rules for prevention of diseases; venereal diseases and infection by employees, among others. The proposed project will encourage the movement of people in search of jobs and opportunities, and with this, the risk associated with spread of diseases. Part IX, section 115, of the Act states that no person/institution shall cause nuisance or condition liable to be injurious or dangerous to human health. Section 116 requires that Local Authorities take all lawful, necessary and reasonably practicable measures to maintain their jurisdiction clean and sanitary to prevent occurrence of nuisance or condition liable to be injurious or dangerous to human health. Such nuisance or conditions are defined under section 118 and include nuisances caused by accumulation of materials or refuse which in the opinion of the medical officer of health is likely to harbour rats or other vermin. 	Zarara has the obligation to ensure adequate compliance to the health and sanitation provisions set out in this Act. Also the environmental management plan (EMP) advises on the safety and health aspects, potential impacts, personnel responsible for implementation and monitoring, frequency of monitoring.

Legislation	Legislative Scope	Relevance to Proposed Project
Employment Act, 2007	Defines the fundamental rights of employees, to provide basic condition of employment of employees, to regulate employment of children.	Zarara should adhere to basic conditions of employees to be observed to avoid unnecessary conflicts in the future.
The Physical Planning Act, Cap 286	 Gives the county governments' physical planning department to develop regulations for development control in their areas of jurisdiction in terms of buildings to ensure orderly and sustainable development planning. Any person who carries out development without permission will be required to restore the land to its original condition. In case the local authority is of the opinion that the proposed development activity will have injurious impact on the environment, the applicant shall be required to submit together with the application an EIA report. 	This covers all development activities in preparation of the well pad that may result in adverse effects on the environment, particularly the generation of waste and the method of its discharge.
Land Act 2012	 According to section 31 of the Act Community land shall be managed in accordance with the law relating to community land enacted pursuant to Article 63 of the Constitution "Section 63 of the Constitution states that any unregistered community land shall be held in trust by county governments on behalf of the communities for which it is held" According to Section 3 of the constitution, Community land consists of— (a) land lawfully registered in the name of group representatives under the provisions of any law; (b) land lawfully transferred to a specific community by any process of law; (c) any other land declared to be community land by an Act of Parliament; and (d) land that is— (i) lawfully held, managed or used by specific communities as community forests, grazing areas or shrines; (ii) ancestral lands and lands traditionally occupied by hunter-gatherer communities; or (iii) lawfully held as trust land by the county governments, 	Community land shall not be disposed of or otherwise used except in terms of legislation specifying the nature and extent of the rights of members of each community individually and collectively.

Legislation	Legislative Scope	Relevance to Proposed Project
	but not including any public land held in trust by the county government under Article 62(2).	
Traffic Act Cap 403	 This Act consolidates the law relating to traffic on all public roads. Key sections include registration and licensing of vehicles; driving licenses; driving and other offences relating to the use of vehicles on roads; regulation of traffic; accidents; offences by drivers other than motor vehicles and other road users. Many types of equipment and fuel shall be transported through the roads to the proposed site. Their registration and licensing will be required to follow the stipulated road regulations. The Act it prohibits obstruction of traffic, either by persons or facilities which are constructed in such a way as to interfere with the flow of traffic on roads or road reserves. 	During transportation of the heavy machines such as the rig, heavy trucks should not interfere with traffic flow, also the speed limit should be should be observed All personnel operating the vehicles and machineries should be licensed by relevant authorities
Public Roads and Roads of Access Act Cap. 399	 The Act provides for the dedication, conversion or alignment of public travel lines including construction of access roads adjacent lands from the nearest part of a public road. The law allows for notices to be served on the adjacent landowners seeking permission to construct the respective roads. The project design concept has left the required road reserves and relevant road widening surrenders. This Act consolidates the law relating to traffic on all public roads. 	Zarara will use the existing road to transport equipment from jetty to the proposed site. Sectiond of the road will be upgraded. Zarara will have to seek permission from the appropriate authorities and land owners to create access roads to the site

Legislation	Legislative Scope	Relevance to Proposed Project
		during the construction phase.
Merchant Shipping Act, 2009	 The law provides for various maritime concerns regarding Kenyan and foreign ships in a port, or place in or within the territorial and other waters under the jurisdiction of Kenya. In relation to the proposed project, there will be transportation of rigs from ports of Mombasa or Lamu and this will focus on the prevention of collisions, the safety of navigation, the prevention of pollution, maritime security, the liability of ship owners and others, inquiries and investigations into marine causalities and to make provisions for the control, regulation, and orderly development of merchant shipping and related services. The Act requires that all ships operating in Kenya waters to be registered in Kenya, the requirement for ship to be registered; the ship if it is of 24 metres or more, not exempted from registration. The act also makes regulations for the protection and preservation of the marine environment from pollution by matter from ships. The regulations may give effect to any provision of the following international maritime conventions and agreements 	There will be transportation of personnel and machineries (Drilling rig, Vehicles, and construction equipment and materials) for the proposed project from the ports of Mombasa and Lamu via barge. The vessel will be registered with KMA and clearly labelled (name written) on the sides. If the proponent wishes to dispose any waste into the sea, they would need to follow regulations set in international maritime conventions and agreements
National Museums and Heritage Act Cap 216	 The Act empower National Museums of Kenya to take lead role in research, development, protection, and management of cultural and heritage resources. Part V on searches and discoveries stipulates the needs for exploration licenses. 	This Act relates to the disturbance of, and interference with, sensitive cultural, natural heritage and archaeological sites in

Legislation	Legislative Scope	Relevance to Proposed Project
	Prohibits the searching or excavation of cultural heritage without the consent of the Minister and without an exploration license. Section 30 obligates reporting chance finds to NMK or the District Commissioner in the jurisdiction, while section 31 prohibits the movement of cultural heritage items from their place of discovery contrary to provision of a heritage exploration license.	the project area, which may be affected as a result of gas exploration. In Pate Island there are archaeological sites at Siyu and Pate locations. Zarara will conduct its activities in a sensitive cultural, natural heritage and archaeological sites in the Island.
Forestry Services Act, 2005	Provides that if mining, quarrying or any other activity carried out in the forest, where the activity concerned is likely to result in forest cover depletion, the person responsible shall undertake compulsory re-vegetation immediately upon the completion of the activity.	The Act requires one to apply for a special licence and involvement of applicable forest officers in public consultations as part of the EIA process. The well site for Pate 1 operated by Shell, is largely covered by shrub and bush. Vegetation will be lost or altered to pave way for construction activities for access roads and well pad (200 m by 200 m). There are no protected forest in

Legislation	Legislative Scope	Relevance to Proposed Project
		and around the proposed site
Wildlife Conservation and Management Act, 2013	 The Act prohibits activities that are likely to have adverse effects on the environment, which include seepage of toxic waste into rivers, streams, lakes and wetlands. The Act also it prohibits any mining and quarrying activities in a National park without approval and consent of Kenya Wildlife Service. KWS will only approve quarrying and mining if only EIA has been conducted according to provisions of the EMCA 1999. The Act in its sixth schedule list various animals and tree species that are nationally considered as critically endangered, vulnerable, nearly threatened and protected species. 	The Act relates to the disturbance and interference with protected areas around the Project area, in this case Block L4 and Block 13 touches Dodori National Park. Block L4 touches Boni National Reserve and Kiunga Marine National Reserve. The well site for Pate 1 operated by Shell, is largely covered by shrub and bush. Vegetation will be lost or altered to pave way for construction activities for access roads and well pad (200 m by 200 m). There are no protected forest in and around the proposed site

4.1.1. Environmental Compliance Standards

National legislation has provided various safeguards/ limits for emissions. This study used these limits as benchmarks for assessing every impact of oil and gas drilling activity. Many of these standards such as Effluent Discharge Standards, Noise Emission Standards as stipulated in the NEMA and World Bank/IFC standards are as shown in subsections below:

Effluent Discharge Standards

Table 4.1: Effluent discharge standards criteria for NEMA and World Bank/IFC Standards⁴

Pollutant or Effluent parameter	Maximum allowable limits	
	NEMA discharge standard (mg/l)	World Bank/ IFC standard (mg/l)
Ammonia	100	10
Biological oxygen demand	30	50
(BOD)		
Chemical oxygen demand	50	250
(COD) Chromium (VI)	0.05	0.1
Chromium (Total)	2	0.5
Iron	1.0	0.5
рН	6.5-8.5	6-9
Oil & grease	Nil	10
Hydrogen sulphide		15 ppm
Total residual chlorine	0.10	0.2
Total suspended solids (TSS)	30	50
Total Dissolved Solids	1200	
Temperature	±30C above ambient temperature of	±30C above ambient temperature
	receptor	of receptor
Zinc	0.5	2.0
Boron	1.0	
Sulphate	0.1	1.0
Fluoride	1.5	20
Arsenic	0.02	0.1
Cadmium	0.01	0.1

⁴ NEMA Environmental Management and Coordination Act (Water Quality) Regulations, 2006 and World Bank Pollution Prevention and Abatement Handbook 1998

Ambient Air Quality Standards

NEMA Fossil Fuel Emission Control

Diesel powered vehicle are not to emit visible emissions in excess of 20% opacity for 5 consecutive seconds or more when under the applicable loading.

Table 4.2: A Petrol powered motor vehicle emission standards⁵

Vehicle Class and Model Year	Maximum Emission Concentration HP (ppm)	CO (percentage)
Class I:		
Gross vehicle weight of 6000 pounds or less		
1975-1977	500	5.0
1978-1979	400	4.0
1980	300	3.0
1981+	220	1.2
Class II		
Gross vehicle weight of 6001 pounds to 1000	00 pounds	
1975-1977	750	6.5
1978-1979	600	5.5
1980	400	4.5
1981-1984	300	3.0
1985+	200	1.2

NEMA Ambient Air Quality Tolerance Limits

The guidelines in the First Schedules prohibits any person from causing ambient air quality to exceed levels listed in the tables below and any other parameter as may be prescribed by the authority from time to time

⁵ EMCA (Fossil Fuel Emission) Control Regulations, 2006. The regulation shows the standards for both petrol and diesel powered motor vehicle emission standards.

Legend

- μg- microgram
- m3 cubic metres
- ppm parts per million
- ppb parts per billion
- the 24-hour limit may not be exceeded more than three times in one year
- ** 24-hour limit may not be exceeded more than three times in one year micrograms/m³
- *** Note to be exceeded more than once per year average concentration

Table 4.3: Ambient Air Quality at Property Boundary for General Pollutants⁶.

	Pollutant	Time weighted Average	Property Boundary
1	Particulate matter (PM)	Annual Average*	50 μg/m³
		24 hours**	70 μg/m³
2.	Oxides of Nitrogen (NO _x);	Annual Average*	80 μg/m³
		24 hours**	150μg/m³
3.	Sulphur oxides (SOx);	Annual Average*	50 μg/m³
		24 hours**	125 μg/m³
4.	Hydrogen Suphide	24 hours**	50 μg/m³
5.	Ammonia	24 hours**	100μg/m³

Note

- a) For residential premises in designated industrial areas, the above standards do not apply.
- b) For industries in designated residential areas, standards for residential areas shall apply.

⁶ EMCA (Air Quality) Regulations, 2014. The Act prohibits any person, operator or owner of any facility from causing or allowing fugitive emissions to cause the ambient air quality at its property boundary to exceed the limits prescribed under the First Schedule of this Act.

Table 4.4: Ambient Air Quality Tolerance Limits6

	Pollutant	Time weighted Average			
			Industrial	Residential,	Controlled
			area	Rural & Other area	areas***
1.	Sulphur oxides (SO _X);	Annual Average*	80 μg/m ³	60 μg/m ³	15µg/m ³
		24 hours**	125 μg/m ³	80 µg/m ³	30μg/m ³
		Annual Average		0.019	
				nnm/50 ug/m ³	
		Month Average		111111111111111111111111111111111111111	
		24 Hours		0.048ppm	
				425 / 3	
		One Hour			
		Instant Peak		500μg/m ³	
		Instant Peak (10 min)		0.191 ppm	
2.	Oxides of Nitrogen (NOx)	Annual Average*	80μg/m ³	60µg/m ³	15μg/m ³
	······································	24 hours**	150µg/m ³	80µg/m ³	30µg/m ³
		8 hours			
		Annual Average		0.2 ppm	
		Month Average		0.3 ppm	
		24 Hours		0.4 ppm	
		One Hour		0.8 ppm	
		Instant Peak		1.4 ppm	

3.	Nitrogen	Annual Average	150µg/m ³	0.05 ppm	
	Dioxide	Month Average		0.08 ppm	
		24 Hours	100ug/m ³	0.1 ppm	
		One Hour	100ug/m	0.2 ppm	
		Instant Peak		0.5 ppm	
4.	Suspended	Annual Average*	360μg/m ³	140 μg/m ³	70μg/m ³
	particulate				
	matter (SPM)	24 hours**	500 ug/m ³	200 ug/m ³	100ug/m ³
		mg/Kg			
		Annual Average****		100 ug/m ³	
		24 hours***		180 ug/m ³	
5.	Respirable particulate matter (<10m) (RPM)	Annual Average*	70 μg/m ³	50 μg/m ³	50 μg/m ³
		24 hours**	. 3	. 3	. 3
6.	PM _{2.5}	Annual Average	150 ug/Nm ³	100 ug/Nm ³	75 ug/Nm ³
0.	2.3	24 hours	35ug/m ³		
		24 110013	75 ug/m ³		
7.	Lead (Pb)	Annual Average*	1.0 ug/Nm ³	0.75 ug/Nm ³	0.50 ug/m ³
		24 hours**	1.5 μg/m ³	1.00s µg/m ³	0.75 μg/m ³
		Month Average		2.5	
8.	Carbon	8 hours**	5.0 mg/m ³	2.0 mg/m ³	1.0 mg/m ³
	monoxide (CO)/ carbon dioxide (CO ₂)				
		1 hour	10.0 mg/m ³	4.0 mg/m ³	2.0 mg/m ³
		mg/Kg	III II mg/m	4 H mg/m	7 II mp/m
		24 hours**			

9.	Hydrogen	24 hours**	150 μg/m ³		
10.	Non-methane	instant Peak	700ppb		
11.	Total VOC	24 hours**	600 ug/m ³		
12.	Ozone	1-Hour	200ug/m ³	0.12 ppm	
		8 hours (instant Peak)	120ug/m ³	1.25 ppm	

World Bank/ IFC standard

The World Bank/IFC guidelines with regard to the maximum ground level concentration of contaminants allowed in ambient air at the site boundary are as per **Table 4.5**.

Table 4.5: Emission from Onshore Oil and Gas Production (milligrams per normal cubic meter, unless otherwise specified)

Parameter	Maximum Value
VOCs, including benzene	20
Hydrogen sulphide	30
Sulphur oxides (for oil production)	1,000
Gas fired	320(86ng/J)
Oil fired	460(or 130ng/J)
Odour	Not offensive at the receptor end (Hydrogen sulphide at the property boundary should be less than 5 mg/m3)

Note: ng/J-nanograms per joule

Noise standards

EMCA Noise and excessive vibration pollution regulation 2009 and World Bank IFC Standards have provided recommended ambient noise levels for different land uses as represented in table XX Below

Rec	eptor	Maximu	ım allov	wable noise in d	ecibels
		NEMA		World Bank/ IF	C standard
		Day	Night	Day (0700-	Night (2200-
		time	time	2200Hrs)	0700)
Α	Silent Zone	40	35		
В	Places of worship	40	35		
С	Residential: Indoor			55	45
	Outdoor	45	35		
D	Mixed residential (with some commercial and places of entertainment)	55	35		
E	Commercial	60	35	70	70

4.1.2. Institutional Framework and Permitting

The summary of the main environmental permitting and licensing requirement relevant to the project is provided in Table 4.6.

Table 4.6: Key Institutions relevant to the development, their roles and requirements

Institutions	Role in Project Cycle	Permits Required	Relevant Legislation	Time
Ministry of Energy and petroleum	Get permission from the Cabinet secretary before commencing any petroleum operations	Petroleum operation license	The Energy Act, 2006	30 working Days. Issued by the Ministry of Energy and Petroleum.
NEMA	Issuance of EIA License -Monitoring project compliance with approval conditions	Environmental Impact License	EMCA 1999	21 working days after submission of project report.

Institutions	Role in Project Cycle	Permits Required	Relevant Legislation	Time
	-Environmental Auditing			45-90 working Days after submission of study report.
Kenya Forest Service (KFS)	License to undertake prohibited activity in forest area	KFS gives input during the ESIA review. No Objection letter given within 90 working days of the submission of ESIA study report to NEMA.	Kenya Forest Act, 2005	Way Leave Permit takes 30 working days upon application. Permit issued by KFS
National Museum of Kenya (NMK)	Permit for movement of heritage items	NMK gives input during the ESIA review.	The National Museum and Heritage Act of 2006	No Objection letter given within 90 working days of the submission of ESIA study report to NEMA
Water Resource Management Authority (WRMA)	Permit for water abstraction from surface water and/or drilling a borehole	Application for a permit shall be the subject of public consultation and, where applicable, of environmental impact assessment in accordance with the requirements of the Environmental Management and Co-ordination Act, of 1999	The Kenya Water Act, 2002	Within 21 working days after inspection visit.
Traffic Department, Kenya Urban	Permit for the transporting wide load	Application for exemptions from the provisions of the	Traffic Act Cap 403 Part V and VI. Kenya Roads	

Institutions	Role in Project Cycle	Permits Required	Relevant Legislation	Time
Roads		traffic Act for bulk carriers and	Act Cap 2 of	
Authority,		abnormal loads	2007	
Kenya Maritime Authorities (KMA)	Provision for the registration and licensing of Kenyan ships, to regulate proprietary interests in ships, the training and the terms of engagement of masters and seafarers and matters ancillary thereto; to provide for the prevention of collisions, the safety of navigation, the safety of cargoes, carriage of bulk and dangerous cargoes, the prevention of pollution, maritime security, the liability of ship-owners and others, inquiries and investigations into marine casualties; to make provision for the control, regulation and orderly development of merchant shipping and related services; generally to	Registration of vessels No	Merchant Shipping Act, 2009.	
	consolidate the law relating to shipping and for connected purposes.			

4.2 National Policies and Plans

National policy	Applicability
Kenya Vision 2030	Kenya Vision 2030 is the country's new development blueprint covering the period 2008 to 2030. The vision has three pillars to achieving its goal and they are economic, social and political and their foundations are anchored by macroeconomic stability; continuity in governance reforms; enhanced equity and wealth creation opportunities for the poor; infrastructure; energy; science, technology and innovation (STI); land reform; human resources development; security; and public sector reforms. The energy sector in Kenya is identified as one of the sectors that contribute to the country's economic growth; it is highly dominated by imported petroleum for the urban/industrial sector and wood fuel for the rural and urban poor.
National Land Policy 2009	The Policy was formulated in August 2009, under Sessional Paper No.3 of 2009 on National Land Policy. This was the first time that Kenya adopted a comprehensive policy on land. The policy covers all aspects of land as regards to holding, classification, adjudication, registration, ownership and management. It also deals with historical injustices on land, and covers issues on natural resources and environment. The policy to achieve the goals of securing the National interests, where the is exploitation of natural, exploration should confer benefits to the local community, government is to compulsorily acquire land in areas where minerals are discovered with an aim of preventing environment degradation and securing mechanisms for restoring the land after exploitation.
Sessional Paper No.4 of 2004 on Energy	The policy that guides the energy industry including oil and gas. This policy on energy was formulated in October 2004 and is meant to guide the GoK in the energy sector for the period 2004 to 2023. The policy only seeks to put in place a legal and regulatory framework for mining, fossil fuel and the management of downstream oil and gas. Regarding hydrocarbons, the policy provides measures that are to be taken by the government in order to mitigate perceived risks by oil exploration companies.
National Energy Policy 2014	The main objective of the policy is to ensure affordable, sustainable, and reliable supply to meet National and county development needs, while protecting needs, while protecting and conserving the environment. According to the policy, petroleum exploration is being undertaken both onshore and offshore in the country's four major sedimentary namely Lamu, Mandera, Anza and Tertiary Rift. The policy outlines major policies that should be considered in petroleum exploration. In petroleum exploration, adoption of Extractive Industries Transparency Initiative (EITI). In addition, the government has the mandate to develop mechanisms for sharing and management of petroleum revenue as well as undertake measures to fast track commercial petroleum discovery.
National Marine Oil Spill Response	The policy aim at dealing with oil spill emergencies likely to occur within the territorial waters of Kenya. Section 1on strategy defines the range of the plan taking into account the geographical area covered; the apparent risks; responsibilities; assignment of roles; and anticipated response strategies. Section on plans and operations section set out the emergency measures necessary for rapid

National policy	Applicability
Contingency Plan (NMOSCRCP)	mobilization of resources for effective response to emergency oil spill. Data directory on the other hand contains lists of available oil spill response equipment and data sheets required to assess an oil spill situation.
Policy Paper on Environment and Development (Sessional Paper No. 6 of 1999)	The policy recommends the need for enhanced re-use/recycling of residues including wastewater, use of low or non-waste technologies, increased public awareness and appreciation of a clean environment. It also encourages participation of stakeholders in the management of wastes within their localities. Regarding human settlement, the paper encourages better planning in both rural and urban areas and provision of basic needs such as water, drainage and waste disposal facilities among others. The policy identifies energy sector as a source of important gaseous pollutants is carbon monoxide, hydrocarbons, hydrogen sulphide, nitrogen oxide and fluorides. These sources of include electric power generation, refuse burning, industrial and vehicle fuel consumption and emissions and industrial by-products.
	 Ensure that from the onset, all development policies, programmes, and projects take environmental considerations into account Ensure that an independent EIA report is prepared for any industrial venture or other development before implementation Effluent treatment standards that will conform to acceptable health guidelines.

4.3 International Agreements and Conventions

Kenya is a signatory to numerous multilateral agreements and international conventions. The agreements of interest to Kenya can be categorized as those for protecting natural resources, atmosphere and social wellbeing of man. The following list is a presentation of some of which are relevant to this project and study.

Conventions Applicability	
Montreal Protocol, September, 1987	Montreal Protocol On Substances that deplete the Ozone Layer: Adopted in September 1987 and intended to allow the revision of phase out schedules on the basis of periodic scientific and technological assessments, the Protocol was adjusted

Conventions	Applicability
	to accelerate the phase out schedules and has since been amended to Introduce other kinds of control measures and to add new controlled substances to the list.
The Basel Convention 1989	It is a global instrument for controlling trans-boundary movement of hazardous waste and their disposal. The convention aimed at reducing trans-boundary movement off hazardous wastes, minimizing creation of such wastes, and prohibiting shipment to countries that lack capacity to dispose of hazardous waste in an environmentally sound manner.
Vienna Convention for the Protection of the Ozone Layer March, 1985	Vienna Convention for the Protection of the Ozone Layer: Inter-governmental negotiations for an international agreement to phase out ozone depleting substances concluded in March 1985 with the adoption of this Convention to encourage Inter-governmental co-operation on research, systematic observation of the ozone layer, monitoring of CFC production and the exchange of Information.
Kyoto Protocol 1997	Pursuant to the objectives of the United Nations (UN) Framework Convention on Climate Change, in which the developed nations agreed to limit their greenhouse gas emissions, relative to the levels emitted in 1990.
Convention on Biological Diversity (CBD, 1994):	This Convention entered into force on 29 December 1993, and its objectives are to: conserve biological diversity; use biological diversity in a sustainable fashion and share the benefits of biological diversity fairly and equitably. This Convention governs Kenya's international obligations regarding biological diversity.
United Nations Educational, Scientific and Cultural Organization (UNESCO) Convention	UNESCO Convention for the protection of the World Cultural and Natural Heritage (World Heritage Convention, 1972): This Convention aims to encourage the identification, protection, and preservation of Earth's cultural and natural heritage. It recognizes that nature and culture are complementary and that cultural identity is strongly related to the natural environment in which it develops;
Convention on the International Trade in Endangered Species (CITES) of Wild Fauna and Fauna, 1990	This is a 1990 treaty that regulates the wildlife trade and protects forests as habitat for endangered species. Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten their survival and it accords varying degrees of protection to many species of animals and plants.

Conventions	Applicability
Convention on the Ban of the Import into Africa and the Control of Trans boundary Movements and Management of Hazardous Wastes (Bamako Convention)	Convention on the Ban of the Import into Africa and the Control of Trans boundary Movements and Management of Hazardous Wastes (Bamako Convention) is a treaty of African nations prohibiting the import of any hazardous (including radioactive) waste. The Convention was negotiated by twelve nations of the Organization of African Unity at Bamako, Mali in January, 1991, and came into force in 1998.

4.4 IFC Performance Standards

IFC Sustainability Frameworks consist of IFC's Policy and Performance Standards on Environmental and Social Sustainability and IFC's Access to Information Policy. On environment and social sustainability, the framework, assess the commitments, roles, and responsibilities necessary from ensuring environmental sustainability.

Performance Standards	Applicability	Relevance to the Project
PS1: Assessment and Management of Environmental and Social Risk and Impacts	This PS relates to integrating and managing environmental and social performance throughout the life of a project with the aim of identifying and evaluating environmental and social risks and impacts of the project; adopting a mitigation hierarchy to anticipate and avoid, or where avoidance is not possible, minimize; and where residual impacts remain, compensate/offset for risks and impacts to workers, Affected Communities, and the environment, promote improved environmental and social performance of clients through the effective use of management systems and to ensure that grievances from affected communities and external communications from other.	The standard requires the management of environmental and social performance throughout the life of a project. It requires the developer to identify the environmental and social risks, establish management programs that will mitigate the risks, establish, maintain, and strengthen organizational structure that defines roles, responsibilities, and authority to implement the ESMS, establish and maintain an emergency preparedness and response system, establish procedures to monitor and measure the effectiveness of the management program, as well as compliance with any related legal and/or contractual obligations and regulatory requirements and establish a stakeholder engagement plan that will be used to disclose and disseminate information, consult and involve stakeholders as well as grievance mechanism.
PS 2: Labour and Working Conditions	This standard seeks to ensure project proponents establish, maintain, and improves the worker-management relationship that promotes the fair treatment, non-discrimination and equal opportunity of workers, and compliance with national labour and employment laws. This PS aims to protect the workforce by applying this standard, which also addresses child labour and forced labour, and promoting safe and healthy	Requires the adoption and implementation of human resources policies and procedures appropriate to its size and workforce that set out its approach to managing workers consistent with the requirements of this Performance Standard and national law. Provide reasonable working conditions and terms of employment. Respect the rights to form and to join workers' organizations of their choosing without interference and to bargain collectively even if not recognised by national laws

Performance Standards	Applicability	Relevance to the Project
	working conditions, and to protect and promote the health of workers by recognizing the role of employees.	To base employment relationship on the principle of equal opportunity and fair treatment, and not to discriminate with respect to any aspects of the employment relationship.
		Prior to implementing any collective dismissals, to carry out an analysis of alternatives to retrenchment. If the analysis does not identify viable alternatives to retrenchment, a retrenchment plan will be developed and implemented to reduce the adverse impacts of retrenchment on workers. The retrenchment plan will be based on the principle of non-discrimination and will reflect the client's consultation with workers, their organizations, and, where appropriate, the government, and comply with collective bargaining agreements if they exist.
		To establish a grievance mechanism for workers (and their organizations, where they exist) to raise workplace concerns.
		Not to employ children in any manner that is economically exploitative, or is likely to be hazardous or to interfere with the child's education, or to be harmful to the child's health or physical, mental, spiritual, moral, or social development.
		Not to employ forced labor, which consists of any work or service not voluntarily performed that is exacted from an individual under threat of force or penalty.
		To provide a safe and healthy work environment, taking into account inherent risks in oil and gas sector and specific classes of hazards in the work areas, including physical, chemical, biological, and radiological hazards, and specific threats to women.
PS 3: Resource Efficiency and	The Performance Standard 3 aims at abetting pollution to air, water, and land that may threaten people and the	To implement technically and financially feasible and cost effective measures for improving efficiency in its consumption of energy, water, as well as other

Performance Standards	Applicability	Relevance to the Project
Pollution Prevention	environment at the local, regional, and global levels. The main objectives of this PS are; to avoid or minimize adverse impacts on human health and the environment by avoiding of minimizing pollution from project activities; to promote more sustainable use of resources, including energy and water and to reduce project-related GHG emissions.	resources and material inputs, with a focus on areas that are considered core business activities. To consider alternatives and implement technically and financially feasible and cost-effective options to reduce project-related GHG emissions during the design and operation of the project To adopt measures that avoids or reduces water usage so that the project's water consumption does not have significant adverse impacts on others. To avoid the release of pollutants or, when avoidance is not feasible, minimize and/or control the intensity and mass flow of their release. This applies to the release of pollutants to air, water, and land due to routine, non-routine, and accidental circumstances with the potential for local, regional, and transboundary impacts To avoid the generation of hazardous and non-hazardous waste materials. Where waste generation cannot be avoided, to reduce the generation of waste, and recover and reuse waste in a manner that is safe for human health and the environment.
PS4: Community Health, Safety, and Security	The role of this PS is to anticipate and avoid adverse impacts on the health and safety of the Affected Community during the project life from both routine and non-routine circumstances and to safeguard personnel and property in accordance with relevant human rights principles and in a manner that avoids or minimizes risks to the Affected Communities. This study evaluates the risks and impacts to the health and safety of the Affected Communities during the project lifecycle and proposes mitigation measures consistent with good international	To identify risks and impacts and propose mitigation measures that are commensurate with their nature and magnitude. To design, construct, operate, and decommission the structural elements or components of the project in accordance with GIIP, taking into consideration safety risks to third parties or affected communities To avoid or minimize the potential for community exposure to hazardous materials and substances that may be released by the project.

Performance Standards	Applicability	Relevance to the Project
	industry practice (GIIP), such as in the World Bank Group Environmental, Health and Safety Guidelines (EHS Guidelines) or other internationally recognized sources	To identify those risks and potential impacts on priority ecosystem services that may be exacerbated by climate change To avoid or minimize the potential for community exposure to water-borne, water-based, water-related, and vector-borne diseases, and communicable diseases that could result from project activities, taking into consideration differentiated exposure to and higher sensitivity of vulnerable groups. To assist and collaborate with the affected communities, local government agencies, and other relevant parties, in their preparations to respond effectively to emergency situations, especially when their participation and collaboration are necessary to respond to such emergency situations To assess risks posed by its security arrangements to those within and outside the project site.
PS5: Land Acquisition and Involuntary Resettlement	The PS5 deals with land acquisition and resettlement of people on the land that they have been depending on. Involuntary resettlement refers both to physical displacement (relocation or loss of shelter) and to economic displacement (loss of assets or access to assets that leads to loss of income sources or other means of livelihood1) as a result of project-related land acquisition and/or restrictions on land use.	This standard relates to the temporary land acquisition process for the proposed exploratory drilling project. To consider feasible alternative project designs to avoid or minimize physical and/or economic displacement, while balancing environmental, social, and financial costs and benefits, paying particular attention to impacts on the poor and vulnerable. If displacement cannot be avoided, to offer displaced communities and persons compensation for loss of assets at full replacement cost and other assistance to help them improve or restore their standards of living or livelihoods. To engage with affected communities, including host communities, through the process of stakeholder engagement on decision-making processes related

Performance Standards	Applicability	Relevance to the Project
		to resettlement and livelihood restoration should include options and alternatives, where applicable.
		To establish a grievance mechanism consistent which will allow receiving and addressing specific concerns about compensation and relocation raised by displaced persons or members of host communities in a timely fashion, including a recourse mechanism designed to resolve disputes in an impartial manner.
		In case of involuntary resettlement, to establish a resettlement and livelihood restoration plan for the affected
		In the case of physical displacement, to develop a Resettlement Action Plan that covers, at a minimum, the applicable requirements of this Performance Standard regardless of the number of people affected.
		In the case of projects involving economic displacement only, to develop a Livelihood Restoration Plan to compensate affected persons and/or communities and offer other assistance that meet the objectives of this Performance Standard.
PS6: Biodiversity Conservation and Sustainable Management of	This PS aims at protecting and conserving biodiversity based on Convention on Biological Diversity, which defines biodiversity as "the variability among living organisms from all sources including, inter alia, terrestrial, marine, and other aquatic ecosystems and the ecological	To consider direct and indirect project-related impacts on biodiversity and ecosystem services and identify any significant residual impacts especially focusing on habitat loss, degradation and fragmentation, invasive alien species, overexploitation, hydrological changes, nutrient loading, and pollution
Living Natural Resources	complexes of which they are a part; this includes diversity within species, between species, and of ecosystems". This PS divides habitat into three categories, modified, natural, and critical. Critical habitats are a subset of modified or natural habitats. Modified habitats are areas that may	To establish appropriate actions that include avoiding impacts on biodiversity through the identification and protection of set-asides, implementing measures to minimize habitat fragmentation, such as biological corridors, restoring habitats during operations and/or after operations; and implementing biodiversity offsets.

Performance Standards	Applicability	Relevance to the Project
	contain a large proportion of plant and/ or animal species of non-native origin, and/ or where human activity has substantially. These may include areas managed for agriculture, forest plantations, reclaimed6 coastal zones, and reclaimed wetlands.	In event the project is located within a legally protected area or an internationally recognized area, Zarara will demonstrate that the project in such areas is legally permitted, act in a manner consistent with any government recognized management plans for such areas, consult protected area sponsors and managers, affected communities, indigenous peoples and other stakeholders on the proposed project, as appropriate; and implement additional programs, as appropriate, to promote and enhance the conservation aims and effective management of the area Not to intentionally introduce any new alien species (not currently established in the country or region of the project) unless this is carried out in accordance with the existing regulatory framework for such introduction. To conduct a systematic review to identify priority ecosystem services. These area, those services on which project operations are most likely to have an impact and, therefore, which result in adverse impacts to affected communities and/or) those services on which the project is directly dependent for its operations (e.g., water).
PS 7: Indigenous Peoples	This standard deals in safeguarding Indigenous People which it defines as social groups with identities that are distinct from mainstream groups in national societies, are often among the most marginalized and vulnerable segments of the population.	To identify, all communities of Indigenous Peoples within the project area of influence who may be affected by the project, as well as the nature and degree of the expected direct and indirect economic, social, cultural (including cultural heritage2), and environmental impacts on them. Undertake engagement process with the affected communities of Indigenous Peoples To consider feasible alternative project designs to avoid the relocation of Indigenous Peoples from communally held lands and natural resources subject to traditional ownership or under customary use.

Performance Standards	Applicability	Relevance to the Project
PS 8: Cultural	This standard defines Cultural heritage as any tangible	Where a project may significantly impact on critical cultural heritage that is essential to the identity and/or cultural, ceremonial, or spiritual aspects of Indigenous Peoples lives, priority will be given to the avoidance of such impacts. The determination, delivery, and distribution of compensation and other benefit sharing measures to the Affected Communities of Indigenous Peoples will take account of the laws, institutions, and customs of these communities as well as their level of interaction with mainstream society. To protect cultural heritage in project design and execution.
Heritage	forms of cultural heritage, such as tangible moveable or immovable objects, property, sites, structures, or groups of structures, having archaeological (prehistoric), paleontological, historical, cultural, artistic, and religious values; unique natural features or tangible objects that embody cultural values, such as sacred groves, rocks, lakes, and waterfalls; and certain instances of intangible forms of culture that are proposed to be used for commercial purposes, such as cultural knowledge, innovations, and practices of communities embodying traditional lifestyles. As a control measures, the standard requires the project proponents to identify and protect cultural heritage by ensuring that internationally recognized practices for the protection, field based study, and documentation of cultural heritage are implemented.	Take the responsibility of siting and designing a project to avoid significant adverse impacts to cultural heritage. The environmental and social risks and impacts identification process to determine whether the proposed location of a project is in areas where cultural heritage is expected to be found, either during construction or operations To consult with affected communities who use, or have used within living memory, the cultural heritage for long-standing cultural purposes. To allow continued access to the cultural site or will provide an alternative access route, subject to overriding health, safety, and security considerations.

4.5. The Equator Principles (EPs)

The Equator Principles (EPs) are a set of voluntary environmental and social guidelines that have been adopted by a significant number of financial institutions influential in the project finance market (collectively the Equator Principles Financial Institutions, EPFIs). The objective of the Equator Principles (EPs) is to provide the EPFIs with a mechanism to incorporate into their financing decisions a structured and rigorous consideration of environmental and social impacts associated with a particular investment initiative. Although project is not expected to require a loan, the Equator Principles have been considered as reference standards for the project due to their international recognition.

The EPs comprise a set of ten broad principles that are underpinned by the environmental and social policies, standards and guidelines of the IFC. Under the EPs, the EPFIs undertake publicly to only contribute financing to projects where the project sponsors are able to demonstrate to the EPFIs' satisfaction that they are both able and committed to comply with the provisions of the EPs. It should be noted that the third revision (EP III) is effective from the 4th June 2013.

The basic framework of the EPs remains intact since 2006; however, there are important expansions and additions in EP III. Key changes include the expansion of the scope of the EPs to apply to a broader range of financial product as project-related corporate loans and the inclusion of bridge loans. Changes also take into consideration the inclusion of new Language on Human Rights in due diligence and Stakeholder Engagement Requirements, with Free, Prior and Informed Consent required for projects with adverse impacts on indigenous people, as well as obligations to analyze and report on Greenhouse Gas emissions arising from high emitting Projects.

Table 4.7:The summary of Ten EPs:

Performance Standards	Applicability
EP 1:	Requires all projects considered for financing to be categorized according to the degree of environmental and/or social risk and impacts they present. Projects with minimal environmental or social impacts require no further analysis under the EPs; those with attributable impacts are potentially subject to meeting the requirements of the remaining Principles
EP 2:	Mandates a project specific environmental and social impact assessment (ESIA) and provides an illustrative list of potential environmental and social issues to be addressed in the assessment.
EP 3:	This principle concerns the environmental and social standards that the project must adhere to during its construction, operation and decommissioning.

Performance Standards	Applicability
EP 4:	This principle addresses requirements for a comprehensive ESMP which needs to be implemented within a structured management system to ensure that the provisions of the remaining EPs are effectively implemented.
EP 5:	This covers the requirements for consultation as well as the public disclosure of key project documentation and information.
EP 6:	This principle takes into account concerns for structured grievance mechanism to be put in place to enable project-affected communities (including workers engaged on the project and workers at neighboring sites) to express any concerns or grievances they may have concerning the development.
EP 7:	This provides for the possible requirement for an independent review of EP compliance in order to assist the EPFI's due diligence.
EP 8:	This provides for the incorporation of covenants linked to EP compliance to be included in the project financing agreements.
EP 9:	This principle deals with the possible requirement for independent verification of monitoring carried out by the project sponsors.
EP 10:	This principle commits each EPFI to report publicly at least annually about its EP implementation processes (and hence is the only one of the ten Principles not to address specific project financing applications).

5.0. BASELINE CHARACTERISTICS

This chapter describes environmental, socio-economic and health characteristics of block L4 and L13 which falls within Lamu County as illustrated in Figure 5.1 below.

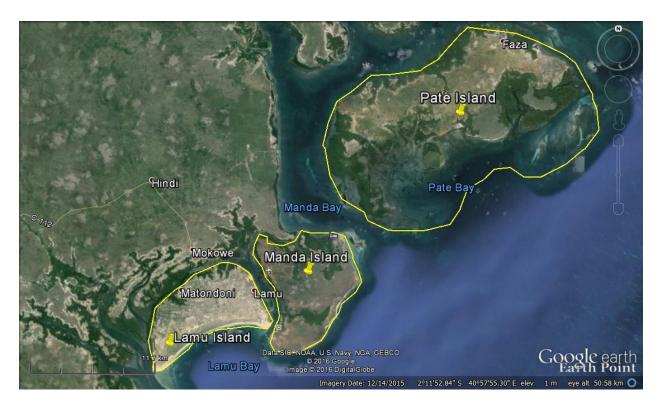
400 Kilometers 343 m 15 60 Kilometers L13 Indian Ocean ALCO O Indian Ocean Legend Constituency Lamu East Lamu West County Boundary Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, Mapmylindia, © OpenStreetMap contributors, and the GIS User County Boundaries **ESF** Consultants COUNTY Lamu

Figure 5.1: Location of Lamu County

Source: ESF Consultants

The location of the exact drill site in the focus areas depends on the characteristics of the underlying geological formations as shown by seismic data; however, the area of interest is in Pate Island as illustrated in Figure 5.2 below). Zarara wishes to further explore and appraise the gas discoveries made by Shell in the 1970s, which encountered high-pressure gas but in an unknown quantity as the well did not fully penetrate the reservoir section and was neither logged nor tested due to technical problems whilst drilling. The scope of work will cover the drilling of two wells on Pate Island, with the option to drill up to two additional wells to further appraise the prospect.

Figure 5.2: Islands in Lamu County



Source: ESF Consultants

Pate is the largest Island in the Lamu archipelago. Pate has a fascinating and colourful history largely defined by the influence of Arabic and Portuguese traders, starting as early as the 19th century. Shipping and trade, battles for power, intermarriage, periods of extreme wealth, creativity and elaborate architecture are just some of the patches in the island's quilt. Remnants from this elaborate history can still be found on the island today, making it one of Kenya's best kept north coast secrets.

5.1. Environmental Baseline

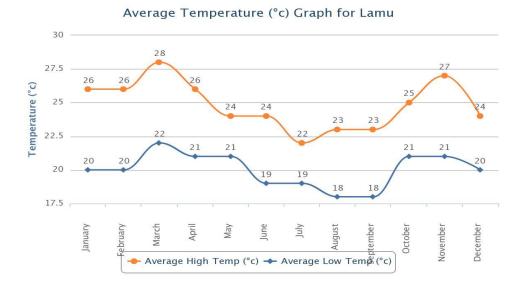
5.1.1. Climate and Meteorology

Temperature

The Lamu area in general has a hot and humid climate, but is further classified by the Kenya Agro climatic description as semi-humid on Lamu Island and along the coastal strip, but semi-arid further inland past Witu. The mean maximum temperature ranges between 28-31°C and the mean minimum temperatures 20-23°C. The hottest months are between December and April while coolest months are between May and July. This shows that total amount of evapotranspiration is high especially in the months of March and September and lowest in May.

Figure 5.3: Average Temperature (°C) Graph for Lamu County⁷

⁷ World Weather Online. 2015. *Manda Airport (LAU) Weather Lamu*



Based on the Koppen and Geiger climate classification, Pate Island lies in Tropical Monsoon and Arid Steppe Hot climate. Climate in Pate is characterized by hot temperatures throughout the year, with mean average temperatures of 27°C, maximum temperatures of 29.3°C and minimum temperatures of 24.3°C. Lamu experiences an East-West temperature variation⁸.

Climate in Pate Island is dominated by large scale pressure systems of the western Indian Ocean (El Nino, Indian Ocean Dipole and the Madden Julian Oscillation) and two distinct monsoon seasons leading to bimodal distribution throughout the year. Annual precipitation averages at 500-900 mm in Lamu. The rainfall pattern is greatly influenced by the Monsoon winds with the main rains coming between late March and early June and declines from August. Short rains come in November and December and rapidly decrease in January and February.⁹

Salinity

Monsoon winds along the coast of Kenya influence both the temperature and salinity of the ocean waters. As shown in **Figure 5.4** below, the highest temperature in this waters range between 28°C and 29°C and occur after the Northeast Monsoon in the months of March and April. During the Southeast Monsoon, the shifting of the ocean currents brings Pacific Ocean waters of high salinity into the South Equatorial Current.

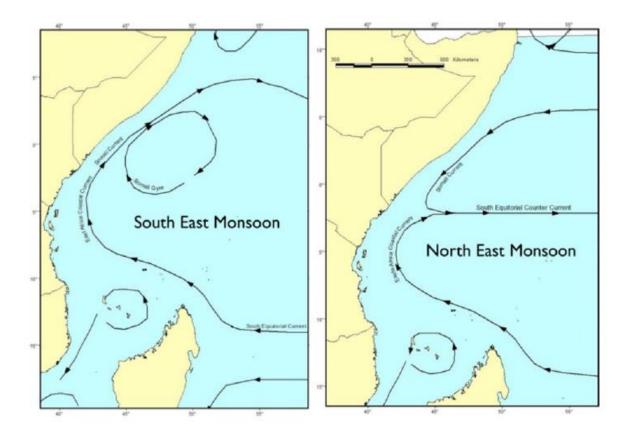
The coldest months are between May to July whereas the hottest months are between December and April. Mean evaporation rates range from 1650 to 2300 mm per year in Lamu. Wind speeds, usually peak in *Kusi* and drop in *Kaskazi* and also show variability in direction. During the Northeast Monsoon, the South Equatorial Currents draws waters of low salinity from the Malay Archipelago. Such changes in salinity affect the salinity of the East African Coastal Current water. In the months of March, April, and May, there are heavy rains which influences salinity of the ocean waters at the Kenya Coastal line due to the

⁹ Benny, P. N., 2002: Variability of Western Indian Ocean currents, 1, 81-90. WIOMSA

⁸ (University of Nairobi, 2012)

discharges from the major river systems that drain into the ocean. Offshore temperature and salinity are however affected by ocean currents and surface water systems and conditions.

Figure 5.4: Monsoon winds and ocean currents¹⁰



Salinity in coastal seawater range from $34.5^{\circ}/_{00}$ to $35.4^{\circ}/_{00}$ (dissolved salts in 1 kilogram of seawater expressed as parts per thousands). **Table 5.1** below: Salinity levels in Lamu

Table 5.1: Salinity Levels in Lamu

Site	Salinity
Kiwayu	36.33
Ndau	37.2
Kizingitini	37

Rainfall

Annual rainfall on the Kenyan coast follows the strong seasonal monsoon pattern influenced by the south-easterly and the north-easterly monsoon winds. The main rains come between late March and early June with the rainfall decreasing from August; May remains the wettest month throughout the area. Some rain

¹⁰ Obura, David O. 2001: Kenya, Marine Pollution Bulletin, 42 (12): 1264-1278, ISSN 0025-326X, Retrieved from: http://dx.doi.org/10.1016/S0025-326X(01)00241-7.

occurs between October and November but from December, rainfall decreases rapidly once again to a minimum during January and February

Lamu is characterized by bimodal rainfall distribution of approximately 540 mm annually and temperatures of 28°C. The tides are semi-diurnal, with mean range of 2.5 to 3 meters and a maximum range of approximately 4 m¹¹. The rainfall pattern in Lamu County is bimodal with the long rains falling throughout the county from mid-April to end of June with light showers in July. May is the wettest month. The short rains fall in November and December. January to March are usually dry months.

Table 5.2: Average Rainfall for Lamu County¹²

Months	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mm	7	3	32	135	299	145	82	41	47	37	42	25

Annual precipitation varies slightly across the Island from north to south, being approximately 835mm in the Kizingitini area, to 882mm p.a around Pate (Figure 6). Precipitation is heaviest in the months of April to July with a peak in May. December to March is the driest season on the island with a cumulative total average of between 10 and 20 mm.

On Pate Island, temperatures average at 26.9°C per annum and rainfall at 882 mm per annum¹³. On Pate Island, the main rainy season lasts from April to July, when 75% of the long term total of mean monthly rainfall is observed with a peak in May. However, in the 10-year period between 1981 and 1991, the total mean was much higher, which shows that there are cyclic periods of high and low rainfall. Figure 5.5 shows that precipitation increases progressively from Kizingitini southwest to Pate. Rainfall is an important source of water for the Island either trapped directly as rainwater harvesting, in djabias as surface runoff or by recharging groundwater to keep a minimum freshwater lens above the saline groundwater layer.

¹¹ Church J. and Palin O. 2003. The Sea Turtle Conservation Initiative in Kiunga Marine National Reserve, Lamu Kenya, from February 1997 to June 2003. Report, WWF EARPO, Nairobi.

¹² Holiday Weather. 2016. *Lamu: Annual Weather Average*. [Date Accessed 17th May 2016] Available from: http://www.holiday-weather.com/lamu/averages/

¹³ climate-data.org, 2015. *Climate Lamu.* [Date accessed 17th May 2016]. Available from: http://en.climate-data.org/location/47680/

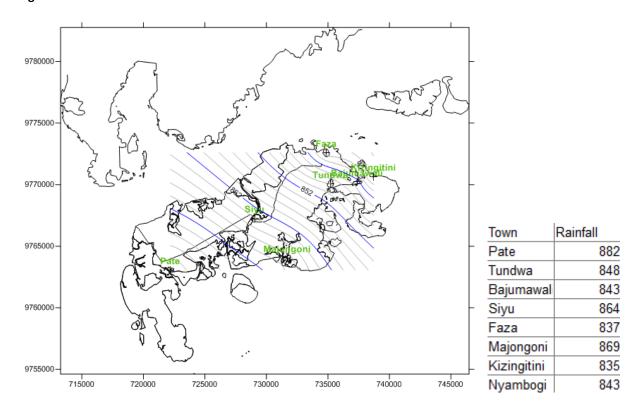


Figure 5.5: Rainfall Distribution

Air Quality

Pate Island is moderately populated, undeveloped with strong winds caused by tides and air pressure variations in the Indian Ocean and the island. Pate Island has bushlands, bushy grasslands, mangrove forests, and scattered coconut trees effective in filtering the air and blocking strong onshore winds.

The presence of Kenya Electricity Generating Company's (KenGen) diesel power plant in Lamu, agricultural activities and flights to and from Lamu, may affect the air quality in Pate Island. There is minimal atmospheric pollution, release of exhaust fumes and dust due to few vehicles traversing on the island. There are herds of grazing goats contributing to minimal dust production from their movements. Air pollution occurring in Pate Island is localized, transient and negligible.

The proposed project may have some impacts on air quality. Vehicular movements, for instance, and other man made events will definitely increase, which will therefore lead to higher levels of air pollutants. The baseline air quality was therefore assessed prior to the commencement of this project and was also in compliance with the Environmental Management and Co-ordination Act, 1999. Airborne concentrations of sulphur dioxide, nitrogen dioxide, carbon dioxide, suspended particulate matter (dust) and volatile organic compounds were determined in Siyu village and at the Shell Drilling Site in Pate Island 19th May 2016. Figure 5.6 shows the air sampling sites on Pate Island.

Figure 5.6: Air sampling collection sites





Siyu Vilage Pate 1 -Shell Site

Sample Collection

Air samples were collected using an electric driven suction pump whose flow rate was 3.44 litres per minute. The air was scrubbed through appropriate trapping solutions for sulphur dioxide, nitrogen dioxide, carbon dioxide and carbon monoxide. Total suspended particulate matter (dust) was trapped in pre-weighed and pre-conditioned membrane filters. Total volatile organic compounds were collected in appropriate air bags and preserved for subsequent chemical analysis.

Quantitative Determination

- 1. Sulphur dioxide was determined quantitatively using the Pararosaniline method.
- 2. Nitrogen dioxide was determined using the Modified Griess-Saltzman method.
- 3. Carbon monoxide was determined spectrophotometrically using the silica ammonium molybdate method.
- 4. Carbon dioxide was determined titrimetrically.
- 5. The Filtration Technique was used to determine the airborne concentrations of suspended particulate matter (dust).
- 6. Total volatile organic compounds were determined using gas chromatography.

Results

Table 5.3 below provides the results of air quality measurements in Pate Island

Table 5.3: Air quality measurements in Pate Island.

Sampling Site, Date and GPS Coordinates	Parameter	Concentrations	WHO Guidelines	NEMA Ambient Quality tolerance limits for Residential, Rural and Other Areas
SIU VILLAGE (19-05-	Sulphur dioxide	34 μg/m³	500 μg/m ³	80 μg/m³
2016)			10 minutes	-24 hours
			350 μg/m ³	60 μg/m³-Annual Average
GPS COORDINATES			1 hour	
(UTM)			125 μg/m³	
LATITUDE 37°			24 hours	
0729359E			60 μg/m³	
9767203N 3 Metres Elevation			1 year	
3 Metres Lievation	Nitrogen dioxide	29 μg/m³	120 μg/m ³	80 μg/m³
			8 hours	-24 hours
			40 μg/m ³	60 μg/m³- Annual Average
			1 year	
	Carbon monoxide	1.014 mg/m ³	30 mg/m ³	2 mg/m ³ -8 hours
			1 hour	4 mg/m³-1 hour
			10 mg/m ³	
			8 hours	
	Carbon dioxide	702 mg/m ³	No published guidelines	No published guidelines
	Total Suspended	46 μg/m³	150-230	180 μg/m³
	Particulate Matter (dust).		μg/m³	-24 hours
			24 hours	
				100 μg/m³
			60-90 μg/m ³	-Annual Average
			1 year	
	Total Volatile Organic Compounds	Not Detected	No published guidelines	6.0 mg/m ³

Sampling Site, Date and GPS Coordinates	Parameter	Concentrations	WHO Guidelines	NEMA Ambient Quality tolerance limits for Residential, Rural and Other Areas
SHELL DRILLING SITE	Sulphur dioxide	26 μg/m³	500 μg/m³	80 μg/m³
(19-05-2016)			10 minutes	-24 hours
			350 μg/m ³	60 μg/m³-Annual Average
GPS COORDINATES			1 hour	
(UTM)			125 μg/m ³	
LATITUDE 37°			24 hours	
0731621E			60 μg/m ³	
9771226N			1 year	
4 Metres Elevation	Nitrogen dioxide	15 μg/m³	120 μg/m³	80 μg/m³
			8 hours	-24 hours
			40 μg/m³	60 μg/m³- Annual Average
			1 year	
	Carbon monoxide	0.760 mg/m ³	30 mg/m ³	2 mg/m³-8 hours
			1 hour	4 mg/m³-1 hour
			10 mg/m ³	
			8 hours	
	Carbon dioxide	686 mg/m ³	No published guidelines	No published guidelines
	Total Suspended Particulate Matter (dust).	41 μg/m³	150-230 μg/m³	180 μg/m³ -24 hours
	inatici (dust).		24 hours	
				100 μg/m³
			60-90 μg/m ³	-Annual Average
			1 year	
	Total Volatile Organic Compounds	Not Detected	No published guidelines	6.0 mg/m ³

NOTE: $\mu g/m^3$ and mg/m^3 means micrograms per cubic metre of air and milligrams per cubic metre of air respectively (1 $mg/m^3 = 1000 \mu g/m^3$).

Observations

- The pollution levels at the two sites were significantly low.
- The parameters that were analysed did not exceed both the NEMA and WHO guidelines for ambient air.
- The levels of carbon dioxide were close to the typical concentrations that are usually found in unpolluted air (about 677 μ g/m³ at the then prevailing weather conditions).

Projected Future climate

For most of East African region, the latest Global Climate Change Model projection largely agree on wetter conditions. However, the model can overlook critical regional climate dynamics which might change local level climate. The future projected climate change for Lamu and/ or seascape has been downscaled to the weather station in Lamu by the Climate Systems Analysis Group (CSAG) at the University of Cape Town, using two future economic scenarios:

- Scenario A1: "Business as usual" growth in greenhouse gas emissions
- Scenario B1: Rapid growth path but based on regional convergence and the introduction of more efficient technology (see

• Figure 5.7).

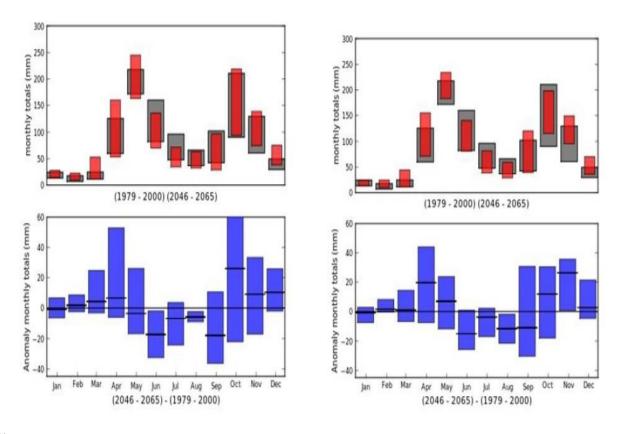
Models generally project increase in rain day frequency from November to April, with most positive change in extreme rainfall between October and November, with a decrease between June to September for all types of rainfall frequency. Decrease in dry spell might occur during the dry season of January to April suggesting a period of rain increase into the future (see

Figure 5.7). Although the same months may have greater dry spell lengths, this may not necessarily translate into the long duration of dry spells defined as droughts.

Figure 5.7: Projected future climate model¹⁴

Scenario A1

Scenario B1



Key

Red colour: Monthly projected rainfall total

Blue colour: Rainfall anomaly (i.e. anything above the line is more rainfall expected than was experienced in 1979-2000 period; while anything below the line shows less rainfall than was experienced in the 1979-200 period)

Winds

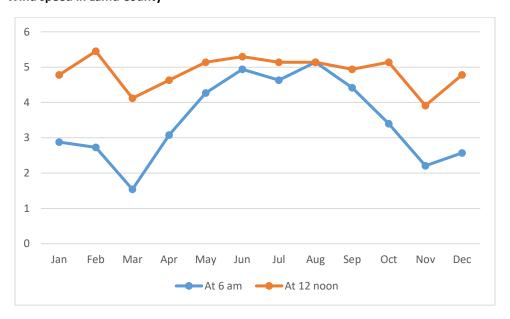
Block L4 is characterized by variable climatic conditions as it lies under agro climatic zones IV (semi-humid to semi-arid), V (semi-arid) and VI (arid). There is presence of strong winds due to pressure changes in the Indian Ocean but moderate due to thick vegetation cover serving as breakers for the strong winds. Void lands experience wind erosion and deposition. **Table 5.4** and **Figure 5.8** below show the wind speed in Lamu County.

¹⁴ CSAG, 2012: Current state of knowledge on climate trends and variability, and downscaled climate change projections, for Eastern Africa, report prepared for WWF CEAI by the University of Cape Town Climate Systems Analysis Group (CSAG), 99p.

Table 5.4: Wind speed in Lamu 15

Lamu V speed	Vind	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
At 6 am		2.88	2.73	1.54	3.08	4.27	4.94	4.63	5.14	4.42	3.40	2.21	2.57
At 12 noon		4.78	5.45	4.12	4.63	5.14	5.30	5.14	5.14	4.94	5.14	3.91	4.78

Figure 5.8: Wind speed in Lamu County



The major ocean current in western Indian Ocean is the Equatorial currents and the Monsoon winds which influence in determining the oceanographic conditions¹⁶. The Kenyan coast experiences two distinct Monsoon seasons, the Northeast Monsoon (*Kaskazi*) and the Southeast Monsoon (*Kusi*). *Kusi* runs from May to September and *Kaskazi* runs from November to March. In between *Kaskazi* and *Kusi* is one or two-month transition period characterized by lower variable winds locally referred to as *Matlai*¹⁷. According to McClanahan in 1988, the start and the end of the two seasons vary with *Kusi* running from March to October and *Kaskazi* running from October to March.

East African Coastal Currents, Monsoon Winds and the Southwest Somali Current form an interplay creating a unique condition on the northern Kenyan coast, i.e. North of Lamu. Lamu Archipelago is characterized by mild upwelling and eutrophic conditions¹⁸. The Somali Current, being the only current that changes direction, is known for its high speeds of up to 3.5 m/s, on its top 200 meters, it reverses and

¹⁵ World Weather Online. 2015. Manda Airport (LAU) Weather Lamu

¹⁶ Schott, F. 2001: The monsoon circulation of the Indian Ocean. Progress in Oceanography, 51(1): 1-123

¹⁷ Church, J. E. and Obura, D. O., 2004: Management recommendations for the Kiunga Marine National Reserve, based on coral reef and fisheries catch surveys, 1998–2003. CORDIO/WWF KMNR, Lamu, Kenya, 1-57.

¹⁸ Obura, David O. 2001: Kenya, Marine Pollution Bulletin, 42 (12): 1264-1278, ISSN 0025-326X, Retrieved from: http://dx.doi.org/10.1016/S0025-326X(01)00241-7.

change direction by 180° clockwise and emerges as a northward extension of East African Coastal Current during the Southeast Monsoon Winds, Southwest Monsoon winds or the Summer Monsoon Winds¹⁹, ²⁰.

5.1.2. Noise Environment

Extreme noise often results in sleep disturbance, annoyance, hearing disabilities and deafness.

The proposed gas drilling activities may enhance the noise levels in that area. Ambient noise level samples were collected from strategic points in Pate Island, to assess the existing noise levels in the island.

There are no industrial activities in Pate Island. The main activities are agricultural activities (livestock and crop farming), fishing, mangrove cuttings, small housing constructions. The potential noise sources in the island are from the vehicle, motorbike (boda boda), speed boats movement; and places of worship

EMCA Noise and excessive vibration pollution regulation 2009 has provided recommended ambient noise levels for different land uses as represented in Table 5.5below.

Table 5.5: EMCA Noise Regulation, 2009 levels²¹

		Maximum allowable noise in decibels				
		NEMA				
		Day time	Night time			
Rece	entor					
Α	Silent Zone	40	35			
В	Places of worship	40	35			
С	Residential: Indoor Outdoor	45	35			
		50	35			
D	Mixed residential (with some commercial and	55	35			
	places of entertainment)					
E	Commercial	60	35			

ESF consultants recorded ambient noise levels using the sound Level Meter, VA8080. Samples were collected at strategic points such as schools, Baraza (public community meeting) meeting points, public social halls in the study areas, among others as represented **Table 5.6** below. The noise level was measured at each location during daytime. It was noted that the noise levels, which were measured during the day, were mostly within the NEMA recommended standards

Table 5.6: Recorded Ambient Noise Levels from Pate Island

_

¹⁹ Spencer, T., Laughton, A. S. and Flemming, N. C., 2005: Variability, interaction and change in the atmosphere ocean ecology system of the western Indian ocean. Philosophical Transactions of the Royal Society, 363(1826): 3-13

²⁰ Gert, J. T., 1989: A numerical study of the seasonal variability of the Somali current. PhD Thesis; Department of Geophysical Fluid Dynamics, The Florida State University. 1-141.

²¹ EMCA Noise regulation, 2009

No.	Sampling location	Noise range in dBA (Day Time)
	Faza Location (Social Hall)	50.6
	Kizingitini Location (Social Hall)	57.2
	Mbwajumwali Location (Baraza Meeting point)	50.35
	Siyu Location (Primary School next to Siyu Port)	46
	Siyu residential village	57.4
	Shell drilling site	54.3
	Tchundwa Location (Tchundwa Primary school)	49.6
	Pate Location (Social Hall)	46.3
	Mtangawanda location (Baraza Meeting Point)	44.5

5.1.3. Geomorphology

To appreciate the geology of the Lamu Basin, a distinction has to be made between the near-surface geology and the thick sedimentary deposits and evaporates laid down in the long geological history of the area.

The geological map of Kenya shows this area as covered by Quaternary sediments, with inliers of Tertiary sediments appearing further inland near Galole. It thus simplifies the geology to the extent that a lot of the surface detail is lost, in terms of the characters of these sediments. On the other hand, geological data acquired through oil exploration activities provide a lot of information on deep-seated geological units.

Oil Block L4 lies in the Lamu Embayment geological feature which developed during the Carboniferous-Permian era during the onset of continental fragmentation. Lamu Embayment represents a failed arm of Palezoic tri-radial rift system which extends to Malawi and Mozambique. Block L4 falls within the Pate syncline separating Garissa High (Northwest-southeast striking structural basement in the northern part of the basin) and Walu-Kipini High (north-south trending basement uplift in the southern part of the basin separating Pate and Tana syclines).

Oil Block L13 also lies in the Lamu Embayment but is comprised of the mainland; coastal; and marine environments constituting the Indian Ocean. The mainland is generally flat with elevations ranging between 16 and 63 meters above sea level. This elevation gradually decreases as you move towards the Indian Ocean. The coastline entails wide beaches sloping gently towards the ocean, and arrays of dune ridges caused by wind deposition. Marine environment with elevations of 0 to <5 meters above sea level is generally composed of life and dead corals as well as mangrove swamps.

The geology of Lamu is composed of residual coral limestone and columns of sand, as illustrated in

Figure 5.9 below. In the islands of Manda and Kiwayu there are rock outcrops; whereas Lamu Island and parts of Mkokoni in Kiunga division have sand dunes. Tectonic processes which resulted in opening up of the Indian Ocean, led to formation of sedimentary rocks along the coastline, into the ocean and offshore. Kenyan coast is predominated by low, approximately 4-6-meter-high limestone coral cliffs. Fossil coral reef deposits form the coastal plain, with reef flats or gently sloping beach formations, while beaches sheltered behind fringing reefs typically are backed by one or a series of windblown sand dunes up to 30 meters in height i.e. north of Kipini, Shela, Kiwayu and Mkokoni. River plumes, on the other hand, reduce, and sometimes prevent offshore coral growth, particularly in the south of the seascape from Kipini to Lamu. The reef is continuous from Lamu Island all the way to Ishakani and broken into islands and patch reefs.

Coral reefs have high biodiversity levels comprised of algae, molluscs, sponges, polychaetes, fish, crustaceans and reptiles. Coral reefs are highly sensitive to natural and anthropogenic disturbance due to their lengthy time they take to develop, and also because recovery of any disturbed or degraded coral reef takes a long to recover. Increased sedimentation clogs coral reefs thereby reducing their productivity.

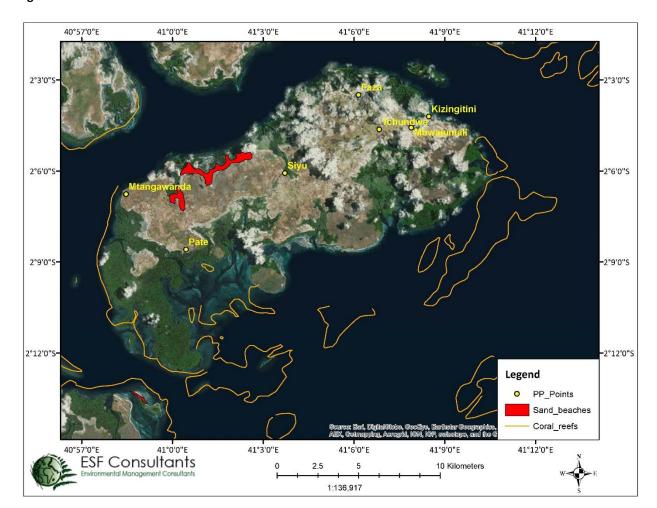


Figure 5.9: Location of Coral Reefs in Pate Island

Source: ESF Consultants

Lamu-Galole area is covered by quaternary aged soils. Apart from Mesozoic and Miocene sedimentary rocks which are predominantly limestone, Block 13 overlays quaternary superficial unconsolidated thick sediments. Quaternary sediments comprising of Kilindini sands are rich in marine sands and clays, raised coastal reefs and windblown sands. Rising a few meters above marine sands and clays, are low ridges of sand usually red in colour in their higher better drained parts. Quaternary sediments are also found in Dodori and Boni, with underlain limestones of Paleocene (Eocene-Oligocene) They are believed to be of Recent Aeolian origin. Recent marine deposits form the present continuation of the Pleistocene sedimentation.

Quaternary Geology

Lamu archipelago is covered by Quaternary deposits which range from estuarine deposits to sands, clays and coral limestone. Seven different types of these Quaternary deposits can be differentiated: -

- i. Sand dunes
- ii. Undifferentiated Quaternary sands

- iii. Near-surface coral limestone
- iv. Beach deposits
- v. Alluvial deposits
- vi. Contemporary estuarine deposits
- vii. Deltaic deposits

Sand dunes

Three different age groups of sand dunes occur in the area. Firstly, there is the Mundane Range type composed of Pleistocene sands. These are often reddish in colour due to staining by ferrous oxides. Secondly, there are the near coastal sand dunes which occur predominantly south of Lamu Island. These are composed mainly of yellow and off-white sands and are of Holocene age. Finally, the recent sand dunes that fringe the coastline on Lamu Island and Kiongwe area on the mainland.

Undifferentiated Quaternary sands

Quaternary sands cover a large portion of the area. These are mostly Pleistocene sands overlying Pliocene sands. The Pleistocene sands are grey or yellow in colour and have been referred to as the Kilindini Sands in comparative relationship with Mombasa area geology. They are variable in thickness and have inclusions of clay material and coral limestone in places.

Near-surface coral limestone

Surface outcrops of this coral reef are uncommon, being overlain by Quaternary sands, sand dunes or beach deposits throughout much of the area. They have a maximum thickness of about 100 metres, but are generally between 30 and 50 metres thick. The reef is not coral in the real sense; instead, it contains large proportions of coral breccia, calcite and quartz grains.

Beach deposits

These are essentially paleo-features overlying either Quaternary sands or corals. They have variable composition ranging from clays and sands to coral breccia. Both consolidated and unconsolidated forms of these deposits occur. They vary in depth up to 10 meters, and areas where they occur are characterized by low ridges.

Alluvial deposits

These deposits consist of fine grained materials, generally clay. Sand deposits also occur. Alluvial deposits are found in the non-estuarine areas of the Duldul and Dodori rivers.

Contemporary estuarine deposits

These are sand deposits with clay lenses and are very similar in composition to the Quaternary sands. Areas where these deposits occur are characterized by mangrove swamps.

5.1.4. Soils

Pate Island was formed as a result of fossilized coral reefs. Overall, the island has poor soils with relatively flat surface covered in white sand. These soils are of sedimentary parent material. The sand often forms dunes which can reach up to about 33 ft. in height.

The soils are broadly divided into three types:

- Soils of the coastal plain developed on lagoonal deposits (Kilindini sands) consists of excessively
 drained to imperfectly drained, brown to very dark grey, loamy sand to sand in the top soil and
 sandy clay loam to sandy clay in the subsoil. The soils become coarser textured as you move
 northwards from the sea²².
- Soils of the bottomlands and swamps developed on infill from lagoonal deposits (Kilindini sands)

 They are light brownish grey to very dark brown sand in the top soil and sandy clay loam to sandy clay in the subsoil. Some parts of these areas are seasonally waterlogged after rains whereas others are permanently water logged, although the amount of water decreases during the dry season. Areas with permanent waterlogging have organic matter accumulated in the top soil.²²
- Soils of the dunes and beach ridges developed on dune sands of Aeolian origin Consists of excessively drained to well drained, dark red to yellowish brown, sandy to sandy clay loams. The colour and texture of these soils vary with topographic conditions. Higher areas have well drained, dark red sandy clay loams while relatively lower areas are excessively drained, yellowish brown sands to loamy sands²².

The entire Lamu County is covered with quaternary deposits ranging from estuarine deposits to sand, clay and coral limestone. These deposits have been categorized into eight different types including²³:

- (i) Barrier Island complex Are formed due to deposition of erosional material from coral reefs. They consist of modern time beach deposits.
- (ii) Undifferentiated quaternary sands They cover large portions of Lamu County. They are mostly Pleistocene sands, grey or yellow in colour, also known as Kilindini sands. They vary in thickness and have inclusions of clay material and coral limestone Pliocene sands are similar to Pleistocene type.
- (iii) Near surface coral limestone Surface outcrops of coral reefs are uncommon, and are overlain by quaternary sands, sand dunes or beach deposits. They have a maximum thickness of about 100 meters, but are generally between 30 and 50 meters thick. The reef is not coral in the real form, it contains large proportions of coral breccia, calcite and quartz grains.
- (iv) Beach deposits They are essentially paleo-features overlying either quaternary sands or corals. They have variable composition ranging from clays and sand to coral breccia. Both consolidated and unconsolidated forms of beach deposits occur. They vary in depth up to 10 meters, and a characteristic of low ridges.
- (v) Deltaic deposits They are contemporary deposits predominantly clay in texture.
- (vi) Offshore corals Are contemporary coral reefs growing laterally without any vertical growth. They are due to no changes in the sea level.

93 | Page

 ²² Kenya Soil Survey, 1985, An Assessment of the Soil Conditions in the proposed extension of Lake Kenyatta settlement scheme (Lamu and Tana River Districts). Site evaluation report No. P62, June, 1985
 ²³ Lamu District Environmental Assessment Report, 1985. National Environment Secretariat, Ministry of Environment and Natural Resources. Nairobi.

- (vii) Alluvial deposits Consists of fine grained material, generally clay. Alluvial deposits are found in non-estuarine areas of the Duldul and Dodori Rivers.
- (viii) Contemporary estuarine deposits They are deposits of clay lenses and very similar in composition to quaternary deposits. These deposits are characterized by mangrove swamps.

Soils are also influenced by the landform topography in which they are developed, hence their distribution provides clues for groundwater occurrence and its quality. For example, in Figure 5.10(below) the bottomlands soils are mainly black cotton clay soils and the coastal beach ridges represent denuded sand dunes and sandy soils on former beach platforms.

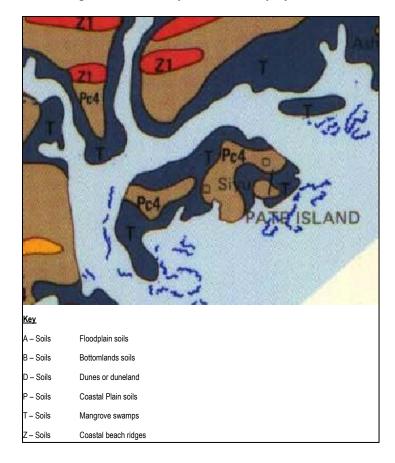


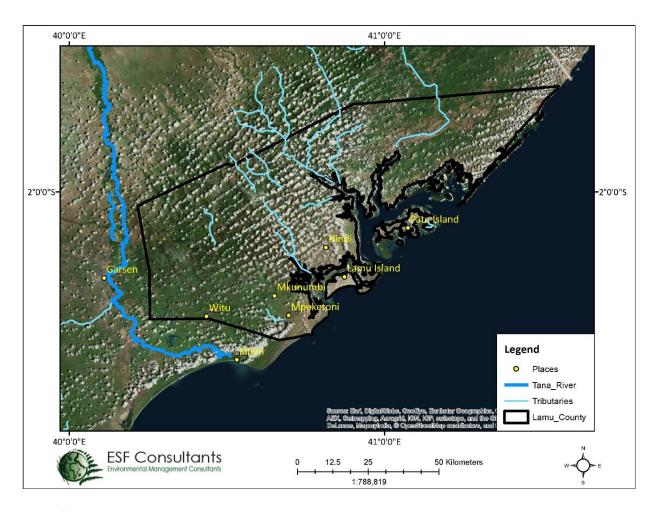
Figure 5.10: Soil map extract of the project area

5.1.5. Hydrology

Hydrology in Lamu County

Water in Lamu County is very scarce, because there are no permanent rivers. Instead there are a number of drainage ways forming seasonal rivers, as illustrated in Figure 5.11 below. There are seasonal rivers in the Lamu County which include: Dodori, Arosen, Duldul, Mkondo wa Bargoni, Mkondo wa Kareni, Kitoko and Mkondo wa Mkuyuni near witu. Other important inland waters are Dodori creek, Mto wange creek, Ndau Bay, Mto wa Hidio, Mto wa Kipungani and Mto wa Mkunumbi. Kibokoni Lakes flow from northwest to the southeast, none reaching the Indian Ocean.

Figure 5.11: Rivers in Lamu



Most of these lakes are however quite small and shallow and are typical ox-bow lakes such as Lake Boa, Kenyatta and Dide Waride which are remnants of various meanders of the Tana River. Some of the lakes especially the smaller ones, have marsh characteristics, and are recharged by rain water and its reliability depends on the reliability of rainfall. The Tana River itself meets the Indian Ocean in an open estuarine delta.

Lagoons are found in Kiunga, Mikokoni and Kiwayu areas. A lagoon is a stretch of sea water partly separated from the sea by low, narrow, elongated strips of land, reef crests or sand bars²⁴. Lagoons separate beaches and cliffs from fringing coral reefs. The depths of lagoons vary from a few centimeters to over 10 meters depending on the shore topography and presence of tidal channels. Lagoons are formed when fringing reefs are separated from the ocean by the reef flats and reef crests. Seagrass beds are commonly found in coastal lagoons with sandy bottoms, while coral heads and micro-atolls may be well developed on more consolidated substrates. Coastal lagoons are important source of food as they are

accessible when fishing on the outer reef is prevented by rough water²⁴. They are also a valued tourist attraction and offer a range of natural services such as storm protection and fisheries protection.

The hydrogeology of Lamu Basin has been studied by various researchers, work which led to the development of the Lamu Water Supply wells, the Chomo wells, the Hindi-Magogoni wells and the Lake Kenyatta (Lake Mukunganya) wells. Pate Island within the basin has however been less researched and still remains undersupplied with fresh water. The hydrogeological concepts of groundwater occurrence developed through these studies include:

- i. Sand dune aquifers on Recent dunes, e.g at Shela and Makafuni on Lamu Island and Kiongwe on the mainland;
- ii. Karst aquifers developed in fossilised coral limestone on the mainland through percolation into sink-hole type depressions, e.g., at Belebele and Chomo.

In 1991, the IFAD-ASAL groundwater survey program placed the thickness of the freshwater lens below the Belebele aquifer at a maximum of 15 - 20m, similarly in and around Lake Kenyatta.

Conceptual model for groundwater occurrence

Most of the groundwater resources in the larger Lamu County are generally saline and therefore not suitable for human and animal consumption, except for dune and coral reef formations.

Previous researches note that groundwater recharge occurs seasonally assisted by a high recharge: rainfall ratio of 13.5% (by one estimate, COWI 1984) and the high porosity of the coral limestone and the fine dune sands.

Dune ridges are a characteristic feature of the East African coastline and in effect each transgression or regression episode resulted to corresponding ridges. Three generations of dune ridges can be found in the Lamu Basin – Tana Delta area, the oldest probably being of Late Pleistocene age, the younger closer to the sea is Holocene (Ase, 1978, in Abuodha 2003). Figure 5 presents the approximate alignments of the three dune ridges, as interpreted from the soil map.

The youngest dunes are the active present day ridges that dot the coastline, e.g., Shela on Lamu Island and Kiongwe on the mainland. On Pate the dune sands are rare and are found in a few places south of Siyu, at Kizingitini, Mbajumwali and Nyambogi. Even then the dunes here have a very low elevation compared to the Shela dunes. While the Shela dunes reach a height of 35m amsl, Pate Island maximum elevation is just about 12m amsl. This means the freshwater lens is very thin on Pate which correspondingly has lower groundwater potential.

Groundwater recharge to the freshwater aquifer lens is assumed to occur in areas with elevation of 5 meters or higher. From DEM model this area is little more than 20 square kilometers. Where precipitation falls on lower ground the recharge is expected to get contaminated with saltwater hence does not count much for freshwater availability on the island.

²⁴ Richmond, M. D. (ed.), 2002. A Field Guide to the Seashores of Eastern Africa and Western Indian Ocean Islands. Sida/SAREC-UDSM.461 pp. ISBN 91-6586-8783-1.

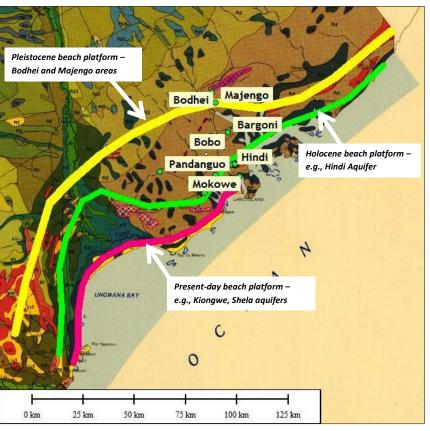


Figure 5.12. Approximate alignment of the three beach ridges in the Lamu – Tana Delta area

Using the COWI estimate of 13.5% rainfall depth for recharge, the average 850mm annual precipitation will yield a recharge of 2,295,000L (2.295 MCM/ per year) for the island. Sand has specific yield as high as 30%, hence this recharge may yield up to 700,000 m³/ year (1,900 m³/day).

Water quality

The Island's population largely depends on groundwater and surface water trapped in underground tanks and shallow wells. Because the highest elevation is approximately only 13 meters above sea level, with most areas being less than 10 meters above mean sea level, the fresh water layer beneath the island is very thin. Furthermore, because of this low elevation the quality of groundwater is expected to vary widely with seasons and daily with the tidal movement.

Water quality distribution on the island broadly follows the pattern shown in Figure 13. It shows that Faza in the northwest and some areas south of Pate have the better groundwater quality that is less mineralized. The distribution is based on the wellhead chemistry (TDS) collected on site during the survey. The distribution is on a coarse scale since there is a wide scatter of the data points, hence it should only be used indicatively.

In terms of water pollution indicators of interest, volatile organic compounds are one of the most common groups of anthropogenic water pollutants. As they are not naturally occurring, the presence of them in

surface waters is a measure of their anthropogenic use. They enter the sea and rivers via discharges of municipal and industrial sewage.

Five samples were collected from settlements across the islands and tested for volatile organic compounds. The results are presented in Figure 5.13.

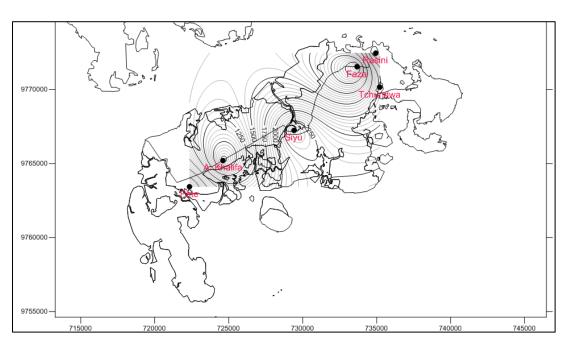


Figure 5.13. Total dissolved solids (TDS) distribution on the island

Table 5.7. Volatile hydrocarbon compounds analysis results

Analyte	Faza	Rasini	Pate	Siyu	Tchundwa	Abubakar Khalifa	Unit
TDS	500	>2000	>2000	>2000	1800	658	mg/l
рН	4.01	4.7	3.35	3.1	3.1	4.5	
Т	29.1	27.9	30.1	31.1	30.1	30.7	С
n-Decane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/l
n-Docodane	<0.01	<0.01	<0.01	0.06	<0.01	<0.01	mg/l
n-Dodecane	<0.01	0.08	<0.01	<0.01	<0.01	<0.01	mg/l
n-Dotetracontane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/l
n-Dotriacontane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/l
n-Eicosane	<0.01	<0.01	<0.01	0.06	<0.01	<0.01	mg/l
n-Hexacosane	<0.01	<0.01	<0.01	<0.01	0.07	0.11	
n-Hexadecane	<0.01	<0.01	0.07	0.08	<0.01	<0.01	mg/l
n-Hexane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/l

Analyte	Faza	Rasini	Pate	Siyu	Tchundwa	Abubakar Khalifa	Unit
n-Hexatriacontane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/l
n-Octacosane	<0.01	0.14	<0.01	<0.01	<0.01	<0.01	mg/l
n-Octadecane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/l
n-Octane	<0.01	<0.01	<0.01	<0.01	0.06	<0.01	mg/l
n-Octatriacontane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/l
n-Tetracontane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/l
n-Tetracosane	0.02	<0.01	0.02	<0.01	<0.01	<0.01	mg/l
n-Tetradecane	0.21	0.11	<0.01	0.03	0.11	<0.01	mg/l
n-Tetratetracontane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/l
n-Tetratriacontane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/l
n-Triacontane	0.05	<0.01	<0.01	0.05	<0.01	<0.01	mg/l

The data shows that the volatile hydrocarbons are largely undetectable in water sources of Pate Island. Nonetheless, each of the sampled wells has at least one organic compound available in detectable limits. It is likely that these come from household sources and the open dumpsites.

The Pate well sampled returned Total Dissolved Solids in the field being over 2000 mg/litre. This is not a measure of chlorides; however, it shows a high concentrate of salts and salinity.

Similarly, total petroleum hydrocarbons (TPH) are undetectable (Table 2) which means there are no current cases of oil pollution in the environment.

Table 5.8. Total hydrocarbon analysis results

Analyte	Faza	Rasini	Pate	Siyu	Tchundwa	Abubakar Khalifa	Units
TPH (>C34)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/l
TPH (>C10 - C16)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/l
TPH (>C16 - C34)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/l
TPH (>C28 - C44)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/l
TPH (>C5 - C12)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/l
TPH (>C6 - C10)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/l
TPH C12 - C28	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/l
TPH C30 - C34	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/l
TPH C5 - C10	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/l
TPH C6 - C44	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/l

With regards to toxic substances – metals in particular, the following were tested for:

- Arsenic
- Cadmium
- Chromium
- Copper
- Lead
- Mercury
- Nickel
- Silver
- · Vanadium, and
- Zinc

All six samples selected from across the island tested very low values below activation limits for all the metal. Boron was also tested for and was found at concentration above activation level in all sites except Faza. It is a naturally occurring element in groundwater hence the levels seen could be as a result of geology.

Sources of water source contamination

As an indication of the contamination of wells on Pate Island, a study that was done in Lamu gives insight (Giorgio, 2005). The concentration of nitrate measured varied from 5 mg/l to a maximum of 106 mg/l. For 145 wells tested in Stone town, only 19 showed levels of nitrate (NO₃-) above 50 mg/l, which is the recommended guideline maximum value for by WHO drinking water standards. The spatial distribution of the data showed that the high concentrations of nitrate were found in wells equipped with motorized pumps, suggesting increased seepage from pit latrines due to the drawdown effect where latrines fall within the area of well influence (AWI).

In public wells water is fetched with buckets. Contamination is visible, with empty plastic bottles, plastic bags and "makuti" thatches floating on the surface of the water. It was observed that some of the wells in the villages are close to dwellings hence they are prone to pollution from household waste. The biggest problem expected is nitrate pollution, which is also observed on Lamu Island.

With very low altitude on the island, the water table is high and there is the real risk of cesspits and latrine leachate to mix with groundwater. The second and related problem is that of solid waste disposal. There is no sanitary way yet on the island to dispose of solid waste, hence leachate from open dumpsites is a quick way for contaminants to pollute shallow groundwater.



Figure 5.14. Open dumping of domestic solid waste

Recommendations from hydrogeological survey

The hydrogeological impact assessment study has established that the proposed project will have the challenge of accessing suitable water supply for their operations, based on the assessed available quantities and quality of water supply. Nonetheless, there are options for accessing water through construction of wells on the mainland, as has been done for the Faza Water Project, installation of a desalination plant or locating suitable relatively fresh aquifers in select areas on Pata and Siyu.

The proponent of the proposed project is committed to putting in place several measures to manage the effects of drilling on the water resources. These include transportation of the drill cuttings for safe disposal, using freshwater for drilling operations instead of seawater.

The client has the option of sourcing water from the mainland and transported by barge to the drilling site or drill water wells in the area on aquifer as the Vumbe wells. The Vumbe wells are about 7.5 kilometres from the Faza landing beach. Once the project comes to an end, these wells should be handed over to the county government to be part of the Faza Water Scheme. The same wells will also come in handy if the need to drill on the mainland becomes imperative.

Overall, it is established that the water sources have no toxic compounds or elements and there is no evidence of hydrocarbon contamination

5.1.6. Flora and Fauna

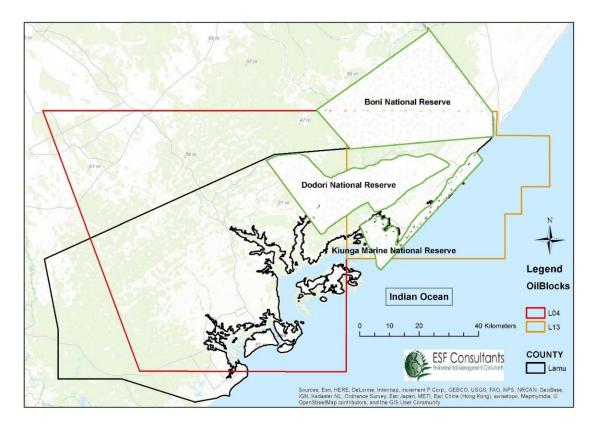
Protected areas

Lamu County has three protected national reserves as shown in Figure 5.15 below, which are:

1. Boni National Reserve

- 2. Dodori Forest
- 3. Kiunga Marine National Reserve

Figure 5.15: Map of National reserves in the project Area



Source: ESF Consultants

Boni National Reserve was gazetted in 1976 as a dry season sanctuary for elephants from Garissa and Lamu Counties. Located in Garissa County and parts of Lamu Count, the general area of the forest lies between 40°83′ E and 41°66′ E and 1°76′ S and 1°25′ S and covers an area of 133 km². As an indigenous open canopy forest that boarders the North coast county of Lamu, Boni Forest is the home of Northern Zanzibar-Inhambane coastal forest mosaic that forms a quasi-continuous belt separating forests of the coastal region from the bushlands on the interior lands. Boni forest represents one of the most varied ecosystems and provides a refuge for endangered mammals like elephants, Hirola, and wild dogs as well as a number of rare species.

Gazetted in 1976, Dodori forest lies between 1° 50′ S, 41° 8′ E in Lamu County and covers an area of 877 KM². The forest forms the northern most extent of the one-time continuous stretch of the East African Coastal forests biome that today remain as fragments of varying sizes and structure and they are one of the Earth's 25 biologically richest places. The forest represents one of the most varied ecosystem and provide a refuge for endangered mammals like the elephant, Hirola and the wild dog, rare species found nowhere else in the world and hundreds of flora and fauna that are still yet to be described. This indigenous open canopy forests of the Northern Zanzibar-Inhambane coastal forest mosaic. Zanzibar-

Inhambane scrub forest forms a quasi-continuous belt that separates the forests of the coastal region from the bush-lands of the interior. Dodori reserve is named after the river ending in the Indian Ocean at Dodori Creek, a breeding place for dugongs. Dodori River and its delta, has some of the densest, most varied assemblage of mangrove forest species in Kenya

Kiunga Marine National Reserve is located in Lamu County, the northern most stretch of the Kenyan coastline (40°07′E, 2°00′S). It was designated in 1979 under Wildlife conservation and Management Act of 1976, and it is currently, under the management of Kenya Wildlife Service (KWS). The reserve covers an area of 250 Km² (25,000 hectares) in the Northern part of Lamu Archipelago. It's over 50 Km in length and 5 Km in width. The reserve extends to the shoreline to a discontinuous outer rocky reef which is as shallow as 8 meters in some places, and has its southern end within the reserve. The bottom reaches a maximum depth of 40 meters mostly in sandy area between shoreline and the rocky reef. Beyond the rocky reef, the continental shelf slopes into deeper waters.²⁵

Kiunga Marine National Reserve and Dodori National Reserve were granted "Man and Biosphere Reserve" status by UNESCO due to their biological sensitivity and dependence by the local community's for natural resources. 26,27

- Strengthening of management operations of Kiunga Marine National Reserve
- Collection, analysis and use of ecological and socio-economic information for management Improvement community and stakeholder understanding of and support for conservation needs Promotion of sustainable use of Kiunga Marine National Reserve's resources to improve their livelihoods.

Vegetation in Lamu

Due to varying soil types, the vegetation keeps changing. Silt and sand support scrub bushes, scatter palms and indigenous trees and scrubs. Grassy open swampy places dominate some parts that have drainage problems due to low altitude in the region. The coastline has sandy beaches, some with mangrove swamp and great variations of marine flora including bivalves, nails and other benthic invertebrates. Microscopic marine plants are absent from the upper part of the inter-tidal zone except for areas with *Bostrychia species*.

Inter-tidal sand and mud have finer sediments below water, which are subject to less wave action, and have become fixed by growth of green algae and *Zostera species*. Dwarf shallow-like shrub thickets of halophytes typical for this region littoral zone are common on the mainland, and species include *ipomea species*, *perus species*, *suaeda species* and *Tephnosia species*. The largest Mangrove forests strands in

²⁵ Weru S. M, Lubia I, Nikes N, Church J, Verheij E, Koyo A. O, Muthiga N, Kavu B. K, Kareko J. K, and Litoro K., 2001: Management plan: kiunga marine national reserve (Hof. T. Ed), Kenya Wildlife Service and World Wide Fund for Nature, Coast Region Headquarters, Mombasa.

²⁶ UNEP, 1998: Eastern Africa Atlas of coastal resources: UNEP Regional Reports and Studies, No. 1 Nairobi, Kenya

²⁷ Tychsen, J. 2006 (ed.): KenSea. Environmental Sensitivity Atlas for Coastal Area of Kenya, 76 pp. Copenhagen; Geological Survey of Denmark and Greenland (GEUS); ISBN 87-7871- 191-6

Kenya are found in Lamu (30,000 hactares from Lamu to Kiunga. Here, there are protective islands, gentle relief and slightly estuarine conditions predominated by sheltered waves.

In Block L4, wooden bushlands are a common terrestrial feature confined to the stabilized sand dunes, beach ridges, low and high level coastal plains and bottomland plains. Wooden bushland dominates the expansive black clay soils and include *Acacia tortilis, Acacia zanzibarica, Commiphora sp, Euphobia spp, Acacia melifera, Trichilla emetic* and *Teminalia spp*.

At Pate Island, Riverine forest occur and they are predominantly composed of woody vegetation found along waterways including *Acacia spp, Afzelia quanzensis, Indigofera Spinosa, Dalbergia melanoxylona* and *Termimalia spp* which dominate riverines of Dodori and Lugga Milimani.

Perhaps the most important type of natural vegetation in Lamu County is the mangrove forests and thickets. This type of vegetation is found in swamps and their adjacent saline areas. The mangrove forests extend from Hongwe in the south to a few kilometres south of Kiunga. Pate Island lies within Kenya's largest mangrove forest archipelago and the island is surrounded by mangroves. This system confers high productivity to the surrounding fisheries and also provides valuable mangrove products for local communities.

Mangroves are of two types: Creek mangrove (occurs in low gradient shores, creeks and bay); and Fringe mangrove (occurs solitarily or in cluster along high energy shores, in front of rocky and cliffs). Creek mangrove is the most common mangrove formation in the project area, and indeed the largest mangrove cover (304.75 km²) found in Lamu archipelago²⁸. Areas with large extents of creek mangroves include Kiwayu, Kiunga, Kizingitini, Ndau and Mikokoni.

Mangroves are inter-tidal as they occur naturally between the mean of low water neap and extreme high water spring²⁸. They grow along sheltered sedimentary shores, especially in bays and estuaries²⁴. Mangrove species in the project area include: *Rhizophora mucronata, Brugueria gymnorhiza, Ceriops tagal, Sonneratia alba, Avicenia marina, Lumnitzera racemose* and *Xylocarpus granatum*.

A salt marsh is dominated by halophytic (salt tolerant) herbaceous plants as they thrive in intertidal transition between land and saline water. Flora composition is therefore low as the vegetation must be salt tolerant, complete or partial submersion, and anoxic mud substrate. Common salt marsh vegetation includes glassworts (*Salicomia spp. And Sarcocomia spp.*), the cord grasses (*Spartina spp*) and several grasses and sedges. Salt marshes are found on the landward margins of Kiunga and Mikokoni areas.

5.1.7. Flora of Pate Island

During the baseline survey the ESF Consultants where able to spot different tree species within the island.

Mango (Mangifera indica)

_

²⁸ Ruwa, R. K., 1992. Mangrove wetlands in Kenya. *In. Crafter S.A; Njuguna S.G; and Howard G.W (Eds), 1992.* Wetlands of Kenya. Proceeding of the KWWG Seminar on Wetlands of Kenya, National Museums of Kenya, Nairobi, Kenya 3-5 July 1991. Vii+183 pp.

The mango trees were spotted mainly in areas of Pate and Siyu location. Mango trees are planted for their fruit, shade due to the large crown, charcoal, fuelwood, timber, herbal medicine, and fodder for livestock.

Mangroves Forest

Mangroves are among the most productive ecosystem. They provide a broad array of goods and services to the local community. They play an important role in on and offshore fishery, providing juvenile fish with nursery habitats and shelter. They are also a source of timber and fuel wood for the adjacent villages. They are rich in biodiversity, they can store and sequester significant amount of carbon, protect the shoreline from soil erosion.

Figure 5.16: Mangroves ecosystem as viewed from Pate social hall



Neem tree (Azadirachta indica)

The tree is drought resistant and does well in poor soils. Its highly used as medicinal from the bark and leaves. It also provides timber and fuel wood for the local community, as the shown in the

Figure 5.17

Figure 5.17: Neem tree (Azadirachta indica) spotted in areas of Mbwajumwali Location



Tamarind (Mkwaju) (Tamarindus indica L)

Is large evergreen tree, with dense crown, greyish-brown leaves alternative, compound with 10-18 pairs of opposite leaflets, the tree can tolerate a wide range of soils and climatic conditions.

Banana plantation

Pate location is one of villages they practice crop faming as shown in the

Figure 5.18. The island has good soils favourable for growing crops especially bananas. They are grown for subsistence and the excess products are sold in the local markets. The bananas grown in Pate Island are rain fed.

Figure 5.18: Banana Plantation spotted at Pate location





Coconut tree (Cocos nucifera)

The coconut tree (*Cocos nucifera*) is a tropical plant from the palm family. Uses of coconut tree are as follows:

- a) used locally for its refreshing drink called "madafu" and white gelatinous flesh
- b) Tree leaves used: for thatching houses, making brooms
- c) Husks used to make rope
- d) Flowers used for its medicinal value
- e) Coconut oil: used for cooking; making skins and hair products

The Cocos nucifera is shown in

Figure 5.19 common found in areas of Faza, Tchundwa, Siyu and Mbwajumwali

Figure 5.19: Coconut trees spotted in Faza location





5.1.8. Fauna spotted in Pate Island

During the field visit the team was able see different species of animals especially livestock kept in the island such as cattle, donkey, cats, dogs and chicken. Keeping of livestock is done mostly by the Somali and Orma pastoralists who migrate frequently depending on the severity of drought in Lamu, Tana River and Garissa Counties. The common types of cattle found are the Boran, Semi-zebu shown in Figure 5.20. Donkeys are kept mainly for use of transport within the Island.





5.2. **Socio Economic Baseline**

The socio-economic baseline will look into the following parameter but not limited to:

- a) Demography characteristics such as population structures and trends, in and around the area of interest
- b) Both direct and indirect economic baseline such as employment, labour supply and demand, among others
- c) Supply and demand of local services such as health, education, housing, transportation, among others
- d) Socio-cultural aspects such as quality of life, social problems, among others

In the development of the socio-economic section of the baseline, the following methodologies were used:

Figure 5.22: Socio-economic Methodology



5.2.1. Administrative Units

Lamu has two sub counties namely Lamu East and Lamu West. In the political mapping the county has two constituencies namely Lamu East composed of Basuba, Faza, and Kiunga wards and Lamu West composed of Bahari, Hindi, Hongwe, Mkomani, Mkunumbi, Shella, and Witu wards. This has been represented in

Figure 5.23 below. The county has 23 locations and 38 sub locations.

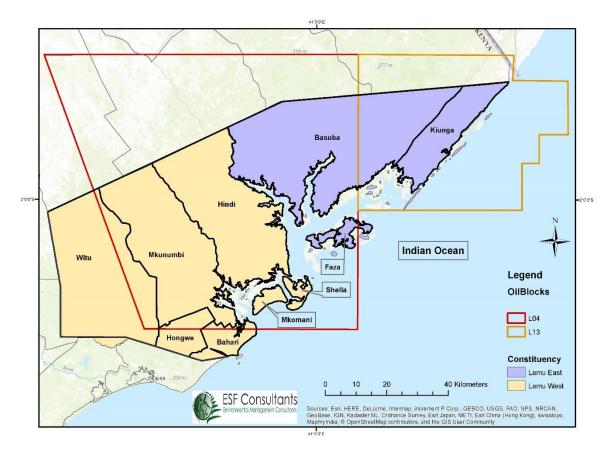


Figure 5.23: Wards Located in Lamu County

Source: ESF Consultants

Below is the ministry structure of Lamu County.

- 1. Ministry of Land, Planning, Development & Natural Resources
- 2. Ministry of Trade and Culture
- 3. Ministry of Fisheries & Livestock
- 4. Ministry of Information, e-Governance and Citizen Participation
- 5. Ministry of Education, Gender, Youth Affairs, Sports & Social Services
- 6. Ministry of Finance, Strategy & Economic Planning
- 7. Ministry of Agriculture
- 8. Ministry of Health Services, Sanitation and Environment

5.2.2. History and Culture

History of Pate Island

The history of Pate begins with the foundation of the kingdom in 1204, when a member of the Nabahani royal house of Oman married the daughter and heiress of the previous dynasty of Pate, the al-Batawoya. The Nabahani established a ruling dynasty for six centuries to about 1812 under 34 kings. The ruling was monarchical²⁹.

According to Mr. Khalifa Bwanamaka, caretaker of Pate ruins, in 14th century, Pate town was the most powerful in the East African Coast as it had conquered all of Lamu Archipelago and had spread its rule as far North as Somali and South to Sofala, (Tanzania and Mozambique border). At this time Mvita was the name of Pate and Mogadishu (which was named by the Europeans) was earlier known as "Mui wa mwisho" which meant the last town. Both towns were under the rule of Nabahani Family. Portuguese later arrived and wanted to dominate as fights ensued.

By mid-16th century the influence by the Portuguese brought about a chapel, prison, custom house (ushuru), grave yards and plantations of cassava, bananas and tobacco started. The plantations before they arrived were cashew nuts, coconuts and mangrove. By the end of 16th century the Portuguese rule was starting to diminish and the Arabs started to flourish as trade was doing well. Wars between Pate and Lamu followed.

There were four wars in total, Pate won the first three but lost the last one which was in Shela. The weapons that were being used included swords, guns and cannons. The battle of Shela was in 1812. After the battle, the royal family and many of the people of Pate moved to Witu and because of the deaths and migration, the population decreased from 48,000 to 7,000 people. About 1892, there was a disaster of cholera and diarrhoea outbreak. There was a further decrease of population from about 7,000 to 3,000 people.

Pate is today a small fishing village but extensive ruins of the former town still exist, and include several mosques, a palace and large surrounding defensive walls³⁰. According to traditional sources the first settlement was made during the 7th Century, by Syrian Arab traders who settled down and intermarried with the local people. Clearly Pate is one of the most important sites of East Africa.

From the key informant's survey, 69% of the respondents were aware of existing historical/archaeological sites. 23% were not aware of any while 8% didn't know³¹.

According to the household socio-economic survey conducted, the communities identified the important historical/ archaeological sites in Pate Island. Pate ruins were identified as the most known historical site

-

²⁹ Allen J, V. (1993). Swahili Origins; Swahili culture and the Shungwaya Phenomenon. London: James Currey Ltd.

³⁰ Spear, T. (2000). Early Swahili History Reconsidered. Boston: Boston University African Studies Centre.

³¹ ESF Consultants key informants survey data collected from Pate Island

while Makaburini was identified as a burial site within the Island³². This is represented in Figure 5.24 below.

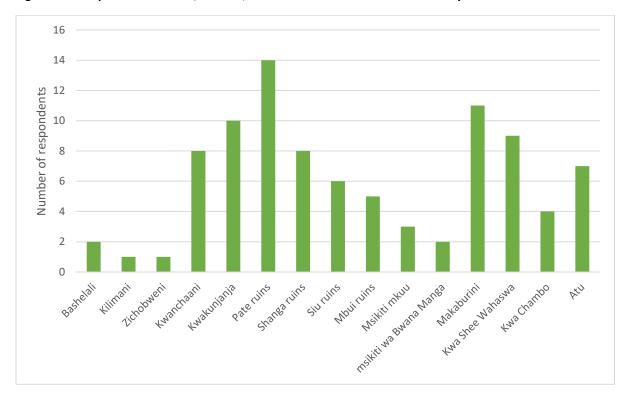


Figure 5.24: Important historical, cultural, and burial sites in Pate as identified by the communities

Cultural Heritage

Lamu Stone Town is recognized as a UNESCO World Heritage Site. Other key monuments and cultural heritage places in Lamu County include

- Boni Dodori National reserve
- Lamu Museum
- Lamu Fort
- Siyu Fort
- Takwa Ruins
- Swahili House
- Kunjanja Mosque
- German Post Office
- Lamu Stone Town
- Kiunga National Reserve

³² ESF Consultants Household Socio-economic data collected from Pate Island

Lamu County is known for its rich Swahili Culture dating back to 14th Century. During these times traders arrived in Lamu and other areas along the East African coastline from different parts of the world including Asia, Arabia, and Europe. Some of the goods and commodities bought by such traders include mangrove poles, animal products, grains, and slaves. In exchanges for these valuable Lamu products, the foreign traders brought in goods like cloths and spices from other parts of the world. As trading continued, some traders settled in Lamu Town and intermarried with the local communities such as the Pokomos and other natives of the area. The resultant blend between the foreigners and the locals led to the formation of the Swahili Culture which is widespread along the Kenya Coast.

Lamu Cultural festival is an annual event dedicated to celebrating and preserving the cultures and heritage of the archipelago. Each year, the event is timed to coincide with the high tides that create ideal conditions for the large Jahazi and Mashua Dhows that engage in the races. Other competitions in this festival include swimming, canoe races, and donkey races. Similarly, the tradition of this festival stipulates that each of the Islands show case their dances. Other activities like henna painting, iron smelting, wood carving, dhow making, mat making, and palm weaving are also show cased in this festival³³.

From the survey, 54% of the respondents from Pate Island were aware of existing cultural sites while 46% were not aware of any³¹. According to the socio-economic survey, customary practices are still practiced in Pate Island. Marriage by Kadhi and circumcision are the most practiced³². These are represented in Figure 5.25 below

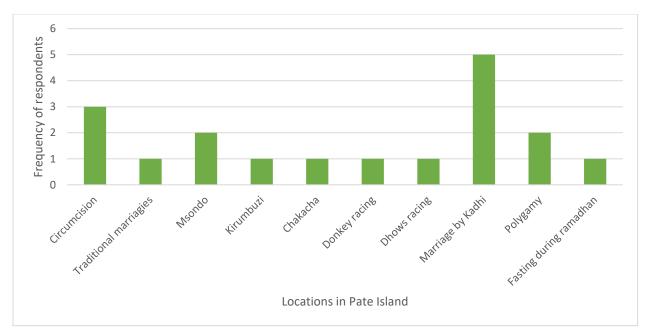


Figure 5.25: Customary practices among communities in Pate Island

Religion

³³ Magical Kenya. n.d. *Lamu: Where history lives.* [Date accessed 5th May 2016] Available from: www.kenyabrussels.com/ckfinder/userfiles/files/.../*Lamu*.pdf

According to archaeological evidence, the earliest mosque to be excavated, dates back to the 8th century was actually in Shanga, which is in Pate Island. Large Percentage of the people in Pate Island are Muslims³⁴.

Islam is the most conspicuous religion in Lamu County with over 68% coverage while Protestant mainstream follow with 13%. Table 5.9 below shows the distribution of religious groups in Lamu County.

Table 5.9: Religious Affiliation in Lamu Couty²⁹

Affiliation	Catholics	Protestant- Mainstream	Protestant- Evangelical	Islam	None
Percentage	11%	13%	8%	68%	0%

From the survey, 69% of the respondents were aware of existing religious sites while 31% were not aware of any³¹. No cultural differences were noted by the people occupying Pate Island. From the household socio-economic survey conducted, there are two main religions in Pate Island i.e. Islam and Christianity³². 97% of the respondents practice Islam as a religion in the project area.

5.2.3. Demography and Social determinants

Population and demography

Lamu County population has registered an upward trend in growth since first censure was held in 1969. Table 5.10 below shows the statistics on the number of persons registered in each of the household census carried out in Kenya. As per the 2012 population projection, it was estimated that Lamu County has a population of 112,551 people out of which 58,641 were males and the rest were females.

Table 5.10: Population Census Results³⁵

	1979	1989	1999	2009
Population	42,299	56,783	72,686	101,539

Based on numerous projects on going in Lamu such as the LAPSSET project and the Lamu Port, the population project continues to increase with migrant population expected to push the county's number to more than one million between by 2020. According to the Lamu County Integrated Development Plan 2014-2019, the following trends shown in Table 5.11 are expected in 2015 and 2017 in terms of population distribution.

³⁴ Maiteri, C. (2012). Form and Symbolism of Swahili Architecture in Pate Island.

³⁵ Kenya National Bureau of Statistics (KNBS). 2009. Economic survey 2009. Nairobi: KNBS. Kiamba, M., 1994. The Dynamics of Urbanization and Urban Development in Kenya.

Table 5.11: Population Projections for Lamu County ³⁷

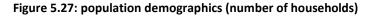
	2009 CENSUS)		2012 (F	2012 (PROJECTIONS)			2015 (PROJECTIONS)			2017 PROJECTIONS		
Age Group	MALE	FEMALE	TOTAL	MALE	FEMALE	TOTAL	MALE	FEMALE	TOTAL	MALE	FEMALE	TOTAL
0-4	8038	7681	15719	8886	8491	17377	9823	9387	19210	10503	10503	21005
5-9	7375	7184	14559	8153	7942	16095	9013	8780	17793	9636	9636	19272
10-14	6148	5904	12052	6797	6527	13323	7514	7215	14729	8033	8033	16066
15-19	5722	5095	10817	6326	5632	11958	6993	6227	13220	7476	7476	14953
20-24	5020	4577	9597	5550	50560	10609	6135	5594	11729	6559	6559	13118
25-29	4155	3905	8060	4595	4317	8910	5078	4772	9850	5429	5429	10858
30-34	3713	3125	6838	4105	3455	7559	4538	3819	8357	4851	4851	9703
35-39	3070	2579	5649	3394	2851	6245	3752	3152	6904	4011	4011	8023
40-44	2363	1918	4281	2612	2120	4733	2888	2344	5232	3088	3088	6175
45-49	1890	1644	3534	2089	1817	3907	2310	2009	4319	2469	2469	4939
50-54	1522	1384	2906	1683	1530	3213	1860	1691	3551	1989	1989	3977
55-59	1113	927	2040	1230	1025	2255	1360	1133	2493	1454	1454	2909
60-64	1051	890	1941	1162	984	2146	1284	1088	2372	1373	1373	2746
65-69	583	468	1051	645	517	1162	712	572	1284	762	762	1524
70-74	533	476	1009	589	526	1115	651	582	1233	696	696	1393
75-79	228	197	425	252	218	470	279	241	519	298	298	596

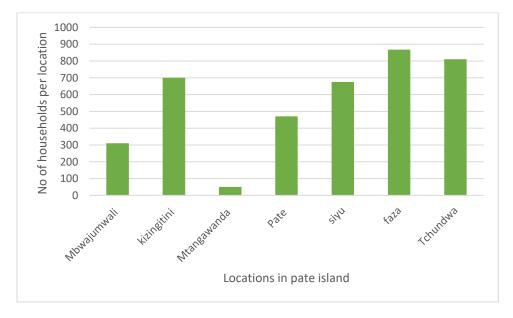
	2009 CENSUS)			2012 (PROJECTIONS)			2015 (PROJECTIONS)			2017 PROJECTIONS		
Age Group	MALE	FEMALE	TOTAL	MALE	FEMALE	TOTAL	MALE	FEMALE	TOTAL	MALE	FEMALE	TOTAL
80+	478	527	1005	528	583	1111	584	644	1228	625	625	1249
85+	43	13	56	48	14	62	53	16	68	56	56	112
TOTAL	53045	48494	101539	58641	53610	112251	64827	59265	124092	71664	65515	137180

Data collected from the key-informants indicated that Kizingitini and Faza had the highest population of people. This is due to the fact that Faza is the administrative headquarters of Pate Island and Kizingitini is the main fishing town in Pate³¹. Figure 5.26and Figure 5.27 below represents number of people per location and number of households per location in Pate Island. According to the socio-economic survey conducted, most households have between 4-9 persons³²



Figure 5.26: Population demographics (number of people) per location in Pate Island





Gender

Out of the 76 participants in the socio-economic survey, 82% were male and 18% female³² Most of the participants were between ages 31-40 years and no minor was interviewed (see Figure 5.28). The survey

targeted household heads and out of the 76 participants, 76% were household heads (see Figure 5.29 below)

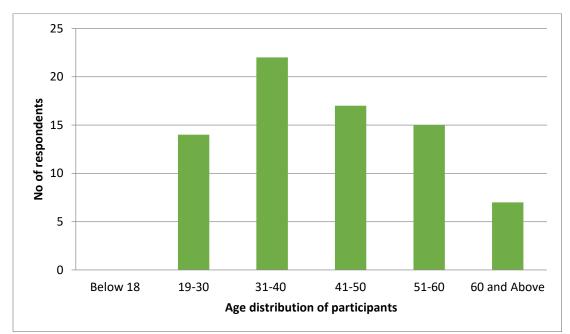
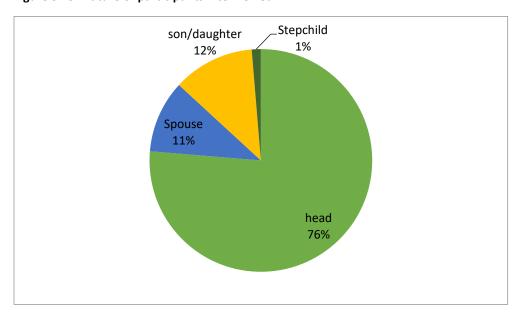


Figure 5.28: Age distribution of the 76 households interviewed

Figure 5.29: Nature of participants interviewed



Ethic Groups and Language

The County is made up of Cosmopolitan population composed of indigenous communities made up of Swahili's, Arabs, Korei, Boni, and Ormas as well as migrant communities from the rest of the country.

According to a survey by Ipsos in 2014, the coast region and Lamu in particular has different numbers of community/ethnic groups. In Lamu County, several communities/ethnic groups exist, including immigrants in both the mainland and Islands (as illustrated in Figure 5.30 below). Kiunga Division is inhabited by the Boni community and Bajunis. The Bonis are preoccupied with traditional bee keeping while the Bajunis are fishermen³⁶. Among the Mijikenda community subtribes only Digo lacks representation in Lamu County³⁷.

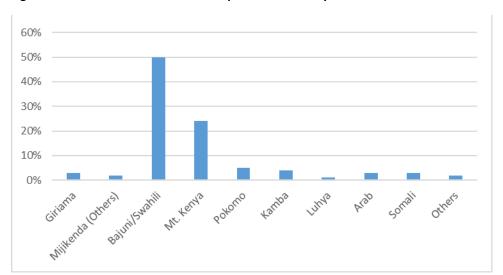


Figure 5.30: Distribution of Ethnic Groups in Lamu County²⁹

According to the key informants survey conducted, Pate Island is predominantly dominated by the Banjunis and just a small percentage of Swahili people. The main language spoken is the banjuni and Swahili language. There are several clans within the locations namely: banjuni, vatandaa, masharifu, lausy, khazrad, Nabahany, Al-kindiey, Bawry, nabahany, Al-mafazii and Wanzalia. The distribution of these clans is represented in

³⁶ Environmental & Social Impact Assessment Project Report for The Proposed Hindi MJ Road – Mokowe Old Jetty – Lamu Island's Mnazi Moja– Manda Island 33kv & 11kv Electrical Transmission Line and Associated Substation in Lamu Island, Lamu County

³⁷ Ipsos Survey, 2014: Household Development, Marginalization, Security, and Public Participation.

Figure 5.31 below.

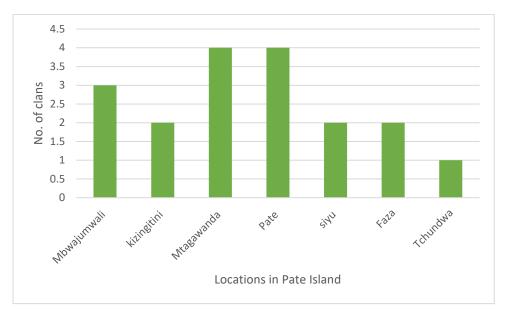


Figure 5.31: Number of clans within the locations in Pate Island

Population influx and migration of people in Pate Island

According to the key informants survey carried out, all key informants observed that there has been an increase in human population in the recent past. Some of the suggested main reasons for the increase in population are high birth rate vs low mortality rate and migration as shown in Figure 5.32 below.

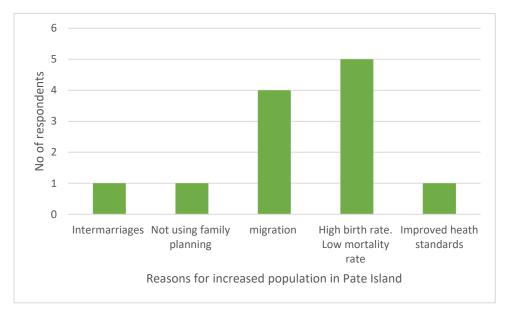


Figure 5.32: Reasons for increased population in the last 10 years in Pate Island

50% of key personnel interviewed expressed that there has been migration into the area. According to the household socio-economic data collected, 96% of the respondents were permanent residents of Pate Island since birth and 4 % migrated to the Island due to issues such as insecurity, Escape from drought/Famine and seeking job opportunities³²

5.2.4. Welfare

Education and literacy levels

Education levels in Lamu County are generally low. Literacy levels are low which is most likely to be attributed to inadequate number of schools and vocational training colleges in the area. A glance at the county' literacy level is presented in Table 5.12

Table 5.12: Literacy Levels³⁷

Education level	Percentage of Population
Illiterate	11%
Functional Literate	9%
Primary Incomplete	19%
Primary Complete	27%
Post-Primary Training	1%
Secondary Incomplete	7%
Secondary Complete	16%
Post-Secondary Training	6%
University	3%

Out of the 76 participants in the survey, only 13% have attained post-secondary education. Majority of the participants have attained primary school education only as depicted in Figure 5.33 below.

Never attended School Postgraduate Level of education Graduate Technical/Vocational secondary School **Primary School** 0 5 15 20 10 25 30 35 No of respondents

Figure 5.33: Level of Education of the 76 participants in the socio-economic survey

According to the Key-informants survey conducted in Pate Island, illiteracy is as a result of low education standards in the area. This is attributed to poverty, early marriages, drug abuse and mental diseases. It was noted that most communities prefer engaging their children in fishing activities when young to attending schools. Figure 5.34 below describes the distribution of learning institutions in Pate Island in regards to data collected from key informants.

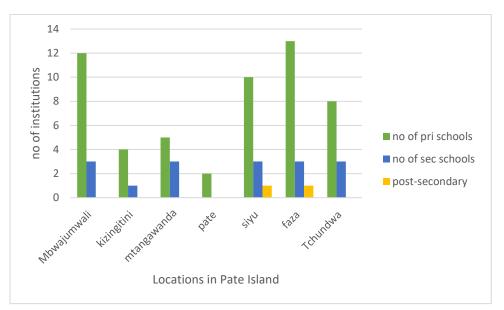


Figure 5.34: Distribution of learning institutions per locations in Pate Island

The average percentage of learning institutions is represented in Figure 5.35 below. This is according to the socio-economic survey conducted.

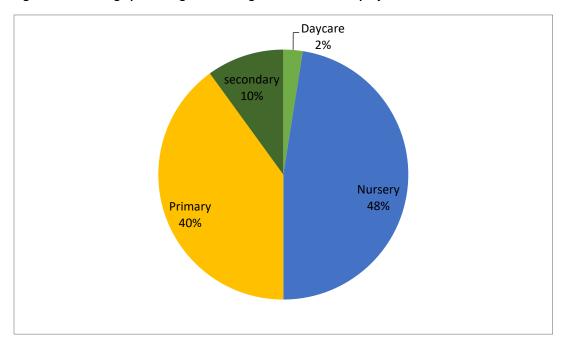


Figure 5.35: Average percentage of learning institutions in the project area.

According to socio-economic survey, 85% of the respondents were not satisfied by the education status in Pate Island while 15% were satisfied. The main reasons given for not being satisfied with education status in Pate include: School fees problem; lack of quality education; limited qualified or professional teachers; shortage of books and poor education performance by schools and students.

The major problems associated with access to education include school fees, teacher availability and poverty. Poverty has the greatest impact on education access (47%) in Pate Island, followed by school fees (33%) and the availability of teachers (20%)³²

Wealth Distribution

The distribution of wealth is a comparison of the assets and incomes of various members or groups in a society. It differs from the distribution of income in that it looks at the distribution of ownership of the assets in a society, rather than the current income of members of that society.

From the survey conducted, it was established that people in the project area acquire wealth through: inheritance, businesses, farming, and fishing. Money is spent in acquiring basic needs such as food, clothes, shelter, education and health services. The community perception of a wealthy person is one who has a lot of money and properties

Vulnerable Groups

Pate Island has been marginalized in many aspects of development. From land ownership and inadequate infrastructure development, people in the Island remain relatively poor and survive on natural resource dependent activities fishing, honey collection, pastoralism, farming, and mangrove harvesting for survival.

Community members listed the poor, women-headed households, disabled, orphans and the elderly as the vulnerable groups among the communities. Persons considered as most vulnerable in the society are the orphans and people with disability. This is represented in Figure 5.36 below.

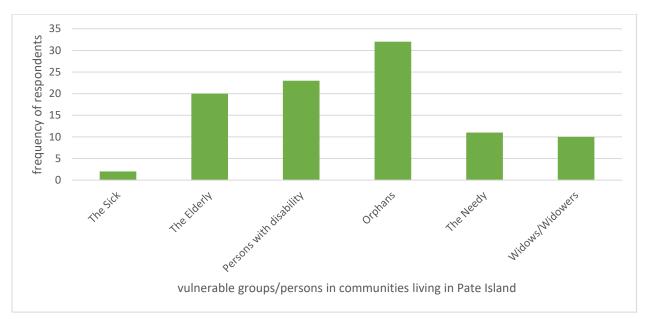


Figure 5.36: Vulnerable groups in the society

5.2.5. Economic Activities

Crop production

Crop production is mainly practiced on the mainland. Major crops grown in the county include maize, cassava, peas and green grams. Others include cotton, coconut, mangoes, bananas and bixa. Horticultural farming has currently been introduced. National Cereals and Produce Board (NCPB) depots provide storage facilities for cereal crops produced.

In Pate Island some of the crops grown include cashew nuts and coconuts³². Based on the data collected from the field, 59% of the sampled population carried out crop farming while 41% did not engage in any crop farming.

A comparison among the seven locations in the project area indicated that Mtangawanda and Siyu had the highest number of respondents engaged in crop farming. On the other hand, Tchundwa and Faza had the highest number of respondents that did not engage in crop farming as show in Figure 5.37 below.

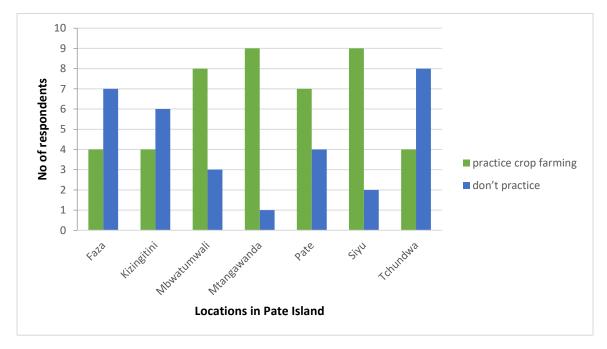
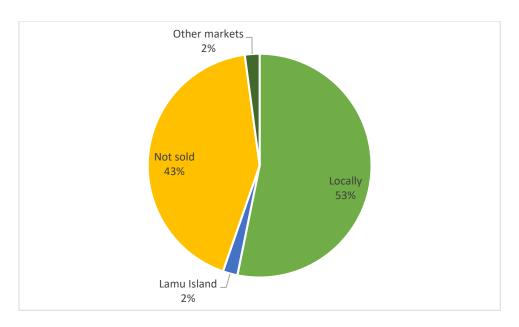


Figure 5.37: Crop Farming Response per Location

The most common crop in the project area is cereals with 82% of the respondents having indicated their engagement in the farming of cereals. Vegetables and fruits each have an 8% of coverage of the crops farmed in the area. All the crop farming done in the project area depends on rains for success.

According to the results of data analysis from the socio economic survey, 53% of the crop produce are sold within the local markets, 43% is consumed, while an equal share of the remaining percentage is shared between sales in the markets of Lamu Island and other areas as shown in Figure 5.38 below.

Figure 5.38: Main markets for crops



Livestock Farming

Livestock farming in Pate Island a source of livelihood for approximately 30% of the population, both directly and indirectly. Some of the common livestock in the area include; cattle, goats and sheep. Poultry farming and bee keeping are also practiced in the area.

Livestock farming plays a role in poverty reduction since pastoralists are among the vulnerable groups and depend on livestock farming for survival

Based in the socio-economic survey and data collected from the field on 34% of the sampled population carried out livestock farming. 66% did not engage in livestock keeping as an economic/agricultural activity as shown in Figure 5.39. Out of the 34% of the livestock keepers among the respondents, Siyu location registered the highest number of livestock keepers followed by Pate. Kizingitini and Mbwatumwali had equal number of livestock keepers. Tchundwa location on the other hand had registered the highest number of population which did not engage in livestock keeping followed by Faza and Mtangawanda. This is described in

Figure 5.39.

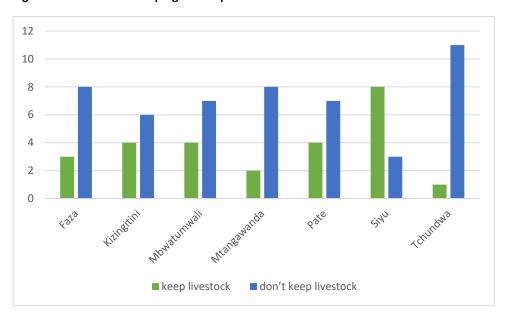


Figure 5.39: Livestock keeping trends per location

Among the 34% of the sample population dealing in livestock keeping, the lead animal in stock area cattle with a 25% coverage followed by goats with 15%. Donkeys are third at 13% while sheep covers only 2% of the animal kept in the project area. Other animals such as chicken, rabbits, pigs, dogs cover 45% of the animals kept in the project area³²

In terms of mode of grazing for the animals kept in the project area, 91% of the respondents use free range mode of grazing while 5% of the respondents use paddocking as a mode of grazing. The rest used other means tethering³²

On the sources of pasture for the livestock, 39% of the respondents got their pasture from community land, 35% from forest while 26% from their own land as shown in the

Figure 5.40 below.

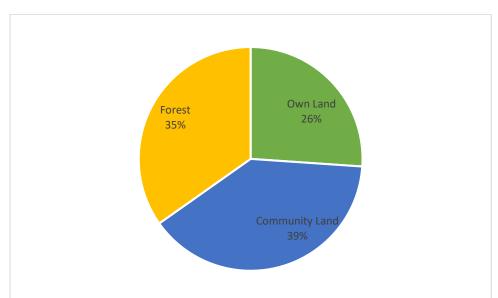


Figure 5.40: Source of pasture for livestock

Different people keep livestock for different reasons. In the project area based on the data collected, Consultants in the socio economic survey, 44% of those who kept livestock drew meat from the livestock. 37% kept livestock for milk while 6% kept livestock for skins and hides. 13% on the other hand kept livestock for other products such as eggs as show in the Figure 5.41 below.

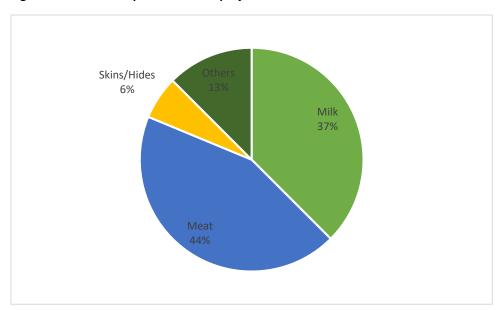


Figure 5.41: Livestock products in the project area

On the market for the animal products, 62% of the population engaged in animal keeping do not sell their animal products. The 38% that sell their products do so in the locally available markets

Fishing

Another major economic activity in the county is fishing especially for the residents of the Island areas. The fishing ground cover 3100 km² of territorial market water surface extending from Kiunga to Ras Teweni. In the mainland, fishing is carried out in fish pond programmes and ox-bow lakes and water masses along the Tana River delta.

In Pate Island, there is no major disparity between the number of persons engaged in fishing and those not engaged in fishing in the area. According to the data from the socio-economic survey 54% of the sampled population did not engage in fishing while 46% engaged in fishing activity³²

A comparison between fishing activities among the location indicate that Faza location had the highest number of respondents engaged in fishing followed by Mbwatumwali and Mtangawanda. Tchundwa and Siyu were the lead location in respondents without engagement in fishing activities. They were closely followed by Pate location as shown in Figure 5.42 below. It is vital to note the main type of fishing in the project area is generally shallow water fishing which requires no form of specialization like in sport fishing and lobster diving.

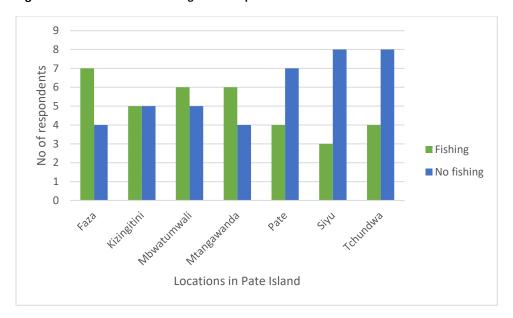


Figure 5.42: Distribution of Fishing Activities per Location

In terms of the ownership of fishing vessels among the population engaged in fishing activities 59% of the respondents did not own the vessels they use for fishing. Only 41% of the respondents owned such vessels. Most of the fishing vessels belonged to the various Beach Management Units (BMUs) which act as societies and group set ups for most fishermen in the project area.

The most common fishing vessel in the area is Mashua with 64% coverage among the fishermen in the project area. This is followed by Flat bottom boats at 29% while the rest of the fishermen use dau as their main fishing vessel as indicated in Figure 5.43 below. In terms of vessel propulsion mode, sail boats are commonly used as illustrated in Figure 5.44 below

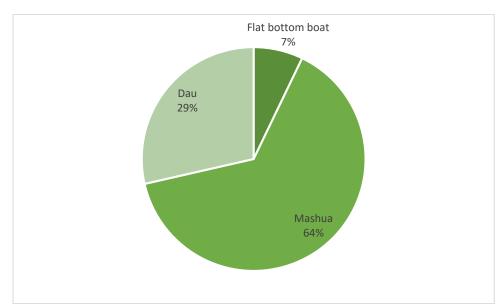
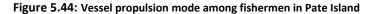
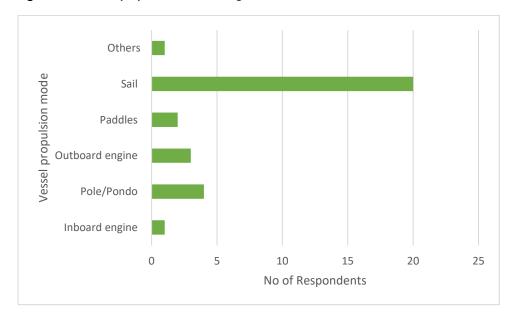


Figure 5.43: Common types of fishing vessels





In terms of registration of vessels for fishing in the project area, 89% of the vessels are registered with the fisheries/maritime department while only 11% are not registered.

According to the socio-economic survey data, 78% of the respondents engaged in the fishing activities are members of local societies. Only 22% of those engaged in fishing have not joined any form of society. Most of these societies are groupings such as the local BMUs and the local self-help SACCOs.

The fishermen in Pate use different fishing gears in their activities. The leading equipment in use are the Long line hooks which take up 31% of the equipment in use followed by gills and sail nets at 19% and 17%

respectively. The least used equipment in this area is cast nets which only has 2% use in the area. The distributions of equipment used for fishing are shown in Figure 5.45 below.

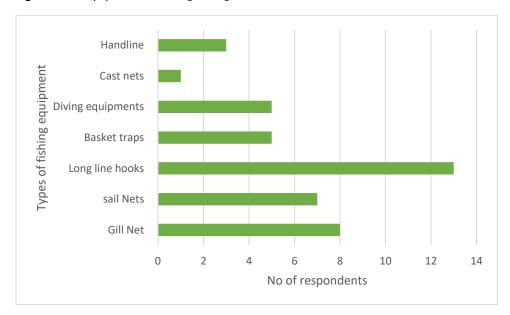


Figure 5.45: Equipment for Fishing among fishermen in Pate

The highest number of fishermen has an experience of between 30-34years in the industry. Those with experiences ranging from between 1-4 years and 15-19years are the lowest in the project area. Figure 5.46 below shows the distribution of experience levels among the fishermen in the project area.

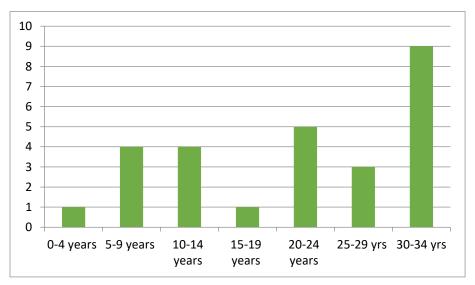
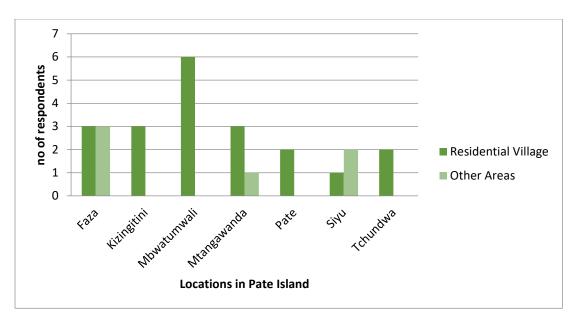


Figure 5.46: Distribution of Experiences among the Fishermen

According to the socio economic survey data, 77% of the respondents engaged in fishing covered their local residential areas. Only 23% of the respondents engaged in fishing went further than their residential areas in times of fishing. Distribution of areas of coverage per location is as shown in Figure 5.47 below

Figure 5.47: Areas of Fishing



Fish harvest depends on the weather conditions of the area. During the winter, the catches are higher with daily harvest ranging from 100kg to 1000kgs in per BMU. During the summer however, the fish harvest is general low with some beach management units like Rasini in Faza location registering only 25kgs per day. The average time taken in the winter season in a fishing season ranges from 4-6hours while in the summer the time taken in the sea for fishing is longer running to at least 8hours. During the low fishing season (summer), the earnings from the fish resources range from 5,000-10,000 Kenya shillings per month while in the high season (winter), the earnings range from between 25,000-35,000 Kenya shillings per month.

Tourism

Tourism is a major economic activity in the county given its rich endowment in diversity of cultural identity, home to several world heritage sites, fauna and flora. There are three national reserves, two national parks and three private ranches which are home to several species of dolphins and sharks (need a map).

Tourists are accommodated at 2 classified hotels and 181 unclassified hotels with a total bed capacity of 1881. The classified hotels attract high market clientele.

With its 130 km of sandy beach coastline and diverse tourist attractions, this sector has huge potential for growth, if effective marketing is done.

Pate Island has many valuable marine resources, such as mangroves, coral reefs and seagrasses, which provide an important source of livelihood and food security for local communities.

There are also ancient ruins, a rich cultural heritage and charismatic species (such as turtles, dugongs, dolphins, sharks, rare corals and fishes) that provide good marketing opportunities for eco-tourism.

5.2.6. Financial services

Lamu County has five commercial banks including Kenya Commercial Bank (KCB), GULF, ABC, EQUITY & Diamond Trust Bank (DTB) all in Amu. KCB and Equity have a branch also in Mpeketoni with several Automatic Teller Machines have been installed at Shella and Witu.

Pate Island has no physical presence of banking services. In such areas, mobile banking structures and internet banking facilities can be used by customers who have access to such services. Except Lamu Teachers Savings and Credit Co-operative Societies that provides Front Office Services (FOSA) in five main trading centres, the rest of the 15 micro finance institutions are concentrated in Mpeketoni.

5.2.7. Employment and Livelihoods

The leading employer in Lamu County is self-employment with 29%. Casual and Part time employment follows at 10% while private sector takes slot three with only 7%. It is important to note that the unemployment rate is high in the county with a total of 29% active and employable part of the population jobless and unemployed. Table 5.13shows the distribution of employment across different sectors.

Table 5.13: Employment Distribution³⁷

Employment Status	Percentage
Self Employed (Small businesses and market stalls)	29%
Unemployed	29%
Casual/Part Time	10%
Employed in the Private Sector	7%
Family Subsistence	6%
Employed in the Public Sector	6%
Students population	3%
Employed in a family Business/Farm	3%
Retired	1%
Others	5%

Distribution of the income source percentages across the county is shown Table 1.6 below.

Table 5.14: Income Source Percentages³⁷

Main source of income	Percentage
Public Sector	10%
Private Sector	25%
Self-Employment (Business owners/Traders)	45%
Agriculture (Own/Household)	8%
Livestock	0%
Relatives	8%
Others	1%

According to the data collected by the ESF Consultants in the field, the project area has relatively high number of poor citizens. No respondent indicated falling in the category of the rich. Pate, Kizingitini, Siyu,

and Tchundwa locations registered the highest number of very poor and poor residents while Faza, Kizingitini, and Siyu registered the highest number of middle income earners in the project area. Pate location had the highest number of poor resident in the entire project area. Figure 5.48 below shows the distribution of income status of the sampled populations in the project area.

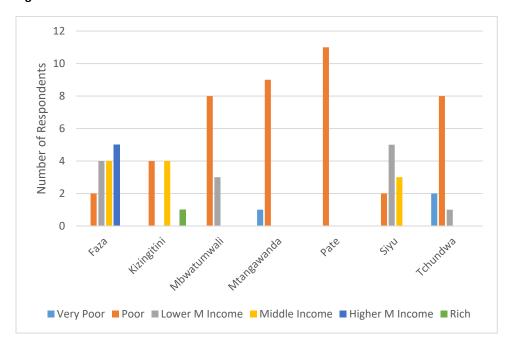


Figure 5.48: Income Status

According to the data collected in the field 42% of the respondents registered zero changes in the income status in the last five years. 27% of the respondents indicated an improvement in their income levels while 31% indicated deterioration in the income levels³²

Based on location levels, Tchundwa location registered the highest number of respondents with a decrease in income levels in the last five years. Siyu location on the other hand registered the highest number of respondents with an increase in the income levels compared to five years ago. Kizingitini on the other hand had an equal distribution respondent in the same status as five years ago and decrease in status level. In this location, only one respondent registered increase in the level of income³².

5.2.8. Transport

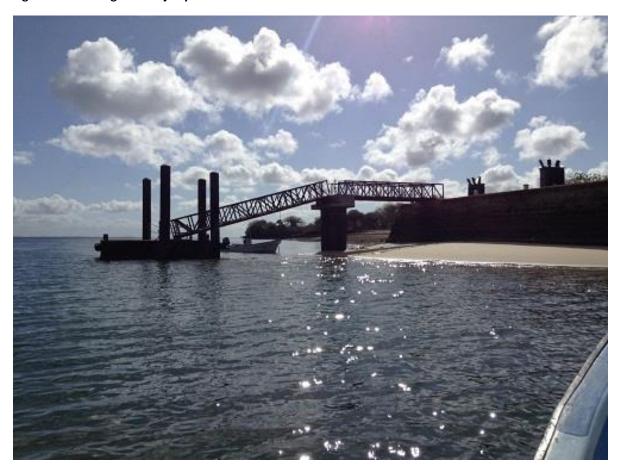
Lamu County has a total road network of 688.6km out of which only 6Km is tarmacked³⁸. Mokowe - Garsen road which connects the county to the rest of the coast counties and the county and Mokowe – Kiunga road which connects the county to Somalia border are the major two roads that are conspicuous in the county³⁸.

³⁸ Lamu County Integrated Development Plan (2013-2017).

Lamu County has seven jetties which inter link the main land to Islands and between Islands. These include Amu, Mokowe, Manda, Matondoni, Hospital Jetty, Custom fisheries Jetty and Mtangawanda jetty (Pate Island)

Major modes of transport in the Lamu - Faza Sea way are semi-Motorized dhows and speedboats. Mtangawanda jetty is the main access to Pate Island. This jetty is depicted in Figure 5.49 below





The county has 13 airstrips out of which 11 are public while two are private. Manda is the main airstrip with three airline companies providing daily passenger flights. Manda point 11, Manda Bay Naval, Mokowe, Kiunga, Kiwayu Island and Kiwayu mainland (Mkokoni) which are fairly maintained; while, Witu, Mkunumbi, Faza, Kizingitini are under bad condition. Tenewi and Mangai are closed due to the LAPSSET project³⁹.

In undertaking the traffic survey in Pate Island, it was noted that the available means of transport are: Public boats, private boats, Motor vehicles, Motor cycles and donkeys. A summary of key findings is represented in Table 5.15 below.

³⁹ Lamu Holiday Solutions. (2016). County Information. Retreived on 22nd March 2016 from http://www.lamuholidaysolutions.com/aboutlamu/general-information-about-county

Table 5.15: Summary of key findings for the traffic survey

Means of transport	Number	Description	Timings
Public boats	2- work alternating, one per day	Transport passengers from Lamu Island to Mtangawanda Jetty in Pate	5 am in the morning 4:30 pm in the evening
	1	Transport passengers form Amu jetty in Lamu to Faza	4 am in the morning
Private boats	Frequency is very low.	Mostly used in transporting tourists or visitors to Pate. These are hired boats.	Anytime.
Motor Vehicles	3 Matatus	Mostly used in the morning and evening when taking passengers to take the boats to and from Mtagawanda and Lamu.	4 am in the morning 4:30 pm in the evening
	1 bus stationed at kizingitini	Used during special occasions	
	Others	Police van, ambulance and power contractor's vehicles found stationed at certain areas	
Motor cycle (boda boda)	Average of 2 per hour	Transport passengers from one village to another	Average of two per hour
Donkeys	Anytime	Transport passengers within the villages Transport goods for villagers	Anytime

From the socio-economic survey conducted, the use of donkeys, boats and motor vehicles were the common means of transport in Pate Island (see

Figure 5.50 below). Poor road network/ structure and high cost of transport were cited as the major transport challenges in Pate Island as depicted in Figure 5.51 below.

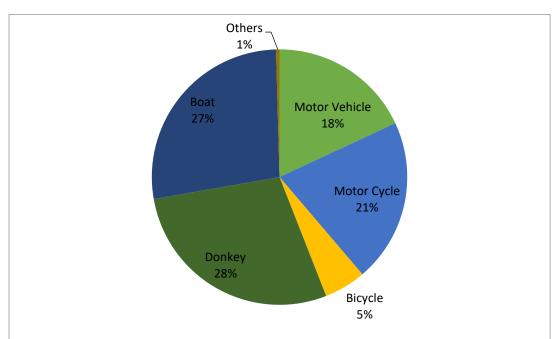
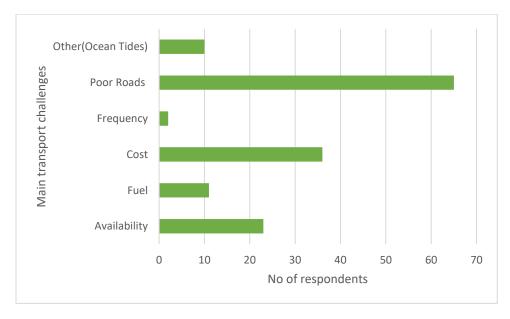


Figure 5.50: Common means of transport

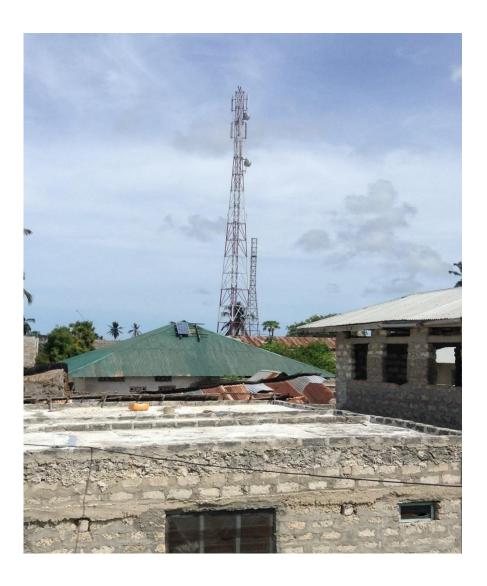




5.2.9. Communication

Communication infrastructure in Pate Island is underdeveloped. Mobile phone connectivity is at 60% while its use is at 50%. Internet access is at 20% and TV and radio coverage is very low. Safaricom mobile network and orange are strongest in Pate Island while Airtel has no signal. Boosters for orange network were observed in Faza town; the administrative headquarters of Pate Island, during the field survey (see Figure 5.52 below)

Figure 5.52: Orange mobile boosters observed in Faza



Common means of communication in Pate is mobile phone, radio, television and word of mouth as depicted in

Figure 5.53 below

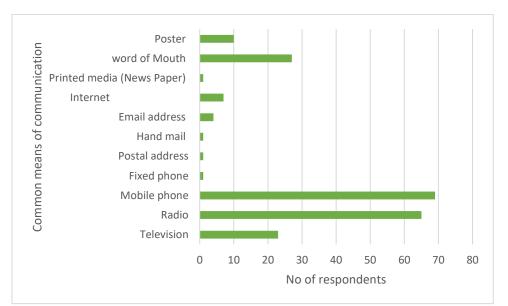


Figure 5.53: common means of communication in Pate Island

5.2.10. Energy

In Lamu County, Kenya Electricity Generating Company (KenGen) supplies the electricity generated through diesel generators located in the main market centres in Lamu West Sub County. Connectivity to the National grid is almost complete: the National Grid power has been extended to the island. The diesel generators are being transferred to Pate.

Private investors have also shown interest in developing renewable sources of energy such as solar and wind energy. However, firewood and charcoal are the main sources of cooking fuel, with use of LPG limited to the affluent in the urban centres.

According to the survey, the most common means of lighting among communities in Pate was solar, paraffin and fuel wood as depicted in

Figure 5.54 below. The main source of heating/cooking energy is fuel wood and charcoal (see Figure 5.55 below). This poses a health risk to most women in the community.

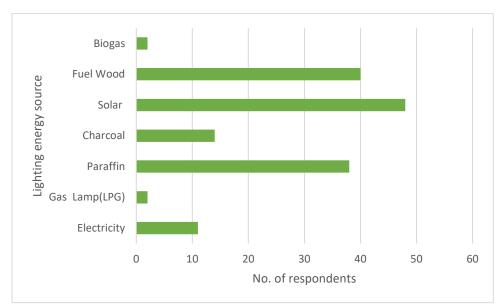
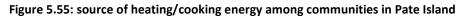
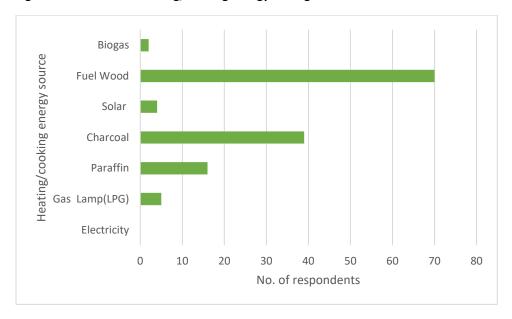


Figure 5.54: Source of lighting among communities in Pate Island





5.2.11. Water

Existing water sources include wells and djabias (underground tanks filled with rainwater); whenever there is a water shortage it is imported from Lamu. According to estimates from interviews on the ground, there are some 330 wells and 350 djabias on the larger Pate.

Stabilized sand dunes provide water around Pate village which is accessed from open shallow wells. Unfortunately, no water bearing formation has been found north of Pate village and the inhabitants of Siyu, Faza, Tchundwa, Kisingitini, Mtawabanga, Mybogi and Mbwajumwali depend on rainwater collection

into djabias for their drinking water needs. The shallow wells tapping relatively salty water are mainly used for cleaning and other domestic purposes.

Djabias are mainly privately owned, but also communal, run by a committee, or the property of the county government/ CDF. More recently, in several locations, some new ones were built by women users associations, financed by different donors. The communal and those owned by the county as well as those run by the women water committees are in generally good condition.

Figure 5.56:Djabias spotted in areas of Mbwajumwali location





Most recently the Faza Water Project was completed. It consists of a 14 kilometer HDPE pipeline, 10 km of which is subsea and 4 kilometres on land. The source is 3 large diameter wells constructed on the mainland south of Dodori Forest. The pipeline delivers 75 cubic meters fresh water per day to Faza. It is expected to supply water to the entire Pate Island that incorporates the villages of Siyu, Shanga, Pate, Tchundwa, Banjumwali, Kisingitini and Faza. Along with these is the Siyu Water Project under which borehole water is proposed to serve parts of Siyu.

Figure 5.57. Water well drilling at Siyu



Traditional wells are dug into the limestone formation and lined with coral stones or blocks. Some of them are lined with concrete rings from the bottom up to the surface. The majority are lined only in the upper part. A wall is built to prevent contamination and for security and in some cases an apron is built (Figure 5.58 to Figure 5.62).

Figure 5.58: Siyu village well



Figure 5.59: Abubakar Khalifa well



Figure 5.60:Tchundwa village well



Figure 5.61: A well at Pate



Figure 5.62: Well at Rasini, note proximity to house



Desalination is another process that is used to remove minerals from sea water to make it suitable for human consumption, there is one machine in Kizigitini Location as shown in Figure 5.63 below.





According to the communities in Kizingitini, the desalinization plant is fully functional and is usually managed by the County government of Lamu; and maintained and repaired by Davis & Shirtliff Company. Often, there are a minor pump breakdown issues (smaller pumps) which are repaired immediately after the county government is alerted. Repair period does not last more than a day.

Depending on the tide, and amount of water pumped, the plant can supply between 12,000 to 20,000 litres per day or more. There are two storage tanks each with a capacity of 10,000 litres. The water is pumped during the night and supplied from 6.00 AM to 8.00 PM with a two hour break in between to allow for the pumps to "rest" thereafter the pumping and supply of water resumes.

The pumped water is enough for Kizingitini residents. Everyone has ample supply of water. No one goes home with empty vessel. Initially, there was another supply tank (transfer station) in the middle of Kizinigitini town, this used to sort out long queues currently witnessed. However, the tank burst some time ago and has yet to be repaired. The other main challenge that can cause inadequate water to be pumped is that the transfer pump is small. It takes up to 6 hours to fill up one tank. If the pump was bigger, it would take approximately 2-3 hours.

Importing fresh water from Lamu Island is an added expense which many cannot afford in Pate Island. During the dry season which often lasts up to 4 months, wells are the only source of water and water shortage in Pate Island. It is vital to note that rainwater is the main source of fresh/soft water for the

county residents. From previous studies, the average distance of households to access clean water is approximately 5km. Organizations involved in the supply of water and sanitation services include Lamu Water and Sewerage Company (LWSCO), Lake Kenyatta Water Association, Hindu Water Association, and Witu Water Users' Association.

According to the key informant's questionnaire, it was noted that majority of the population in Pate Island rely on wells and rain water as their main source of water (see Figure 5.64 below). In Kizingitini, there is a desalinization plant that is used by the locals as a source of water. Water scarcity during dry seasons, wells having saline water and poor quality water were cited as the common water problems in Pate Island.

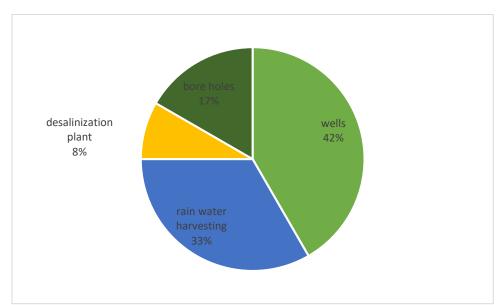


Figure 5.64: Distribution of water sources in Pate Island

Source: ESF Consultants

From the socio-economic survey carried out, community's main sources of drinking water in Pate Island are rain water, wells and boreholes (see

Figure 5.65 below). Rain water is most preferred due to the fact that its soft water compared to other water sources. Most water sources are saline and the overall average distance to the nearest water source for all communities in Pate Island is 1 km, from the results from the socio-economic survey conducted by ESF Consultants.

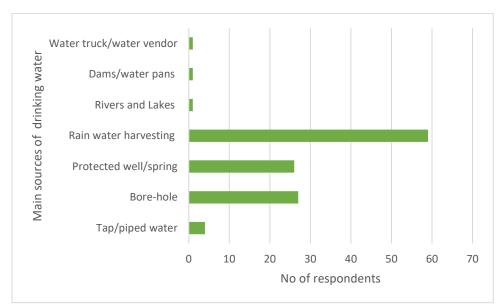


Figure 5.65: Main sources of drinking water in Pate Island

Water quality, travelling long distances to find water and having commonly shared water sources with animals are the major problems in water access in Pate Island as shown in Figure 5.66 below. However, in some locations like Pate and Mtangawanda, water quality was not a major challenge since there are fresh water wells. All other locations cited poor water quality as a major challenge

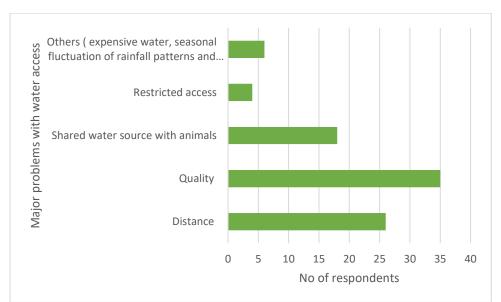


Figure 5.66: Major problems in water access in Pate Island

5.2.12. Sanitation

Toilet facilities

In Pate, it was noted that 95% of the communities use pit latrines and 5% use bush as their main toilet facilities. 96% of these toilets are privately owned within the homestead, while 4% of the respondents use public toilets³²

Foul sewer (grey water) drainage

It was also noted that Pate Island lacks connection to sewer system. 64% of the grey water is discharges into pits especially pit latrines which are commonly used in the area. Only 34% of it is discharges in septic tanks³²

Waste water

According to the survey conducted, it was noted that 67% of waste water is directed to sea. This poses a risk of spread of water borne diseases in the area. Other methods used for discharge of waste water include directing into septic tank, outdoor pouring, and using pit latrines. This is represented in Figure 5.67 below.

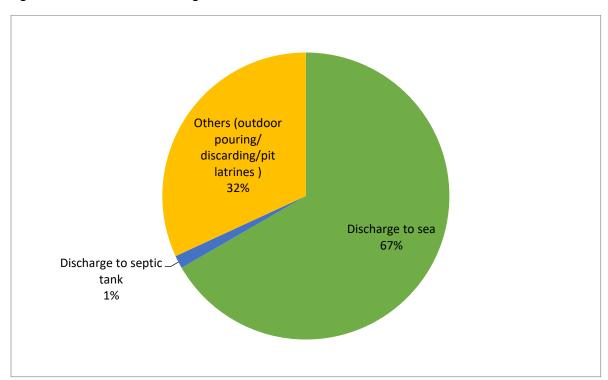


Figure 5.67: Waste water discharge method in Pate Island

Solid waste

Solid waste is handled through open burning and dumping into pits. Organic waste is sometimes taken to *shambas* as a form of manure (see Figure 5.68 below)

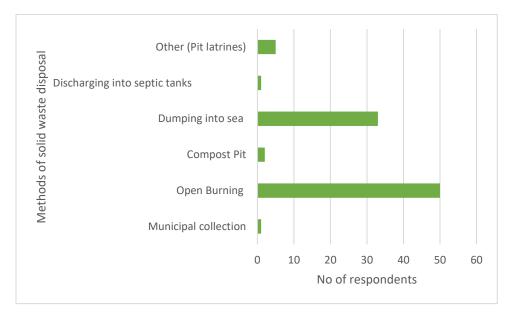


Figure 5.68: Methods of solid waste disposal

5.2.13. Housing and dwelling

The most common housing type in Lamu County is the Swahili housing type of setup. The architecture is traditional with coral rag walls and thatched roofing made from palm tree leaves (makuti). In some areas, some of the unique stone townhouses dates back to early 18th century.

The Swahili houses were designed as an inward looking self-contained complex with a plan organized around a central courtyard (Prof. Abdul Sheriff, 1998) and the houses vary in form and sizes, from relatively modest, single storey houses to magnificent mansions but share the same uniformity in design, construction and decoration. Thick walls, high ceilings and small windows are deliberately designed to protect the inhabitants from the equatorial sun and ensures that the interiors are cool, private and secluded.

Pate Island is an early and important site and covers an area about 30 hectares. It has no proper harbor and the houses in Pate are clustered together illustrating cooperation during construction thus the houses have common party walls and interlocking plan forms. Sanitation is through a stoned-lined pit toilet and bath-like water container for washing (Garlake, 1966).

However, modern upcoming houses are bungalows and are not designed in the traditional Swahili architecture. This is due to the increasing population on the Island allowing for modern influence.

Types of Houses

According to the data collected, bungalows are the leading type of houses in the areas having registered more than fifty percent responses from all the location except Tchundwa. In Siyu location all the respondents lived in Bungalows. Figure below shows the distribution of housing types across all the seven location in the project area.

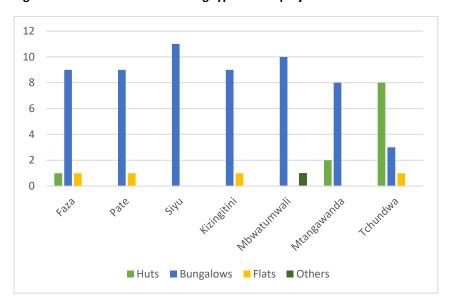


Figure 5.69: Distribution of housing types in the project area

Occupancy Tenure

In Faza, Siyu, and Tchundwa all the respondents owned the houses they lived in. As per the data collected in the field, it is only in Kizingitini, Mbwatumwali, and Mtanagwanda that registered 1 respondent as staying in rental houses as shown in Figure 5.70 below.

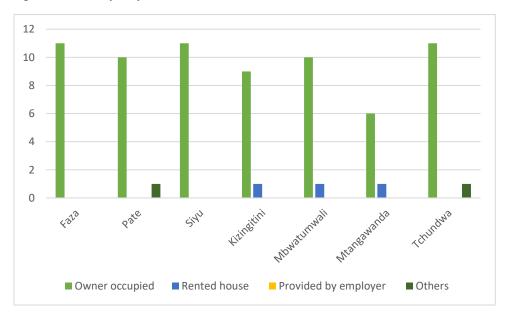


Figure 5.70: Occupancy tenure in Pate Island

Wall materials

Stones are the most used materials for building walls for houses. Mud/Wood and Bricks/Blocks are the second highest used materials in building walls for most house in the project area. Figure 5.71 below

shows the distribution of materials used for building walls across all the seven locations in the project area.

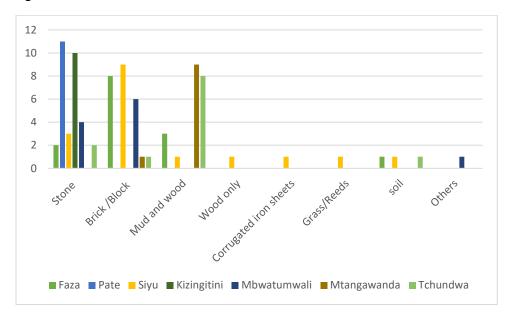


Figure 5.71: Wall material for houses in Pate Island

Roofing materials

In Faza, nine out of the 11 respondents lived in houses whose roofs were made of iron sheet with only two respondents having roofs made of slab. In Mtangawanda, all the respondents had their roofs made of Grass/reeds while in Mbwatumwali all the responds expect one had their roofs made of makuti. The distribution of roofing materials in the project area as depicted by the data collected, Consultants in the field are as presented in Figure 5.72 below.

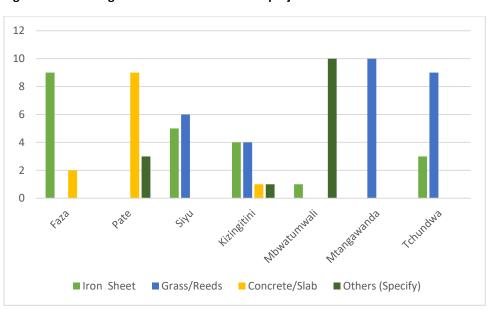


Figure 5.72: Roofing materials for houses in the project area

Floor Materials

According to the data collected, it's only in Kizingitini location that all the respondents have cement floors in their houses. Faza, Pate, and Siyu all had cement as the leading floor material. Mbwatumwali, Mtangawanda, and Tchundwa on the other hand have rammed earth as the leading material for floors. Other materials used for making housing floors in the project are including wood and cow dung.

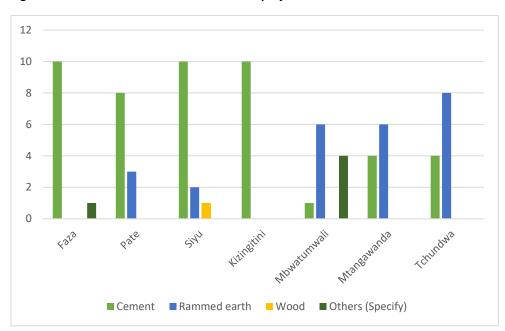


Figure 5.73: Floor materials for houses in the project area

5.2.14. Land and Land Use

Lamu County has a land surface area of 6273.1km² composed of 5517 km² of arable land 649.7 km² of non-arable land, 130km² of coastline and 308 km² under water mass.

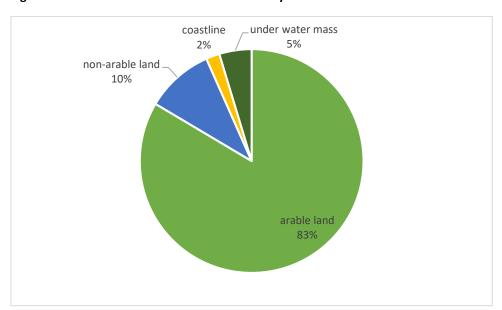


Figure 5.74: Land use distribution in Lamu County

Lamu West sits on land surface area of 3971.3km² hence taking 63.3% of total land, leaving Lamu East with 36.7%³⁷. The bulk of arable land is in Lamu West while Lamu East takes the bulk of water mass. Based on the physiographic and climatic conditions, the county is classified into the following Agro-Ecological zones.

- Coastal lowlands
- Coconut Cassava zone
- Cashew nut-Cassava zone
- Livestock millet zone
- Lowland ranching zone

Landlessness and land ownership and squatter occupation is the biggest concern for the indigenous communities such as the Swahili, Arabs, Korei, Boni and Orma and the perennial source of conflict between farmers and livestock herders. There are 13,000 households who have title deeds, making 42% of the county households who have land ownership.

According to socio-economic survey conducted, it was noted that Land in Pate Island is mainly owned through purchasing and inheritance. 82% of the respondents owned land while 18% did not own land. 80% of the people who own land in Pate have a valid title deed or an allotment letter of the parcel of land³².

97% of the respondents agreed that women are allowed to own land while 3% of the respondents disagreed to the same. However, all respondents agreed that when women own land, they are agreed to sell or decide how to use land independently³²

Land acquisition is mainly through inheritance in Pate Island. Other forms of land acquisition include communal lands while other are squatters inhabiting the said land. This is represented in Figure 5.75 Below.

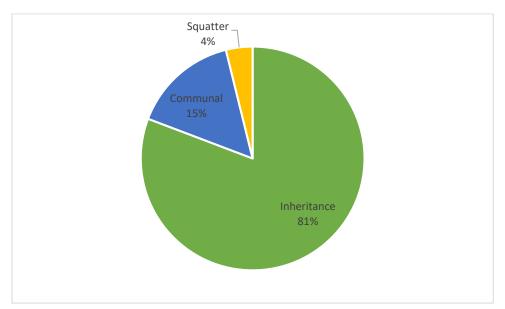


Figure 5.75: Modes of land acquisition in Pate Island

Land ownership structure is 70% privately owned, 23% communally owned and 7% clan owned, according to the survey.

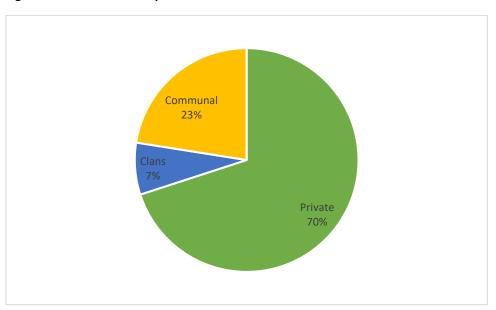


Figure 5.76: Land ownership structure in Pate Island

Predominant land uses include crop and animal farming; Quarrying for block harvesting. Traditionally, land use is determined by the community especially the elders.

According to the survey conducted, it was noted that crop farming and house are allocated the major proportion of the land by most communities in Pate Island each at 40% of the total land. Animal farming is allocated 14% while 6% of the land is allocated for other purposes such as being left bare to fallow. This is represented in Figure 5.77 below.

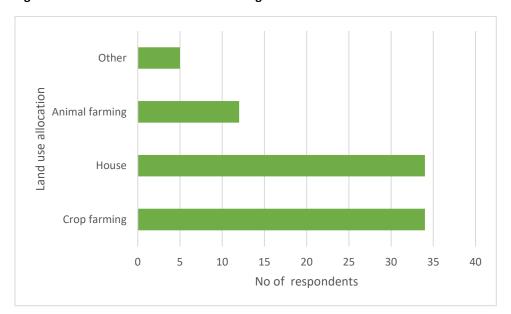


Figure 5.77: Land allocation structure among communities in Pate Island

5.2.15. Security

The security situation in Lamu County is on a high alert due to the proximity to the volatile Somalia and the constant threats of terrorism, kidnapping and cross-border attacks. In the recent past, several foreign countries had issues travel advisories to its citizens against travelling to Lamu County due to attacks which occurred on the Island. However, the security situation in the Island has significantly improved lately, with the State together with the County Government collaborating in establishing police posts thus increasing the security presence in the area.

In Pate area, increased numbers of youths are abusing drugs thus becoming addicts. This has led to incidences of theft and robbery in the area, however their severity is quite minimal.

According to the survey conducted, in Pate, joblessness and drug abuse were cited as the main security threats in the Island as shown in Figure 5.78 below.

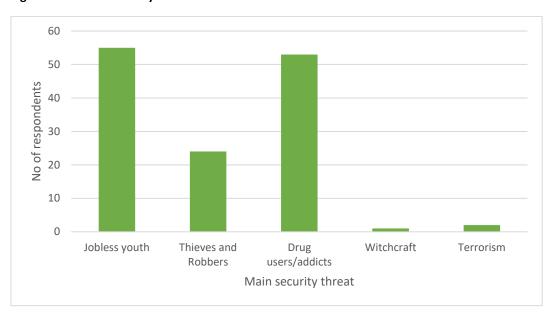


Figure 5.78: Main security threats in Pate Island

The participants gave suggestions on measures to reduce security threats and the most mentioned one was creating employment opportunities especially for the local youths. This is represented in Figure 5.79 below.

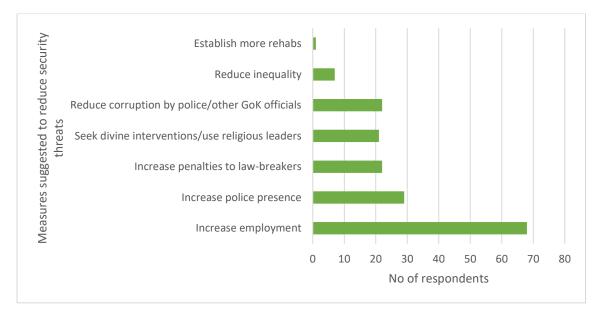


Figure 5.79: Suggested measures to reduce security threats in Pate

55% of participants also noted that security situation in the area has improved, while 36% felt that it was still same in the last three years.

5.2.16. Health Access

In the County, access to health care is a major issue. The number of health services providers in the county is far much lower than the population of the citizens of Lamu. In total, there are 42 health facilities, 24

County Government owned, 3 owned by faith-based organizations, 1 NGO owned and 14 private institutions composed of 3 level five facilities, 5 health centres, 1 nursing home and 33 dispensaries with a total bed capacity of 172 beds³⁷.

The County has only 4 medical doctors, 24 clinical officers, 94 nurses, 17 public health officers, 5 pharmacists and 30 technical personnel. On average a patient cover approximately 5Km to the nearest health facility³⁸.

Malaria is the leading diseases in the area with over 63.3% health care records attributed to it. HIV/AIDs prevalence rate stand at 3.2 percent with male prevalence at 3.7% while female prevalence is 2.7%. The prevalence is higher in urban settlements as compared to rural areas. In addition to all the county health facilities, there are 13 VCT centres that provide voluntary testing and counselling services³⁷.

Table 5.16: Health Services in Lamu County

Facility Name	Туре	Owner	Constituency	Division	Location	Sub Location	Be ds	Cot s	Operational Status
Faza Hospital	Sub-District Hospital	County Government	Lamu East	Faza	Faza	Faza	15	0	Operational
Patte Dispensary	Dispensary	County Government	Lamu East	Faza	Patte	Patte			Operational
Siu Dispensary	Dispensary	County Government	Lamu East	Faza	Siu	Siu			Operational
Tchundwa Dispensary	Dispensary	County Government	Lamu East	Faza	Tchundwa	Tchundwa			Operational
Kiunga Health Centre	Health Centre	County Government	Lamu East	Kiunga	Kiunga	Kiunga	4	0	Operational
Mangai Dispensary	Dispensary	County Government	Lamu East	Kiunga	Mangai	Mangai	0	0	Operational
Mkokoni Dispensary	Dispensary	County Government	Lamu East	Kiunga	Mkokoni	Mkokoni	0	0	Operational
Kiwayuu Dispensary	Dispensary	County Government	Lamu East	Kizingitini	Kiwayuu	Kiwayuu	0	0	Operational
Kizingitini Dispensary	Dispensary	County Government	Lamu East	Kizingitini	Kizingitini	Kizingitini			Operational
Mbwajumwali Dispensary	Dispensary	County Government	Lamu East	Kizingitini	Kizingitini	Mbwajum wali	0	0	Operational
Ndau Dispensary	Dispensary	County Government	Lamu East	Kizingitini	Ndau	Ndau	0	0	Operational
Baraka Medical Clinic (Lamu)	Medical Clinic	Private Practice - Clinical Officer	Lamu East	Mpeketoni	Central	Mpeketoni	0	0	Operational
Ibnusina Clinic	Medical Clinic	Private Practice - Clinical Officer	Lamu West	Amu	Langoni	Langoni	0	0	Operational

Facility Name	Туре	Owner	Constituency	Division	Location	Sub Location	Be ds	Cot s	Operational Status
Kipungani Dispensary	Dispensary	County Government	Lamu West	Amu	Matondoni	Kipungani	0	0	Not- Operational
Lamu Clinic	Medical Clinic	Private Practice - Nurse / Midwife	Lamu West	Amu	Mkomani	Mkomani	0	0	Not- Operational
Lamu District Hospital	District Hospital	County Government	Lamu West	Amu	Langoni	Langoni	60	20	Operational
Lamu Fort VCT	VCT Centre (Stand- Alone)	Private Enterprise (Institution)	Lamu West	Amu	Langoni	Langoni	0	0	Not- Operational
Langoni Nursing Home	Nursing Home	Private Enterprise (Institution)	Lamu West	Amu	Langoni	Langoni	0	0	Operational
Matondoni Dispensary	Dispensary	County Government	Lamu West	Amu	Matondoni	Matondon i			Operational
Pablo Hortsman Health Centre	Health Centre	Non-Governmental Organizations	Lamu West	Amu	Mkomani	Mkomani	4	0	Operational
Shella Dispensary	Dispensary	County Government	Lamu West	Amu	Shella	Shella	0	0	Operational
Bargoni Nys Dispensary	Dispensary	County Government	Lamu West	Hindi	Hindi	Bargoni	0	0	Operational
Hindi Magogoni Dispensary	Dispensary	County Government	Lamu West	Hindi	Hindi	Hindi	6	0	Operational
Hindi Prison Dispensary	Dispensary	Other Public Institution	Lamu West	Hindi	Hindi	Hindi	0	0	Operational
Mokowe Health Centre	Health Centre	County Government	Lamu West	Hindi	Mokowe	Mokowe	4		Operational

Facility Name	Туре	Owner	Constituency	Division	Location	Sub Location	Be ds	Cot s	Operational Status
Rafiki Miracle Clinic (Hindi)	Medical Clinic	Private Practice - Nurse / Midwife	Lamu West	Hindi	Hindi	Hindi	0	0	Operational
Sowa Medcal Clinic	Medical Clinic	Private Practice - Clinical Officer	Lamu West	Hindi	Hindi	Hindi	0	0	Operational
Hongwe Catholic Dispensary	Dispensary	Kenya Episcopal Conference-Catholic Secretariat	Lamu West	Mpeketoni	Hongwe	Hongwe	0	0	Operational
Hongwe Clinic	Medical Clinic	Private Practice - Nurse / Midwife	Lamu West	Mpeketoni	Hongwe	Hongwe	0	0	Operational
Jamii Clinic (Lamu)	Medical Clinic	Private Practice - Clinical Officer	Lamu West	Mpeketoni	Central	Mpeketoni	0	0	Operational
Mapenya Dispensary	Dispensary	County Government	Lamu West	Mpeketoni	Mapenya	Mapenya	0	0	Operational
Maria Teressa Nuzzo Health Centre	Health Centre	Kenya Episcopal Conference-Catholic Secretariat	Lamu West	Mpeketoni	Baharini	Baharini	6	0	Operational
Mission K Clinic	Medical Clinic	Private Practice - Nurse / Midwife	Lamu West	Mpeketoni	Central	Mpeketoni	0	0	Operational
Mkunumbi Dispensary	Dispensary	County Government	Lamu West	Mpeketoni	Mkunumbi	Mkunumbi	0	0	Operational
Mpeketoni Health Services Clinic	Medical Clinic	Private Practice - Clinical Officer	Lamu West	Mpeketoni	Central	Mpeketoni	0	0	Operational

Facility Name	Туре	Owner	Constituency	Division	Location	Sub Location	Be ds	Cot s	Operational Status
Mpeketoni Sub- District Hospital	Sub-District Hospital	County Government	Lamu West	Mpeketoni	Central	Mpeketoni	50	0	Operational
Mugos Clinic	Medical Clinic	Private Practice - Clinical Officer	Lamu West	Mpeketoni	Central	Mpeketoni	0	0	Operational
Muhamarani Dispensary	Dispensary	County Government	Lamu West	Mpeketoni	Mkunumbi	Kibaoni	0	0	Operational
Sloam Medical Clinic	Medical Clinic	Private Practice - Nurse / Midwife	Lamu West	Mpeketoni	Central	Mpeketoni	0	0	Operational
Uzima Medical Clinic (Lamu)	Medical Clinic	Private Practice - Clinical Officer	Lamu West	Mpeketoni	Central	Mpeketoni	0	0	Operational
Didewaride Dispensary	Dispensary	County Government	Lamu West	Witu	Didewarid e	Didewarid e	0	0	Operational
Moa Dispensary	Dispensary	County Government	Lamu West	Witu	Moa	Moa	0	0	Operational
Mpeketoni Health Sevices (Witu)	Medical Clinic	Private Practice - Clinical Officer	Lamu West	Witu	Witu	Witu	0	0	Operational
Pandanguo Dispensary	Dispensary	Community	Lamu West	Witu	Pandanguo	Pandangu o	0	0	Operational
Witu Health Centre	Health Centre	County Government	Lamu West	Witu	Witu	Witu	10	0	Operational

According to the key informants survey, Malaria and fever were the most common diseases among the people. Other common diseases and their frequencies are represented in Figure 5.80 below. Shortage of medical staff, equipment and medicine was cited as the biggest challenge in access to medical care.

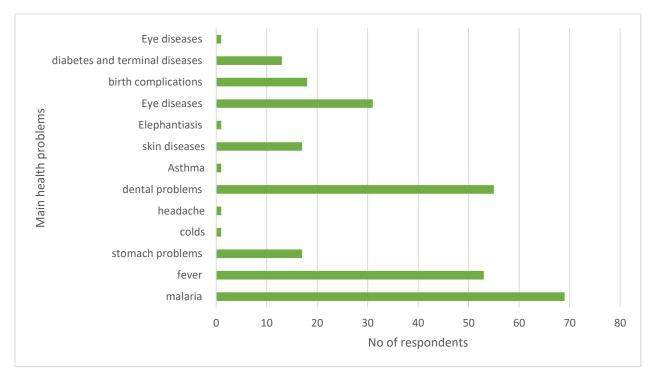


Figure 5.80: Common diseases in Pate Island

It was noted that most population goes to district hospital in faza. Most of the health centers in the area are dispensaries and some community members seek medication from traditional healers. This is represented in

Figure 5.81 below. The average distance that communities travel for medical services is 1.27 km as representeed in Table 5.17 below.

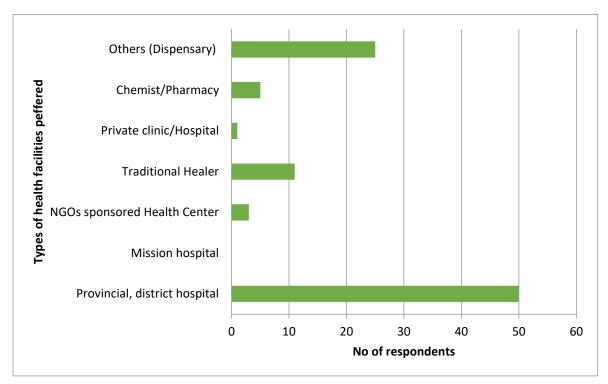


Figure 5.81: Hospitals where community's in Pate seek medication

Table 5.17: Average distances that locations seek medical services

Location	average distance to nearest health facility in Km
FAZA	1.52
KIZINGITINI	0.47
MBWAJUMWALI	0.79
MTANGAWANDA	3.5
PATTE	0.87
TCHUNDWA	0.5
SIYU	
overall average distance	1.275

87% of the responses given portrayed that most of the respondents were not satisfied by the current health facilities and services, while 13% showed a level of contentment with the health facilities. Issues raised that led to the non-satisfactory state include: lack of skilled and professional doctors; lack of or limited supply of medicines; lack of medical facilities such as hospital beds; and poor health services from doctors and nurses.

6.0. PUBLIC AND STAKEHOLDER CONSULTATION

EMCA amendment Act 2015 and The EMCA 1999 and IFC Performance Standards call for effective stakeholder participation and public in the EIA process, this case an ESIA. This chapter describes the Stakeholder Engagement Exercise that was carried out for the proposed drilling programme on Blocks L4 and L13.

Stakeholder engagement is a key part of this ESIA process. One of the key aims of the stakeholder engagement exercise is to ensure all relevant stakeholders are provided with the opportunity to express their concerns and opinions and in turn have them reflected in the ESIA and ESMP. The stakeholder engagement exercise also provides NEMA with the necessary information to assist it in making an informed decision about the Project.

6.1. Objectives of Public Consultation

The main objective of the exercise was to inform stakeholders about the project and its likely effects, which in turn would incorporate their inputs, views and concerns, and thus enable their views to be taken into account during the decision-making. The specific objectives of the consultations were to:

- Obtain local and traditional knowledge that may be useful in decision-making including any Indigenous Knowledge Systems (IKS) (if any);
- Facilitating consideration of alternatives, mitigation measures and trade-offs (if any);
- Ensuring that important impacts are not overlooked and benefits are maximized;
- Reducing chances of conflict through early identification of contentious issues;
- Provide an opportunity for the public to influence the project design and operational plan in a positive manner;
- Improving transparency and accountability of decision-making; and
- Increasing public confidence in the ESIA

6.2. National and International Regulations and Requirements for Stakeholder Engagement

6.2.1. National Requirements for Stakeholder Engagement

The Environmental Impact Assessment (EIA) and Audit Regulations (2003) provide for the stakeholder engagement within EIA and were relied upon while engaging the Stakeholders within the Project Area.

6.2.2. International Best Practices for Stakeholder Engagement

There are Standards for International Best Practice on Stakeholder Engagement that was relied upon during the consultation exercise. These include:

- IFC Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts, 2012
- IFC's Access to Information Policy (AIP), 2012
- AFDB Handbook on Stakeholder Consultation and Participation

6.3. Stakeholders Identification

The first step in the process of public participation process was stakeholder identification. Stakeholder identification was to determine all organizations and individuals who may be directly or indirectly (positively or negatively) affected by the proposed project. In the end, the stakeholders were grouped into two main categories depending on their various needs, interest, and potential influence to the project: which are:

- 1. **Primary Stakeholders:** These are stakeholders directly affected by the project such as the local residences/ communities.
- Secondary Stakeholders: These are stakeholders indirectly by the project but influence development through project implementation. These include but not limited to: National Government, Lamu County Government, Local Government, non-governmental organization (NGOs).

6.4. Tools and Methods of Engagement

6.4.1. Tools

The following documents were developed to support the Stakeholder Engagement Exercise:

- 1. Background Information Documents (BID) in both English and Swahili (Appendix 1). The BID included the following information:
 - Identification of the project proponent
 - A brief summary of the ESIA process, including the public consultation process and opportunities for stakeholder participation
 - A description of the proposed Project (the nature of the exploration drilling activities, methods, equipment and activities schedule)
 - A brief description of the project location as a map
- 2. Meeting Presentation (Appendix 2)
- 3. Stakeholder Meeting Register (Appendix 3)
- 4. Email and follow up telephone conversations. Respondents had the option to return Comments Registration Sheets (CRS) (Appendix 4)

6.4.2. Methods of Stakeholder Engagement

Interview

Enumerators were employed during the stakeholder consultation period to undertake socio-economic questionnaires with key community members and stakeholders. The interviews were expected to yield the following information:

- Socio-economic characteristics of the area. This information was used to corroborate and verify data obtained from other sources, such as the literature review and the quantitative household survey
- 2. Impact of the project on the social, cultural and community settings

Focused Group Discussions (FGD) and Community Baraza's

Focused grouped discussions involved meetings with representatives from different sectors from the National Government, County Government, Local Government, NGOs, Community Based Organisations (CBOs).

The main aim of the community baraza's was to target local residents from the location in Pate Island.

The FGD and Community Baraza's were held in order to obtain:

- Information on community expectations and social risk associated with the project
- Insight on the challenges faced in the County
- Environmental and Socio-economic baseline characteristics of the project area
- To assess impact of the project on the environment and communities, both positive and negative impacts
- To establish mitigation measures for the negative for the negative impacts

6.5. Stakeholders Consulted

The stakeholder consultation process was conducted from 18th April 2016 – 6th May 2016, meetings held in both Lamu County and Nairobi County.

The study team that took part in the stakeholder consultation exercise are as shown in the Table 6.0.1 below.

Table 6.0.1: Public and Stakeholder Consultation Team

ESF Consultants	Zarara
1. Duncan Oyaro	1. Peter Nduru
2. Dorothy Suleh	2. Alawy Abzein
3. Linet Mbova	3. Abdulswamad Basheikh
4. Anthony Kiovi	
5. Michael Kiboi	

6.5.1. Primary Stakeholders Consulted

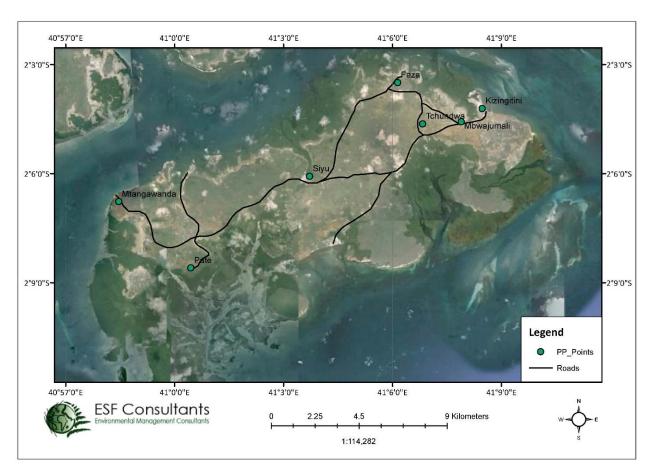
This comprised of communities in Pate Island. The Community stakeholder consultation concentrated in Pate Island because this is the area of interest where the proposed drilling programme is likely to take place.

Table 6.0.2: List of Communities Consulted

Date	Community		
18 th April 2016	Faza		
19 th April 2016	Kizingitini		
	Mbwajumwali which included some community members from Nyabogi		
20 th April 2016	Tchundwa		
	Siyu which included some community members from		
	Shanga		
21st April 2016	Pate		
	Mtangawanda		

^{*}See appendix 5 Public and Stakeholder Meeting Pictures

Figure 6.0.1: Locations of Communities Consulted



6.5.2. Secondary Stakeholders Consulted

Date	Contact Person	Institution	Position Role		
18 th April	Ann Komen	WWF Kenya	Project Officer, Boni-Dodori SFM Project		
2016	Jonathan Chebesa	County Commissioners Office	Assistant County Commissioner		
	Kamal Sharif	Department of Fisheries, Livestock and Co-operative	Director		
19 th April 2016	Edward Wanekhwe Mulongo	Kenya Maritime Authorities (KMA)	Branch Vessel Inspector		
	Mahmoud H. Ali	Kenya Ports Authority (KPA)	Senior Superintendent		
	Ali S. Bwana	Kenya Wildlife Services (KWS)	County Wildlife Conservation and Compensation Committee (CWCCC)		
	Ali Osman Ferul	Kenya Forest Services (KFS)	Corporal		
	Representatives from the Public Health Department (Please see register in Appendix 3)	Public Health Department			
20 th April 2016	Save Lamu Members (Please see Appendix 3 Stakeholder Meeting Register and appendix 5 Public and Stakeholder Meeting Pictures)	Save Lamu NGO			
	Haji Mohamed	Lamu Museum	Conservation Officer		
	Eric Muteti Njeru	National Museums of Kenya	Archaeologist		
	Khalifa Bwanamara Khalifa	Lamu County Government	Faza Ward Administrator		
	Mr. Salim	Ministry of Water	Hydrologist		
	Executive Members	Tafakur Livestock Keepers Self Help	o Group – Tchundwa Location		

Date	Contact Person	Institution	Position Role
		(Please see Appendix 3 Stakeholder Stakeholder Meeting Pictures)	Meeting Register and appendix 5 Public and
21 st April 2016	Philip Oloo Molo	Ministry of Interior and Coordination	Assistant County Commissioner Kiingitini Division
	Luqman Aboud		Chief Kizingitini
	Mohamed S. Mohamed		Assistant Chief Mbwajumwali
22 April 2016	Florence Ndungu	Ministry of Trade and Tourism	Chief officer Trade, Tourism, Culture, Wildlife and Forestry
18 th May 2016	Shakila Abdalla		Lamu County Women Representative
2010	Athman Shariff		Lamu East Member of Parliament
	Mr. Abubakar		

Secondary Stakeholders who responded to comments via phone call and email

Date	Communication means	Contact Person	Institution	Position Role	
25 th April 2016	Phone Call	Shalom 0704864853	Individual interested in	the project	
3 rd May 2016	Email	Mohamed Hashim	County Assembly of Lamu	Speaker	
4 th May 2016	Email	Barkatch Mukholi cliff	NEMA Lamu	Environmental Officer	
5 th July 2016	Phone Call	Tom Bwana	Individual Interested in the project		

^{*}Comments can be found in Appendix 4 CRS and Appendix 6 Issues and Response

6.6. Summary of the Key Issues, Concerns and Comments raised during the Stakeholder Engagement Exercise

Communities raised concerns that the project might have both environmental and socio-economic effects to the surrounding communities. Below are some of the issues raised:

6.6.1. Environmental

Impact on Biodiversity

The communities fear the proposed drilling process might lead to excessive gas been directed into the mangrove ecosystem. The community members claimed that this happened in the 1970s, during the oil drilling done by Shell. Zarara assured the communities that the current technologies are more advanced compared to the 70s, measures have been put in place such as blowout preventers have been fitted to the drilling rig to manage any accident that may arise from drilling.

Due to the unknown location of the drilling site, community members are speculating that the proposed project will be conducted offshore, hence will affect the breeding grounds for fish, crabs, and mangrove ecosystems. The community members were reassured by the both Zarara and ESF Consultants that the operations will be conducted onshore, and no waste from the well pad will be directed into the ocean.

Gas drilling being a new process in Lamu county, community feared that the project will impact on the biodiversity such as destruction of vegetation and soil disturbance in the area. Community proposed that measures should be put in place to ensure that all biodiversity in the area are conserved and not impacted on by the proposed gas drilling activities by undertaking a detailed ecological baseline that will be used in the development of the ESIA report. The vegetation to be impacted will be only on the 200mx200m, we as environmental consultants recommend that the company to plant indigenous trees along the perimeter wall.

It was also noted with the development of access roads in the area will improve accessibility in the area, hence other environmental challenges such logging and poaching will reduce.

Waste Generation

Waste generation and methods of waste disposal was another concern raised by the community members. ESF Consultants assured community members that a waste management system will be put in place; for example, the drilling fluid will be treated and reused in the drilling process. Waste will also be handled and transported by a NEMA certified waste handler.

Water Quality

The community from Pate location raised issues on water quality, their water wells turned salty rendering it unfit for human consumption after over abstraction by BGP during the seismic process. They feared the process of gas drilling which uses a lot of water, the company will not rely on their water wells for water use. Zarara assured the community that they had received complaints from the community members, hence sourced water from Hindi and Lamu Island instead. ESF Consultants would also recommend Zarara to use sea water in their drilling process, if possible.

Air Pollution

During the stakeholder consultation process, some of the community members feared that the process of gas exploration will generate emissions and generate dust leading to air pollution. Zarara and ESF Consultants informed the members that the project will be using up to date technologies to improve efficiencies to reduce emissions and mitigation measures will be put in place to reduce emissions.

Noise and Vibration

Community members are aware that the mobilisation and operation phase of the project will generate noise in and around the projects area; however, they wanted to enquire what mitigation measures will be put in place to reduce the impacts. ESF Consultants informed the community members that mitigation measures will be put in place and this will be included in the report.

6.6.2. Socio-Economic

Employment

Community members appreciated the employment opportunities created during the seismic period, this helped reduce cases of insecurity caused by the unemployed youths. Hence, enquired if there will be employment opportunities during the drilling phase, and what would be the criteria for employment. If employment opportunities will be there first consideration should be given to the local residence. ESF Consultants informed the community that during the ESIA period enumerators were used to collect socioeconomic data to inform the report. Zarara went on to explain that there will be employment opportunities at the drilling stage, though less compared to the seismic phase. This is due to the specialist skills required for the project and confined area space-200m by 200m, less compared to the area coverage during the seismic stage.

The stakeholder also noted that other than created employment opportunities, the proposed development could also create improved retail business in the area for good and services such as food.

Land use

The land in some part of the Island is still in dispute and some still have unresolved land issues. It was also noted that most of the people in Pate Island do not have land Title deeds. Community membered feared that people from other areas will come and reposes or purchase their lands due to the project. There are fears that land speculations might increase the value of land in the area. Therefore, the community demanded that before any commencement of the proposed gas drilling program, community to be issued with land title deeds to avoid conflicts in the future. Zarara assured the community that it will only work on the lands which has no dispute and will deal with land owners.

Compensation

The issue of compensation was raised by the communities in all locations where community stakeholder meetings took place. They suggest that the compensation plan be mutually and legally agreed by all parties involved, it should be done through the actual land owners and not through the chiefs. Zarara assured community the process of gas exploration will only take place after agreement between the

Zarara Oil and affected individuals or community on the land the drilling will take place. They also assured the communities that gas drilling will be site specific; that is, 200m by 200m: smaller in comparison to the size/extent of land the seismic lines passed.

Community leaders consulted during the stakeholder consultation exercise raised concern that compensation should be done to the whole communities and not only to the land owners, it is the community that will be affected by the proposed project.

Community benefits and Corporate Social Responsibility (CSR)

The communities were more concerned on the benefits they would receive once gas has been discovered in Pate Island; and if whether the communities or individuals would benefit from the project. Zarara informed the community members that there will be both direct and indirect benefits to the community members such as employment, CSR proposed by the community members, improved roads since they will need to be upgraded to facilitate transportation of project equipment's. Zarara also gave the example of The Natural Resources (County Royalties) Bill 2013 which has been tabled in parliament for discussion, the Bill seeks to make provisions for sustainable exploitation and equitable apportionment of royalties with other accruing benefits by allocating 20 per cent of the proceeds to county government, 75 per cent to the national government and 5 per cent to the local community where activities are carried out.

Some of the community members claimed that in the past they had been promised CSR project by Zarara, but this is yet to be seen. It was noted the key concern in the area is poor road network; and inadequate health and education facilities. Community members have requested for more CSR projects to be done to improve the economic standards of the area. Some of the suggested CSR projects include: a girls boarding secondary school; rehabilitation and expanding of the only existing roads in Pate Island; equipping of health centers; and providing cheap energy to the communities.

Health and Safety Issues

Communities wanted confirmation from Zarara that their safety will be considered at all times during project operation. Zarara and ESF Consultants confirmed to the community members that the project will be confined within the well pad. Measures will be put in place to ensure health and safety measures are observed at all times.

Social impacts

The proposed project will increase the number of people in the project area and its surroundings which could lead to socio-cultural diversification.

There are also fears that with the increase in population into the project areas, there will be an increase in the spread of HIV and AIDS.

Interference of Mtangawanda Jetty

Community raised concern on the use of Mtangawanda Jetty during the transportation of drilling equipment's. Zarara responded that logistical issues have not yet been finalized, but it will be

recommended to the infrastructure engineers to consider contracting a temporary jetty/platform adjacent to the existing jetty or to expand the existing jetty.

Infrastructural Development

The proposed project will improve accessibility to the area, hence the local residence will be able to access social services provided by the government and other NGOs.

6.6.3. Other Concerns

Issues related to the ESIA

Community members wanted to know the start date for the drilling process. ESF Consultants informed the communities that the start date has not yet been determined, and EIA license needs to be acquired first. To acquire the license this would take 45-90 working days as stipulated in The Environmental (Impact Assessment and Audit) Regulations, 2003: after submission of reports. Zarara went further to explain that the Government of Kenya has extended their exploration license which is to expire in 2017, hence they need to have commenced with the drilling exercise during this time period.

Majority of the stakeholders wanted to know the exact location where the drilling will be undertaken. Zarara informed the community members that the exact locations are not yet known since results from the seismic data has not been finalised.

Key stakeholder also noted that with the new studies to be conducted such as hydrological survey, ambient air quality, and ecological survey will provide much needed data of the area.

All those consulted requested that there should be additional and continuous stakeholder consultations with opinion leaders and community members.

Majority of the stakeholder consulted are for the project because it will promote green energy in the area, and it has potential to create employment and improve accessibility in the area.

Issues not related to ESIA

Community members, particularly from Tchundwa Location raised concerns that holes created during the seismic period were not properly rehabilitated. Zarara confirmed that during the decommissioning phase of the seismic activates all the seismic lines where rehabilitated to its original state. The holes in question might have resulted from the heavy rainfall experienced after the process.

7.0. IMPACT IDENTIFICATION AND ASSESSMENT

This chapter outlines the potential negative and positive impacts that will be associated with the project. The impacts will be related to activities to be carried during the life cycle of the project: that is, design construction, operation and decommissioning phase.

The proposed development has the potential to create a range of impacts on the environment. These potential impacts can be both positive and negative. The objective of this chapter is to assess the likelihood of impacts which will be incorporated in the project design, construction, operation and decommissioning phase. If the negative impacts cannot be eliminated at least to be mitigated to as low as reasonably practicable and meets county, national and international laws.

The purpose of impact assessment and mitigation is to identify and evaluate the significance of potential impacts on identified receptors and resources according to defined assessment criteria and to develop and describe measures that will be taken to avoid or minimise any potential adverse effects and to enhance potential benefits.

7.1. Methodology

Potential Impacts associated with the proposed development were identified from their sources that include project's activities; equipment; processes; materials against their main receptors that include the baseline environmental and social condition. Information collected from public consultation, literature review, and professional knowledge were used to inform the baseline characteristics of the project site. The evaluation of baseline data provides crucial information for the process of evaluating and describing how the project could affect the biophysical and socio-economic environment.

The impacts were then classified as either positive or negative and the project phase whence which they will occur. The evaluation approach implemented in this study is a Receptor-Specific Analysis approach addressing the various sources of impacts from the project's different implementation phases decommissioning of existing structures, project design, construction, operation, and decommissioning phase.

The next step of the impact identification process is in the assessing the impacts in terms of their significance, duration, reversibility, likelihood of occurrence and geographical extent. The list of criteria used to assess significance is shown in Table 7.0.1 and the rating of likelihood of occurrence criteria is shown in Table 7.0.2. Based on the two lists of criteria the impacts of severities are determined.

Table 7.0.1: List of criteria used to assess significance

Criteria	Consequences
Massive impact over a large area resulting in extensive, potentially irreparable damage to a VEC*.	5: Catastrophic
Has a measurable effect on the livelihood of those using a resource over a period of years.	

Massive impact over a large area resulting in extensive, potentially irreparable damage to a site of social and/or cultural importance.	
Long term or continuous impact resulting in substantial adverse changes in a VEC, well outside the range of natural variation. Unassisted recovery could be protracted.	4: Significant
Area of effect is extensive and/or encompasses an area that supports a statistically significant proportion of a VEC population or ecosystem.	
Has a measurable effect on the livelihood of those using a resource over a period of months.	
Significant damage / impact to a site of social and/or cultural importance.	
Moderate adverse changes in a VEC or area that supports a VEC population. Changes may exceed the range of natural variation though potential for recovery within a few years without intervention is good.	3: Moderate
Area of effect encompasses an area that supports either a moderate or minor proportion of a VEC population or ecosystem.	
Long term (> 5 yrs) changes over an area which is not considered to be a VEC.	
Has a measurable effect on the livelihood of those using a resource over a period of weeks.	
Moderate damage to a site of social and/or cultural importance.	
Minor adverse changes in a VEC. Changes will be noticeable but fall within the range of normal variation and be typically short-lived, with unassisted recovery possible in the near term. However, it is recognized that a low level of impact may remain.	2: Minor
Medium term impact (1-5 yrs) in an area that does not encompass a VEC or whose impact is highly localized within a VEC.	
Long term impact over a discrete, small area which does not support a VEC.	
May be noticed but does not affect the livelihood of those utilizing a resource.	
Minor impact to a site of social and/or cultural importance.	
Short term changes in an ecosystem that are unlikely to be noticeable (i.e. fall within the scope of natural variation). Area of effect is restricted to the immediate vicinity of the source.	1: Negligible
Has no discernible effect on the environmental resource as a whole and is likely to go unnoticed by those who already use it.	
Negligible impact to a site of social and/or cultural importance.	
Changes that result in a net positive impact to an ecosystem, environment or population.	Beneficial

^{*} VEC means Valuable Ecosystem Component, used to refer to components of the environment that are considered to be of commercial and/or ecological importance.

Table 7.0.2: Likelihood of occurrence criteria

Likelihood to occur	Category	Score
Impact is highly likely or certain to occur under normal operating/ construction conditions	High	С
Impact may possibly occur under normal operating/construction conditions.	Medium	В
Impact is unlikely to occur under normal operating/construction conditions but may occur in exceptional circumstances.	Low	A

Having identified and characterized the potential significant impacts during each phase using the screening procedure identified above, a matrix was developed to summarize all identified impacts during each phase of the project, please refer to Table 7.0.3.

Table 7.0.3: Impact Assessment Matrix

		Likelihood Rating		
		А	В	С
9	1	1A	1B	1C
CONSEQUENCE RATING	2	2A	2B	2C
ENCE	3	3A	3B	3C
SEQU	4	4A	4B	4C
CON	5	5A	5B	5C
	6	6A	6B	6C
KEY				
Consequence		Likelihood	Acceptability	
1-Negligible 4-Significant		A-Low	Negligible with minor mitigation	
2-Minor	5-Catastropic	B-Medium	Minimize Impacts	
3-Moderate	6-Beneficial	C-High	Unacceptable	

7.2. Positive Impacts

7.2.1. Design Phase

This is one of the beginning stages of a project where the management process of planning and controlling the performance and execution of a project.

It is also at this stage where the ESIA process is undertaken, and preparing the proponent to get the necessary documentations for the execution of the project.

Receptor	Construction Phase Impacts	Impact Significance Rating	
Socio-	Planning for Corporate Social Responsibility (CSR) in the area	6C	
economic	Expectations from stakeholders are that social investment from the project will directly benefit the communities. From the public and the stakeholder consultation exercise, the key focus areas for the CSR strategy are likely to be health, education, employment, and water. These programmes should be undertaken in full consultation with local communities, the county government, and national government; and should be designed to provide positive benefits to individuals and communities.		
	Creation of employment and business opportunities 6		
	The design phase of the project will create employment and business opportunities for various professionals/consultants involved in the planning stage of the project. They include project managers, engineers, surveyors, environmentalists, among others. They may be employed directly in the project or be consultants whose services will be procured.		
	Environmental Opportunities	6C	
	The design phase of the project will present opportunities for green/sustainable designing of the project, which support the minimization of the environmental impacts whilst fortifying the project to achieve its intended objectives.		

7.2.2. Construction Phase

This phase involves mobilization and establishment of the camp, which includes preparing the drilling equipment and ancillary drilling materials and setting up the drilling pad which will accommodate approximately 180 workers.

Receptor	Construction Phase Impacts	Impact Significance Rating
Socio-	Employment	6C
economic	There will be several employment opportunities during the project construction phase. The employment opportunities will be either directly in the project or indirectly through associated businesses (supply food stuffs in the camp). These	

Receptor	Construction Phase Impacts	Impact Significance Rating
	include the generation of employment for skilled and unskilled labour in the short to medium term.	
	Setting up the drilling pad will require extra hands; therefore, employment opportunities will be available for the locals to carry out manual work. The contractor will be expected to recruit, train and employ approximately 50 Lamu residents from the island or immediate due to the complexity of the work at hand.	
	Infrastructural development	6B
	The roads leading to the site will be modified to ease access of transportation of civil engineering staffs, drilling rig and other construction materials to the site. The roads to the site will also serve other residents who are set to benefit from this infrastructure development brought by the project. This will enhance the ease of access to the project site especially to people neighbouring the project.	
	Improved economic growth	6C
	The resources and raw materials needed for the success of the project such as fuel/oil, food, water, among other; will attract taxes including VAT which will be payable to the government hence increasing government revenue while the cost of these raw materials will be payable directly to the producers. The locals may also indirectly benefit by providing goods and services through associated businesses to the camp	

7.2.3. Operational Phase

This phase will involve the actual drilling activities and any other supporting activities.

Receptor	Construction Phase Impacts	Impact Significance Rating
Socio-	Employment	6C
economic	The hydrocarbon exploration drilling project will provide employment opportunities to the people of Pate Island. During the drilling phase the contractor and the company will be expected to recruit, train and employ approximately 50 Lamu residents from the island or immediate due to the complexity of the work at hand. The employed residents will constitute about one quarter of the workforce during the drilling program.	
	Improved living Standards	6B

Receptor	Construction Phase Impacts	Impact Significance Rating
	Employment opportunities as a result of the project will be a platform for the	
	employed local community members to improve their living standards. The income	
	generated can serve the employed personnel to meet their basic needs.	
	Growth of the local economy	6C
	Business investments owned by locals may benefit from the project by providing	
	goods and services to the working crew on tender basis. The use of local providers	
	for goods and services for the development will generate revenue which will be	
	able to flow into the local economy.	

7.2.4. Decommissioning Phase

This phase will involve dismantling the drilling pad and rehabilitation of the drilling site into its previous or better state.

Receptor	Construction Phase Impacts	Impact Significance Rating
Socio- economic	Employment Opportunities The decommissioning phase and its activities will create business for the contracting company that will be charged with pulling down the structure and transporting the resultant materials/debris. This will create employment opportunities for transport services and staff involved in the dismantling of structures and equipment's.	6C
	Growth of Local Economy All the income generated will be taxed and the central government will benefit from the income tax.	6B
	Provision of cheaper building materials Recyclable building materials such as stones, metals, glass, wiring, electronics, and plumbing etc, maybe used for future projects strategically to increase the productivity of the purposes the establishments in which they are used. The materials may also be donated and used for development projects (schools, hospitals etc.) in much needed areas. This will assist in promoting development where it's mostly needed and generally improve the quality of life in those areas and cumulatively in the country.	6B
	Improved aesthetic value/ rehabilitation	6B

Receptor	Construction Phase Impacts	Impact Significance Rating
	Upon decommissioning the project, rehabilitation of the project site and access roads will be carried out to restore the area back to its original or better state. This will include backfilling of the topsoil and re-vegetation which will improve the visual quality of the area.	
Environment	Environmental Conservation and Restoration Waste material/debris can be reused or recycled as raw materials in other construction process, which reduces the demand for raw materials hence reducing the potential impact to the environment that would have been felt if the demand of the raw materials hadn't reduced. The disturbed areas (well pad site and access roads) should be rehabilitated to its original state if not better, this should be done to prevent soil erosion.	6B

7.3. Negative Impacts

7.3.1. Design Phase

Receptor	Design Phase Impacts	Impact Significance Rating	Mitigation Measures	Residual Impacts
Socio- economic	Locals against the project There is a potential that there may be stakeholders/ local residents who may be against the project. However, from the public consultation exercise and the socio-economic survey that was undertaken many of the respondents support the project. Though, majority want to see direct benefits from the project in terms of CSR and employment.	1A	 There should be continuous stakeholder engagement throughout the project life cycle. Develop a grievance mechanism to record any complaint from the public/stakeholders Employ locals 	1A
Socio- economic	Land acquisition In Pate Island, some areas the owners have title deeds and some the land is communal. In the case of private land, the proponent could negotiate with the land owner to lease the land off them. In the case of communal land, the client will have to negotiate with the communities and leaders on what benefits the communities will want. This may create	1B	 Constant communication with the land owners and community members Communicate with local administration, national and county government 	1A
	economic Socio-	There is a potential that there may be stakeholders/ local residents who may be against the project. However, from the public consultation exercise and the socio-economic survey that was undertaken many of the respondents support the project. Though, majority want to see direct benefits from the project in terms of CSR and employment. Socio- economic In Pate Island, some areas the owners have title deeds and some the land is communal. In the case of private land, the proponent could negotiate with the land owner to lease the land off them. In the case of communal land, the client will have to	Socio- economic Locals against the project There is a potential that there may be stakeholders/ local residents who may be against the project. However, from the public consultation exercise and the socio-economic survey that was undertaken many of the respondents support the project. Though, majority want to see direct benefits from the project in terms of CSR and employment. Socio- economic In Pate Island, some areas the owners have title deeds and some the land is communal. In the case of private land, the proponent could negotiate with the land owner to lease the land off them. In the case of communal land, the client will have to negotiate with the communities and leaders on what benefits the communities will want. This may create	Socio- economic There is a potential that there may be stakeholders/ local residents who may be against the project. However, from the public consultation exercise and the socio-economic survey that was undertaken many of the respondents support the project. Though, majority want to see direct benefits from the project in terms of CSR and employment. Socio- economic In Pate Island, some areas the owners have title deeds and some the land is communal. In the case of private land, the proponent could negotiate with the land owner to lease the land off them. In the case of communal land, the client will have to negotiate with the communities and leaders on what benefits the communities will want. This may create

7.3.2. Construction Phase

Impact	Receptor	Construction Phase Impacts	Impact Significance Rating	Mitigation Measures	Residual Impacts
Vegetation Loss/ Soil Disturbance	Biodiversity	Plora Due to varying soil types, Pate Island is largely populated with scrub bushes, scatter palms and indigenous trees, and scrubs. Grassy open swampy places dominate some parts that have drainage problems due to low altitude in the region. The well site for Pate 1 operated by Shell, is largely covered by shrub and bush. Vegetation will be lost or altered to pave way for construction activities for access roads and well pad (200 m by 200 m)	3C	 Clearing vegetation only in construction areas and demarcating areas where no clearing will happen Education on the importance of flora and fauna in the areas, including the appropriate regulatory requirements Rapid regeneration of plant cover must be encouraged by setting aside topsoil during earthmoving and replacing onto areas where the reestablishment of plant cover is desirable to prevent erosion if it was necessary. Implement a tree planting program within the well pad to offset loss of trees due to the construction phase 	2B
	Soil	Activities such as movement of truck transporting drilling materials to site and the construction of the well pad will lead to disturbance of the topsoil which will cause soil erosion. Due to the heavy nature of drilling equipment's (approximately 24-80 tonnes) to be transported by road the roads will be upgraded; and where necessary jetties, bridges and drainage and culverts will be strengthened and reinstated. These activities will lead to the disturbance of top soils leading to an increase in dust levels.	3C	 Work areas should be clearly defined and demarcated, where necessary to avoid unnecessary disturbance on areas outside the development footprint Providing soil erosion control structures on the steeper areas of the site & controlling activities during the rainy season Manage storm and flood flash water effectively to avoid movement of loss soils. Vehicles coming into the site must use designated roads 	2B

Impact	Receptor	Construction Phase Impacts	Impact Significance Rating	Mitigation Measures	Residual Impacts
				 Sprinkling water periodically when operations are under way to prevent raising of dusts Impose and enforce speed limits and provide driving guidelines for vehicle operators; for example, 40 Km/hr 	
Introduction of Invasive species	Biodiversity	During movement/transportation of drilling equipment and materials to the project site will create the risk of introducing invasive species from one area to another. For example, invasive species are introduced into new areas through: foods, stowaway's that attach themselves to shipping ballast tanks, shipping crates, passengers.	2В	Develop a plan for control of noxious weeds and invasive plants that could occur as a result of new surface disturbance activities at the site. The plan should address monitoring, weed identification, the manner in which weeds spread, and methods for treating infestations.	18
Air Pollution	Air Quality	Air pollution as a result of fumes and gases from vehicles and machinery such as generators or fossil fuel using-machines, will generate emission such as oxides of Carbon, Sulphur, and Nitrogen, which will pose risks to environmental and human health. Such emissions will contribute to both regulated pollutants and greenhouse gases in the project site. Raised dust as a result of anthropogenic movements such vehicle movements, throughout the drilling program will also contribute to air pollution.	3C	 Use of low Sulphur fossil fuel. Regular maintenance and services of machines and engines Educate and raise awareness to construction workers on emission reduction and emissions that are likely to occur. Sensitize truck drivers to avoid unnecessary racing of machinery engines at loading, offloading sites, and parking areas and encourage them to keep the vehicle engines off at these points. 	2C
	Occupationa I Health and Safety	The health effects of exposure to fumes and dust generated from construction activities of the well pad, vehicle movement transporting drill rig to site can include irritation of the upper respiratory tract (nose	3B	 Provide workers with appropriate PPE such as dust masks. 	2B

Impact	Receptor	Construction Phase Impacts	Impact Significance Rating	Mitigation Measures	Residual Impacts
		and throat), tightness in the chest, wheezing, lung damage, bronchitis, sight problems.			
Noise Pollution		During the construction phase of the proposed project, there will be an increase in the noise levels within the area due to machinery/ equipment including generators, vehicular traffic, and other construction activities. Elevated noise levels within the site will affect project workers and the residents, passers-by and other persons within the vicinity of the project site. The estimated average level of noise generated during the construction phase is about 65 dBA covering 500 feet from the source. ⁴⁰	3C	 Machinery should be maintained regularly to reduce noise resulting from friction during operations. Using modern machinery equipment with noise suppressing technologies in order to reduce the noise-rating as much as possible. Natural gas or diesel engines can be replaced with electric motors. These motors, if properly installed, tend to be much less noisy than their engine counterparts. The use of electrical motors depends on the availability of electricity Locate all stationary construction equipment (i.e., compressors and generators and exploratory wells) as far as practicable from nearby residences and other sensitive receptors. Vehicle movement should be limited to daytime hours, except in emergency cases, to reduce generation of noise 	3B
Traffic Impacts	Traffic	Traffic Congestion Activities related to construction works will undoubtedly induce uncharacteristic levels of additional vehicular traffic along access roads.	3B	 Issue notices/advisories of pending traffic inconveniences and solicit tolerance by local residents before 	2В

⁴⁰ Earthworks. *Oil and Gas Noise*. [Date Accessed 20th May 2016] Available from: https://www.earthworksaction.org/issues/detail/oil and gas noise

Impact F	Receptor	Construction Phase Impacts	Impact Significance Rating	Mitigation Measures	Residual Impacts
		There will be approximately 5 – 10 trucks transporting material to and from Mtangawanda Jetty to the project site. The trucks will carry approximately 150-210 truckloads of equipment's: carrying loads weighing approximately 24-80 tonnes. This is significantly more compared to the current modes of transport - 3 matatus which operate in the morning and evening transporting passengers to take boats to and from Mtangawanda and Lamu - 1 bus stationed at Kizingitini used during special occasions - Others such as: police van, ambulance and power contractor's vehicles found stationed at certain areas - Boda Boda transporting passengers from one village to another - Donkeys transporting passengers and goods within villages Though the vehicle movements are not that frequent. Most common transport means in the area are boda bodas and donkeys. The drilling rig and ancillary drilling equipment will be transported by ship or barge from the ports of Mombasa to Lamu. These materials will be landed on Pate Island by barge using the Jetty at Mtangawanda or on the adjacent beach and transported to the drill site by road using truck. Fear from community members is that this will interfere with regular vessel movements at the jetty.		the commencement of construction works Flagmen/ road marshals should be employed to control traffic and assist mobilization vehicles as they enter and exit the project site. Ensuring that all drivers for the project comply to speed regulations, i.e 40 kmph Ensure all vehicles and machinery used for the project are in good working conditions both legally and are commensurate to the intended use. Prepare an access road siting study and management plan to guide road design, construction, and maintenance standards, and to allow for successful interim and final reclamation. (For example, require operators to coordinate closely with the local governments responsible for maintaining roadways providing access to the project area. Compare the number, size, and weight of loads to service projects to the existing road infrastructure to determine if roads	

Impact	Receptor	Construction Phase Impacts	Impact Significance Rating	Mitigation Measures	Residual Impacts
Health and	Occupationa	Occupational Health and Safety In addition, increased traffic will result in noise creation, dust generation, and safety impacts for other road users and the local residents living and working within a close proximity to the access roads of the site. Below are some of the hazards that will lead to health and safety rick if proper HSE proceedures are not	3B	and bridges are adequate to support intended loads. Consider routing project traffic to minimize impacts on local residents.) Provide workers with appropriate	2B
Safety Risks	I Health and Safety	and safety risk if proper HSE procedures are not followed: 1. Working in confined spaces 2. Injuries caused by moving objects 3. Working at heights 4. Fire risks Workers will also be exposed to biota in the area that can pose health and safety risks such as snakes, scorpions, mosquitos, among others.		PPE such as goggles, gloves, hard hats, overalls, ear muffs, among others Employing an Occupational safety and health (OSH) plan that will outline all OSH risks and provide a strategy for their management; Maintain on site a record of incidents and accidents Provision of warning signs warning of construction activity and heavy machinery turning. Providing firefighting equipment and in easily accessible areas as well as ensuring site personnel are well trained to use them as well as maintaining them regularly Raising awareness, educating workers on risks and use of equipment; animal species and habitats found in the area and their risks; first aid training. Have a malaria management plan in place	
Visual impact		Tourism	2B	 The design should take advantage of the existing topography and 	1B
<u> </u>					

Impact	Receptor	Construction Phase Impacts	Impact Significance Rating	Mitigation Measures	Residual Impacts
		Construction activities such as clearing of vegetation, transportation of drilling materials to site, construction of the well pad will affect aesthetic values of the area. Pate Island is known to get tourist to view its historical and cultural sites. This will affect tourism in the area due to the sudden movements of equipment's and people in the area.		vegetation, and should use low profile facilities and storage tanks if technically feasible and if the overall facility During construction of the well pads, existing vegetation around the perimeter of the site should be maintained to minimize views into the site. Following construction, natural vegetation should be restored in none operational areas of the site and/or additional landscape planting with local indigenous species used to improve views into the site. Consider site-specific landscaping in selected area to provide screening for resident whose property abuts the project. Consider suitable paint colour for large structures that can blend with the background. Consider the use of existing utility and transport corridors for access roads to the extent possible; Ensure good housekeeping of the site in order to create a positive image in the eyes of the public.	

7.3.3. Operation Phase

Impact	Receptor	Operational Phase Impacts	Impact Significance Rating	Mitigation Measures	Residual Impacts
Fauna Disturbance	Fauna Disturbance	Short-term disturbance of local habitats from base camp lights, drilling noise, vehicular traffic and other activities will lead to changes in – animal habitat, food supplies, migration routes of birds or changes in herbivore grazing patterns (livestock) etc. Pate 1 drill is located near Siyu location. From the socio-economic survey conducted, Consultant majority of the respondents practice livestock keeping. Livestock grazing is practiced in and around the area. Depending on the location of the proposed project site this will affect grazing patterns but at a minor level since the proposed development will take up 200m by 200m area coverage. Other wild speices such as dik dk, wild dogs will be affected by the light and noise pollution from the proposed projects.	2A	 Educate workforce on environmental concerns and implement policies to protect biodiversity. Schedule operations during least sensitive periods such as species migration periods, nesting and mating seasons. For example, there are nesting sites for sea turtles in Pate Keep the workforce within defined boundary and to the agreed access routes for vehicles. Implement a tree planting program within the well pad to offset loss of trees due to the construction phase Ensure protection of important resources by establishing protective buffers to exclude unintentional disturbance. 	1A
Noise and Vibration	Biodiversity and Human settlement around the proposed project area	The project involves a 24 hour drilling program. Noise and vibration from the drilling operations are limited to the surrounding environment. Vibrations are localized and limited to the point of drilling. Noise and vibration pollution will emanate from flaring and rotating equipment-rigs. Noise sources will include flares and vents, pumps, compressors, generators, and heaters. However, the operational	3C	 Machineries should be maintained regularly to reduce noise resulting from friction during operations. Using modern machinery equipment with noise suppressing technologies in order to reduce the noise-rating as much as possible 	2C

	crew will be the most exposed to the noise and vibration, and can be negatively affected. Expected noise levels to be generated from the drilling site are as follows ⁴¹ : • Typical compressor station 50dBA (375 feet from property boundary) • Pumping unit 50 dBA (325 feet from well pad) • Fuel and water trucks 68 dBA (500 feet from source) • Crane for hoisting rigs 68 dBA (500 feet from source) • Concrete pump used during drilling 62 dBA (500 feet from source) • Average well construction 65 dBA (500 feet from source)		 Provision of warning signs should be made at the gate warning of construction activity and heavy machinery turning. A grievance procedure will be established whereby noise complaints by neighbours are recorded and responded to Workers to be provided with PPE such as earmuffs and be trained on how to use them when operating in noisy environment. Housing engines and pump jacks in sound insulated building to reduce noise Operating engines at their recommended constant number of revolutions per minute (RPM) to reduce the annoying fluctuating noise caused by engines slowing down or speeding down 	
Soil disturbance	Activities such as vehicle movement and drilling activities will lead to soil disturbance such as removal of vegetation, mixing of soil horizons, soil compaction, increased susceptibility of soils to wind and water erosion, soil contamination, loss of top soil productivity, disturbance of biological soil crust.	3C	 Work areas should be clearly defined and demarcated, where necessary to avoid unnecessary disturbance on areas outside the development footprint Providing soil erosion control structures on the steeper areas of the site & controlling activities during the rainy season 	3B

⁴¹ Earth Works. *Oil and Gas Noise.* [Date accessed 20th May 2016] Available from: https://www.earthworksaction.org/issues/detail/oil and gas noise#.V0Kuob6M64b

			 Manage storm and flood flash water effectively to avoid movement of loss soils. Rapid regeneration of plant cover must be encouraged by setting aside topsoil during earthmoving and replacing onto areas where the reestablishment of plant cover is desirable to prevent erosion if it was necessary. 	
Waste generation	The main sources of waste generated during the drilling campaign will be the drilling mud and cuttings; drilling rig waste; and domestic waste from the people living in the well pad. Domestic waste: containers, packaging, drinking water bottles, and miscellaneous waste form equipment. Drilling waste: drilling mud, drilling cuttings, plastics and scrap metal. Typically, the solid medium used in most drilling fluids is barite (barium sulphate) for weight, with bentonite clays as a thickener. Drilling fluids also contain a number of chemicals that are added depending on the downhole formation conditions. These cuttings contain a proportion of residual drilling fluid. These spent fluids are then contained for reuse or disposal (NADFs are typically reused).	3C 3C	Storage in dedicated storage tanks or lined pits prior to treatment, recycling, and / or final treatment and disposal On-site or off-site biological or physical treatment to render the fluid and cuttings non-hazardous prior to final disposal using thermal desorption in an internal thermal desorption unit to remove NADF for reuse, bioremediation, landfarming, or solidification with cement and / or concrete. Final disposal routes for the nonhazardous cuttings solid material should be established, and may include use in road construction material, construction fill, or disposal through landfill including landfill cover and capping material where appropriate. In the case of landfarming it should be demonstrated that subsoil chemical, biological, and physical properties are preserved and water resources are protected;	2C

Produced water:-the produced water will contain a complex mixture of inorganic (dissolved salts, trace metals, suspended particles) and organic (dispersed and dissolved hydrocarbons, organic acids) compounds, and in many cases, residual chemical additives (e.g. scale and corrosion inhibitors) that are added into the hydrocarbon production process. Produced water discharges to surface waters or to land should be the last option considered and only if there is no other option available To reduce the volume of produced water for disposal the following should be considered: Adequate well management during well completion activities to minimize water production; Recompletion of high water producing wells to minimize water shutoff techniques, when technically and economically feasible; Shutting in high water producing wells. To minimize environmental hazards related to residual chemical additives in the produced water stream where surface disposal methods is adopted, production chemicals will be selected carefully by taking into account their volume, toxicity, bioavailability, and bioaccumulation potential.			 Recycling of spent fluids back to the vendors for treatment and re-use. 	
	complex mixture of inorganic (dissolved salts, trace metals, suspended particles) and organic (dispersed and dissolved hydrocarbons, organic acids) compounds, and in many cases, residual chemical additives (e.g. scale and corrosion inhibitors) that are	3C	Sprayed on the unpaved roads for dust control, Produced water discharges to surface waters or to land should be the last option considered and only if there is no other option available To reduce the volume of produced water for disposal the following should be considered: Adequate well management during well completion activities to minimize water production; Recompletion of high water producing wells to minimize water production; Use of downhole fluid separation techniques, where possible, and water shutoff techniques, when technically and economically feasible; Shutting in high water producing wells. To minimize environmental hazards related to residual chemical additives in the produced water stream where surface disposal methods is adopted, production chemicals will be selected carefully by taking into account their volume, toxicity, bioavailability, and	

Water Sources	Water	Water Consumption Maximum expected water usage for the well is 3.18 million litres. Approximately 40,000 litres of water per day will be used in the civil engineering process such as the construction of the well pad and associated infrastructure. Water will also be used in field camps which will depend on several factors such as the number of people in the camps, number of facilities such as accommodation, among others. Approximately 200 litres will be used per person per day. However, Pate Island has a problem in the accessibility of freshwater. There are minimal boreholes in the area that provide freshwater, hence	3B	Before disposal of the water on surface water or land, the produced water will be treated to achieve the standards below • Total hydrocarbon content: 10 mg/L • pH: 6 - 9 • BOD: 25 mg/L • COD: 125 mg/L • TSS: 35 mg/L • Phenols: 0.5 mg/L • Sulfides: 1 mg/L • Heavy metals (total)a: 5 mg/L • Chlorides: 600 mg/I (average), 1200 mg/L (maximum) • There several options in sourcing freshwater: 1. Drilling a bore hole to tap in to aquifer of Vumbe wells in the mainland 2. Filling barges with water from rivers in the main land (e.g. Tana River) or from Malindi or Mombasa; and transporting to Pate Island. 3. Building a storage pit which can be filled with freshwater before commencement of the project, which can act as an available reserve to minimise possible over abstraction with the local supply.	2B
		-			
		•		abstraction with the local supply.	
		the proponent needs find alternative sources of			
		water.		The proponent could also consider the	
				use of seawater in the drilling process.	
				However, this is dependent on the type	
				of drill mud to be used. The proponent	

			wishes to use WBM. However, if seawater is used together with WBM it will have an impact on fluid and cutting disposal due to the associated chloride content. The chloride content could be too high for disposal on site, the maximum permissible level is 600 parts per million (ppm).	
			The best options we would recommend to be used during this project would be sourcing water from Malindi or Mombasa and transported to Pate Island via barge.	
Waste water	Waste Water Liquid effluent will be from the drilling process, accommodation, kitchen, rain water etc. Storm water from heavy rainfall can introduce sediment and toxic chemicals into nearby rivers and streams and other water sources. These have the potential of contaminating water sources if not properly handled.	3C	 Wastewater can be recycled and used in the drilling process, domestic effluent can also be treated and recycled and sludge from site for safe disposal at a designated disposal site. In the management of black and grey water, the proponent can dispose the waste in the three methods below: Use of a septic tank of sufficient capacity to accommodate anticipated crew numbers Kitchen waste water will be channelled through a grease trap before going into the septic tank Kitchen sinks, wash basins and drains shall be permanently 	2B

				soils and avoid conduction line
				clogging
				 Where possible rain water can be
				used in the drilling process. If pit
				water is deemed uncontaminated it
				can be pumped offsite or reused as
				irrigation water for restoration of
				the site perimeters.
Air	Air quality	Air pollution as a result of:	3C	■ Sprinkling water periodically when 2C
Pollution		 exhaust fumes and gases from vehicles and 		operations are under way to prevent
		machinery such as compressors, generators or		raising of dusts;
		fossil fuel using-engines, gas flaring will generate		■ Impose and enforce speed limits and
		emission such as oxides of Carbon, Sulphur,		provide driving guidelines for vehicle
		Nitrogen, and particulates		operators e.g. speed limit of 30kph
		 raised dust levels by disturbing and moving soils 		in the site area
		from activities such as clearing vegetation,		 Use of low Sulphur fossil fuel.
		excavating, truck and equipment movement,		 Regular maintenance and services of
		drilling		machines and engines
				■ Educate and raise awareness to
		This can pose risks to environmental and human		construction workers on emission
		health.		reduction and emissions that are
				likely to occur.
		Such emissions will contribute to both regulated		Sensitize truck drivers to avoid
		pollutants and greenhouse gases in the project site.		unnecessary racing of machinery
				engines at loading, offloading sites,
				and parking areas and encourage
				them to keep the vehicle engines off
				at these points.
				Provide workers with appropriate
				PPE such as dust masks.
				 Use of cost effective technologies
				and practices to minimize emissions

				of greenhouse gases and other	
Oil and Chemical spill	Physical Environment	This include spills from domestic products used in cleaning; fuel stored on site use din vehicle, machinery used on site such as the drilling rig, generator. This will pose risk of soil pollution.	2B	 Requirements of oil spill and emergency plans must be met before operations commence. Apply spill prevention practices and response actions in refueling and vehicle-use areas to minimize accidental contamination of habitats and soil. Address spills immediately per the appropriate spill management plan, and initiate soil clean-up and soil removal if needed. Containerize spent oils and lubes for appropriate disposal or recycling. Containerize contaminated soils that cannot be treated in situ and remove off-site for treatment Conducting maintenance and repair activities in well-established zones having paved surfaces to collect the 	1B
Health and Safety Risks	Occupational Health and Safety	Risks and hazards that will lead to serious injury associated with the exploration drilling process, include: Falls from elevated platforms (drilling platforms, well pads, etc.) Working in confined spaces which has several hazards such as reduced oxygen Ergonomic Hazards such as lifting heavy items, bending, reaching overhead, pushing and pulling	4C	 oil and prevent soil pollution Placing signs around where there are risks. Signs should meet international standards and should be in English and Kiswahili for easy understanding Placing visible and readable signs to control the movement of vehicles and notify motorists and pedestrians around the, and workers in the site 	2C

heavy loads, posture: all these may lead to strains	The well pad should be cordoned off
and sprains	to protect the general public from
 High pressure lines and equipment hazards 	dangers associated with operations
■ Electrical hazards (electric faults, electrocution)	work
which might cause fires	 Ensuring there is security in and
■ Fatigue	around the site to control the
Insecurity	movement of unauthorized
	personnel
	■ Ensuring all potential hazards such
	as movable machine parts are
	labeled
	■ Providing safe and secure storage
	for equipment and materials in the
	site and maintaining Material Safety
	Data Sheets (MSDSs)
	All workers should be provided with
	PPE and trained on how to use
	them. These include safety boots,
	overalls, helmets, goggles, earmuffs,
	dust masks, gloves among others
	 Raising awareness, educating
	workers on risks from equipment,
	and ensuring they receive adequate
	training on the use of the equipment
	■ Employing an OSH plan that will
	outline all OSH risks and provide a
	·
	strategy for their management
	■ Establishing emergency procedures
	against hazards and ensuring the
	202

				workers stay aware/educated on following them and commensurate to the magnitude and type of emergency, by conducting regular drills and involving the neighbors. Providing firefighting equipment and in easily accessible areas as well as ensuring site personnel are well trained to use them as well as maintaining them regularly Creating safe and adequate fire and emergency assembly points and making sure they are well labeled	
Socio- economic	Local	Cultural and regional interaction with the local community Inter and intra communal conflicts and human rights issues may occur as a result of labour supply which could attract third party agitation. The workers and other migrants could include those who are from diverse cultural traditions and religious backgrounds.	2B	 Grievance Mechanism will be in place to resolve any employment and local supplier-related grievances. Where feasible look into vocational training programs for the local workforce to promote development of skills required by the oil and gas industry Develop and implement a Health Risk Assessment; and a workforce management plan for the local workforce. Preference should be given to locals as source of labour force for skilled, semi-skilled and unskilled laborers. Observing the cultural setup of the local community in terms of 	1A

			interaction between men and	
			women	
will have a shof an area. Paits historical amovement of tourism in the perception. Due to the lonot be visible	of the rig and associated infrastructure fort term visual impact on the character ate Island is known to get tourist to view and cultural sites. Due to the sudden activities in Pate, this will impact area depending on individual cation of Pate 1 the proposed project will from the main road. The height of a rigitely 50 m high.	2B	 Adopt suitable paint colour for large structures (rig) to blend with the background. External lighting shall be as unobtrusive as possible and shall be shielded and directed downwards to prevent side spill. The use of tall mast lights shall be carefully assessed before being used due to proximity of fauna and residential areas. Ensure good housekeeping of the site in order to create a positive image in the eyes of the public. Landscaping can help reduce the visual impacts of the wells e.g. forming the soils around the well pads into ridges or gentle berms and planting vegetation on ridges and berms The wellpad design should take advantage of the existing topography and vegetation, and adopt the use low profile facilities and storage tanks In adopt the use low profile facilities and storage tanks In adopt the use low profile facilities and storage tanks In adopt the use low profile facilities and storage tanks In adopt the use low profile facilities and storage tanks In adopt the use low profile facilities and storage tanks In adopt the use low profile facilities and storage tanks In adopt the use low profile facilities and storage tanks In adopt the use low profile facilities and storage tanks 	1A

7.3.4. Decommissioning Phase

Decommissioning aims at restoring the project site back to its original state or to a stable environmental conditions for future use. However, some of the decommissioning activities to be carried out onsite may result in negative impacts to the bio and socio-economic environment.

Decommissioning activities may include but not limited to: dismantling of the drilling rigs, ancillary equipment and the camp; transportation of equipment out of site; re-grading of the roads; and revegetation.

Impact	Receptor	Operational Phase Impacts	Impact Significance Rating	Mitigation Measures	Residual Impacts
Waste Generation	Environment	Waste generation During the decommissioning phase and demolition of the well pad the waste generated will contain materials that were used in construction of the well pad. These include concrete, metal, wood and waste in form of debris and pieces of steel.	2В	 The contractor should prepare a site waste management plan prior to commencement of demolition activities. Some of the solid waste produced can be recycled for use in future projects or sold off as scrap. Identifying all sources of wastes, and ensuring wastes are handled by licensed NEMA waste handler Combustible waste material should not be burned on site 	1B
Noise and Vibration	Local residence	The sources of noise during the decommissioning phase will be generated from bringing down the drilling rig, auxiliary equipment and camp; vehicle movement transporting the rig and auxiliary equipment from the site to the jetty.	3C	 Inform local residents beforehand, via notices and advisories, of pending noisy periods and solicit their tolerance well before the commencement of demolition works. Limit pick-up trucks and other small equipment to an idling time, observe a common-sense approach to vehicle use, and encourage 	2C

Impact	Receptor	Operational Phase Impacts	Impact Significance Rating	Mitigation Measures	Residual Impacts
Air pollution	Air quality	Major sources of emissions are dust from increased heavy vehicular traffic; exhaust emissions and particulates from generators; vehicles and heavy machinery; and dust due to restoration of disturbed areas (for example; re-grading of the road surfaces).	3C	workers to shut off vehicle engines whenever possible. Providing workers with appropriate PPE's such as earmuffs when operating noisy machinery and when in a noisy environment. Sprinkling water on the loose road surfaces to reduce dust emission. Imposing speed limits to limit the heavy vehicles from racing through the unpaved road surfaces. Scheduling track movement to reduce the vehicular traffic Use of efficient new technologies having low particulate emissions. Regular maintenance of vehicles and machines ensuring low emissions. Provision and Use of Personal Protective Equipment (PPE) e.g. dust masks, safety glasses	2C
Health and Safety Risk	Occupational Health and Safety	The potential health and safety risks during the decommissioning phase are related to the presence of heavy machinery and increased vehicular traffic which increases the likelihood of accidents occurring.	3C	 Provision and Use of Personal Protective Equipment (PPE) e.g. dust masks, overalls, gloves, Raising awareness among the workers on the likely risk and hazards and ensure they have adequate training on the use of machines and equipment. 	3B

Impact	Receptor	Operational Phase Impacts	Impact Significance Rating	Mitigation Measures	Residual Impacts
				 Employing a proper OHS plan that will outline all the potential OHS risks as well as propose a management strategy. Proving proper firefighting equipment and establishing fire assembly zones. 	
Socio- economic	Employees	Loss of employment After decommissioning of the project, there will be loss of jobs to locals employed on contract basis to work on site. This will affect both skilled and unskilled personnel	4C	 Zarara will ensure all the local employees are well informed on the project decommissioning and its likely impacts before the project final closure. Zarara will also consider providing training to build the local skills 	1C
Traffic Impacts	Traffic congestion to the local residence	During the decommissioning and reclamation phase, there will be an increased in heavy vehicle traffic to and from the project site. Such vehicles will be carrying heavy machinery and hauling wastes from the site. Due to the scarcity of vehicle in the project site this will be a minimal impact to the local residents. The Mtangawanda jetty on Pate Island will also witness increased sea traffic; however, the jetty is mostly used in the early morning and late evening by local residents.	3B	 Issue notices/advisories of pending traffic inconveniences and solicit tolerance by local residents before the commencement of works Flagmen/ road marshals should be employed to control traffic and assist mobilization vehicles as they enter and exit the project site. Ensuring that all drivers for the project comply to speed regulations Ensure all vehicles and machinery used for the project are in good working conditions both legally and are commensurate to the intended use. 	2B

8.0. ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)

In this part of the report, environmental and social management control measures are articulated. The control measures seek to avoid, minimize, and manage all the environmental, social, health, and community related risks and negative impacts identified in the study. The chapter also covers monitoring indicators that Zarara and its contractors will use in evaluating the performance of the control systems. All these measures lie within the Kenyan legislations and international best practices as well as the Zarara Oil Internal Environmental, Social and Health (ESH) management systems.

This ESMP set a benchmark for successful implementation of the project as well as respect and conservation of both the social and environmental set up within which the project will operate. Some aspects of the ESMP recommend training and re-training of the responsible persons to ensure that they have the capacity to implement the recommendations on the control mechanisms. This implies that training and capacity building forms a key pillar in the implementation of the ESMP.

8.1. Design Phase

Impact	Receptor	Impact Significance	Mitigation Measures	Residual Impacts	Indicator	Responsible Person/	Performance and Monitoring	Timing/ Frequen
		Rating				Function		су
Community	Socio-	1A	■ There should be	1A	Complaints raised	CLO	Grievance	Weekly
perception	economic		continuous stakeholder		by public and		Mechanism	
			engagement throughout		stakeholders	Zarara		
			the project life cycle.					
			■ Develop a grievance			Relevant		
			mechanism to record any			external		
			complaint from the			consultants		
			public/stakeholders					
			Employ locals			Local,		
						County and		
						National		
						Government		
Conflict on	Socio-	1B	 Constant communication 	1A	Complaints raised	CLO	Grievance	Weekly
land issues	economic		with the land owners and		by public and		Mechanism	
			community members		stakeholders	Zarara		

Impact	Receptor	Impact	Mitigation Measures	Residual	Indicator	Responsible	Performance	Timing/
		Significance		Impacts		Person/	and Monitoring	Frequen
		Rating				Function		су
			Communicate with local					
			administration, national			Relevant		
			and county government o			external		
						consultants		
						Local,		
						County and		
						National		
						Government		

8.2. Construction Phase

Impact	Receptor	Impact Significance Rating	Mitigation Measures	Residual Impacts	Indicator	Responsible Person/ Function	Performance and Monitoring	Timing/ Frequency
Vegetation Loss/ Soil Disturbance	Biodiversity	3C	 Clearing vegetation only in construction areas and demarcating areas where no clearing will happen Education on the importance of flora and fauna in the areas, including the appropriate regulatory requirements Rapid regeneration of plant cover must be encouraged by setting aside topsoil during earthmoving and 	2В	No harm to Species and Habitat Amount of landscaped areas or vegetated areas	Contractor EHS Officer	Follow management plan and procedures to minimize: • Selective clearing of vegetation • Biodiversity management to try to control personnel and project to	Weekly

Impact	Receptor	Impact Significance Rating	Mitigation Measures	Residual Impacts	Indicator	Responsible Person/ Function	Performance and Monitoring	Timing/ Frequency
			replacing onto areas where the reestablishment of plant cover is desirable to prevent erosion if it was necessary. Implement a tree planting program within the well pad to offset loss of trees due to the construction phase				prevent causing harm to habitats or species	
	Soil	3C	 Work areas should be clearly defined and demarcated, where necessary to avoid unnecessary disturbance on areas outside the development footprint Providing soil erosion control structures on the steeper areas of the site & controlling activities during the rainy season Manage storm and flood flash water effectively to avoid movement of loss soils. Vehicles coming into the site must use designated roads 	2B	Size of landscaped areas Number of erosion control structures Number of designated access roads for the vehicles			

Impact	Receptor	Impact Significance Rating	Mitigation Measures	Residual Impacts	Indicator	Responsible Person/ Function	Performance and Monitoring	Timing/ Frequency
			 Sprinkling water periodically when operations are under way to prevent raising of dusts Impose and enforce speed limits and provide driving guidelines for vehicle operators; for example, 40 kmph 					
Introduction of Invasive species	Biodiversity	2B	■ Develop a plan for control of noxious weeds and invasive plants that could occur as a result of new surface disturbance activities at the site. The plan should address monitoring, weed identification, the manner in which weeds spread, and methods for treating infestations.	1B	Record of invasive species found in the area	EHS Officer		Weekly
Air Pollution	Air Quality	3C	 Use of low Sulphur fossil fuel. Regular maintenance and services of machines and engines Educate and raise awareness to construction workers 	2C	Availability of speed limit signs Number of engines switched off during loading /offloading	Contractor Supervisors EHS Officer	Vehicle maximum speed limit of 40 kmph Use of in- vehicle	Daily

Impact	Receptor	Impact Significance Rating	Mitigation Measures	Residual Impacts	Indicator	Responsible Person/ Function	Performance and Monitoring	Timing/ Frequency
	Occupational Health and Safety	3B	on emission reduction and emissions that are likely to occur. Sensitize truck drivers to avoid unnecessary racing of machinery engines at loading, offloading sites, and parking areas and encourage them to keep the vehicle engines off at these points. Provide workers with appropriate PPE such as dust masks.	2B	Incidence record of ill employees PPE to be worn during operations	Contractor Supervisors EHS Officer	monitoring system (IVMS) Safety observation card system PPE worn during operations and at relevant sections Safety observation card system	Daily
Noise Pollution		3C	 Machinery should be maintained regularly to reduce noise resulting from friction during operations. Using modern machinery equipment with noise suppressing technologies in order to reduce the noise-rating as much as 	3B	Number of noise warning signs on site (i.e. areas that generate more than 80 db of noise) Availability of PPE such as ear muffs	Contractor Supervisor EHS Officer	Incident report PPE to be worn during operations Safety observation card system	Daily

Impact	Receptor	Impact Significance Rating	Mitigation Measures	Residual Impacts	Indicator	Responsible Person/ Function	Performance and Monitoring	Timing/ Frequency
			possible. Natural gas or					
			diesel engines can be					
			replaced with electric					
			motors. These motors,					
			if properly installed,					
			tend to be much less					
			noisy than their engine					
			counterparts. The use					
			of electrical motors					
			depends on the					
			availability of					
			electricity					
			Locate all stationary					
			construction					
			equipment (i.e.,					
			compressors and					
			generators and					
			exploratory wells) as					
			far as practicable from					
			nearby residences and					
			other sensitive					
			receptors.					
			Vehicle movement					
			should be limited to					
			daytime hours, except					
			in emergency cases, to					
			reduce generation of					
			noise					

Traffic Impacts	Traffic	3В	 Issue notices/advisories of pending traffic inconveniences and solicit tolerance by local residents before the commencement of construction works Flagmen/ road 	No accident/incident reported Availability of warning signs for heavy traffic and trucks on site	Contractor Supervisors EHS Officer	Vehicle speed limit of 40 kmph Follow Zarara management policies and guidelines	Daily
			employed to control traffic and assist mobilization vehicles as they enter and exit the project site. Insuring that all drivers for the project comply to speed regulations, i.e 40 kmph Ensure all vehicles and machinery used for the project are in good working conditions both legally and are commensurate to the intended use. Prepare an access road siting study and management plan to guide road design, construction, and maintenance	Availability of speed limit signage on site Frequency of engine maintenances and servicing		card system	

1			1	1
	standards, and to allow			
	for successful interim			
	and final reclamation.			
	(For example, require			
	operators to			
	coordinate closely with			
	the local governments			
	responsible for			
	maintaining roadways			
	providing access to the			
	project area. Compare			
	the number, size, and			
	weight of loads to			
	service projects to the			
	existing road			
	infrastructure to			
	determine if roads and			
	bridges are adequate			
	to support intended			
	loads. Consider routing			
	project traffic to			
	minimize impacts on			
	local residents.)			

Impact F	Receptor	Impact Significance Rating	Mitigation Measures	Residual Impacts	Indicator	Responsible Person/ Function	Performance and Monitoring	Timing/ Frequency
Safety Risks H	Occupational Health and Safety	3B	 Provide workers with appropriate PPE such as goggles, gloves, hard hats, overalls, ear muffs, among others Employing an OSH plan that will outline all OSH risks and provide a strategy for their management; Maintain on site a record of incidents and accidents Provision of warning signs warning of construction activity and heavy machinery turning. Providing firefighting equipment and in easily accessible areas as well as ensuring site personnel are well trained to use them as well as maintaining them regularly Raising awareness, educating workers on risks and use of equipment; animal species and habitats found in the area and their risks; first aid training. 	28	Records of training, induction, tool box meetings, Incident report Availability of PPE Availability of warning signs in areas with occupational, safety and health risks on site	EHS Officer Medic	Safety observation card system Incident report	Daily

Impact	Receptor	Impact Significance Rating	Mitigation Measures	Residual Impacts	Indicator	Responsible Person/ Function	Performance and Monitoring	Timing/ Frequency
			Have a malaria management plan in					
			place					
Visual		2B	Issue	1B	Number of	Contractor	Grievance	Daily
impact			notices/advisories of		complaints and	CLO	mechanism	
			pending traffic		reports	CLO		
			inconveniences and		Amount of	EHS Officer		
			solicit tolerance by		vegetated/			
			local residents before		landscaped areas			
			the commencement of					
			construction works					
			 During construction of 					
			the well pads, existing					
			vegetation around the					
			perimeter of the site					
			should be maintained					
			to minimize views into					
			the site. Following					
			construction, natural					
			vegetation should be restored in none					
			operational areas of					
			the site and/or					
			additional landscape					
			planting with local					
			indigenous species					
			used to improve views					
			into the site.					
			Consider site-specific					
			landscaping in selected					
			area to provide					
			screening for resident					

Impact	Receptor	Impact Significance Rating	Mitigation Measures	Residual Impacts	Indicator	Responsible Person/ Function	Performance and Monitoring	Timing/ Frequency
			whose property abuts the project. Ensure good housekeeping of the site in order to create a positive image in the eyes of the public.					

8.3. Operation Phase

Impact	Receptor	Impact Significance	Mitigation Measures	Residual Impacts	Indicator	Responsible Person/	Performance and Monitoring	Timing// Frequency
		Rating				Function		
Fauna		2A	 Educate workforce on 	1A	Complaints from	Contractor	Follow	Daily
Disturbance			environmental		community		management	
			concerns and		members	EHS Officer	plan and	
			implement policies to				procedures to	
			protect biodiversity.		Record of species	CLO	minimize:	
			 Schedule operations 		found within 500 m		 Selective 	
			during least sensitive		of the project site		clearing of	
			periods such as				vegetation	
			species migration		Timing of the		 Biodiversity 	
			periods, nesting and		activities		manageme	
			mating seasons. For				nt to try to	
			example, there are				control	
			nesting sites for sea				personnel	
			turtles in Pate				and project,	
			 Keep the workforce 				to prevent	
			within defined				causing	

			boundary and to the				harm to	
			agreed access routes				habitats or	
			for vehicles.				species	
			Implement a tree				.,	
			planting program					
			within the well pad to					
			offset loss of trees					
			due to the					
		,	construction phase					
			Ensure protection of					
			important resources					
			by establishing					
			protective buffers to					
		(exclude unintentional					
		(disturbance.					
Noise and	3C	•	Machineries should	2C	Noise level warning	Contractor	Grievance	Daily
Vibration		- 1	be maintained		signs on site		Mechanism	
		1	regularly to reduce			Supervisors		
		1	noise resulting from		Incidence report		Incidence report	
		1	friction during			EHS Officer		
		(operations.		Availability of			
		- 1	Using modern		appropriate PPE on			
		1	machinery equipment		site e.g. ear muffs			
		,	with noise					
		!	suppressing					
			technologies in order					
			to reduce the noise-					
			rating as much as					
			possible					
			Provision of warning					
			signs should be made					
			at the gate warning of					
		(construction activity					

			and heavy machinery					
			turning.					
			A grievance					
			procedure will be					
			established whereby					
			noise complaints by					
			neighbours are					
			recorded and					
			responded to					
		•	Workers to be					
			provided with PPE					
			such as earmuffs and					
			be trained on how to					
			use them when					
			operating in noisy					
			environment.					
		•	Housing engines and					
			pump jacks in sound					
			insulated building to					
			reduce noise					
		•	Operating engines at					
			their recommended					
			constant number of					
			revolutions per					
			minute (RPM) to					
			reduce the annoying					
			fluctuating noise					
			caused by engines					
			slowing down or					
			speeding down					
Soil	3C	•	Work areas should be	3B	Number of soil	Contractor	Cases of soil	Weekly
disturbance			clearly defined and		erosion structures		erosion or water	
			demarcated, where			EHS Officer	logging	

		necessary to avoid		Amount of			
		unnecessary		vegetated/			
		disturbance on areas		landscaped areas			
		outside the					
		development		Demarcation of			
		footprint		land for operation			
		 Providing soil erosion 		activities			
		control structures on					
		the steeper areas of					
		the site & controlling					
		activities during the					
		rainy season					
		 Manage storm and 					
		flood flash water					
		effectively to avoid					
		movement of loss					
		soils.					
		 Rapid regeneration of 					
		plant cover must be					
		encouraged by setting					
		aside topsoil during					
		earthmoving and					
		replacing onto areas					
		where the					
		reestablishment of					
		plant cover is					
		desirable to prevent					
		erosion if it was					
		necessary.					
Waste	3C	 Establishing a waste 	2C	Amount of waste	Supervisor	Waste	Weekly
generation		management plan		generated		Management	
		such as:			EHS Officer	Log Book	
						indicting	

0	terms on waste	Frequency of waste	NEMA	-	Type of	\exists
	collection	collection,			waste	
	schedule and	segregation,	County	-	Weight	
	disposal by waste	transportation, and	Department	-	Mode	
	handler credited	disposal	of OHS		of	
	by NEMA				disposa	
0	Training of site	Availability of			l and	
	personnel in	waste management			frequen	
	proper waste	and sensitization			су	
	management and	sigs on site				
	chemical handling					
	procedures					
0	Provision of					
	suitable facilities					
	for the collection,					
	segregation, and					
	safe disposal of					
	the wastes.					
	Waste should be					
	segregated in					
	terms of					
	recyclable,					
	reusable,					
	biodegradable,					
	non-					
	biodegradable					
	and providing					
	equipment for					
	handling waste.					
0	Regular cleaning					
	and maintenance					
	programme for					
	drainage systems,					

		sumps and oil					
		interceptors.					
Water	3B	 There several options 	2B	Availability of water	Contractor	Grievance	Weekly
Sources		in sourcing		storage facilities		Mechanism	
		freshwater:			CLO		
		 Locating a local 		Availability of local			
		source that is		freshwater sources	EHS Officer		
		acceptable with		Availability of rain			
		the local		water harvesting			
		community		structures			
		Drilling a bore					
		hole to tap in to					
		aquifer of Vumbe					
		wells in the					
		mainland					
		Filling barges with					
		water from rivers					
		in the main land					
		(e.g. Tana River), Malindi or					
		Mombasa, and					
		transporting to					
		Pate Island.					
		4. Building a storage					
		pit which can be					
		filled with					
		freshwater					
		before commencement					
		of the project,					
		which can act as					
		an available					
		reserve to					
		minimise possible					
		over abstraction					

		with the local					
		supply.					
		The proponent could also					
		consider the use of					
		seawater in the drilling					
		process. However, this is					
		dependent on the type of					
		drill mud to be used. The					
		proponent wishes to use					
		WBM. However, if					
		seawater is used together					
		with WBM it will have an					
		impact on fluid and cutting					
		disposal due to the					
		associated chloride					
		content. The chloride					
		content could be too high					
		for disposal on site, the					
		maximum permissible					
		level is 600 parts per					
		million (ppm)					
		The best options we would					
		recommend to be used					
		during this project would					
		be sourcing water from					
		Malindi or Mombasa and					
		transported to Pate Island					
		via barge.					
Waste Water	3C	 Wastewater can be 	2B	Amount of water	Contractor	Grievance	Weekly
		recycled and used in		recycled/re-used		Mechanism	
		the drilling process,			CLO		

domestic effluent can	
also be treated and	Clear lines of EHS Officer
recycled and sludge	collection of waste
from site for safe	water. Separation
disposal at a	of black and grey
designated disposal	water at the points
site.	of generation
■ In the management of	
black and grey water,	
the proponent can	Availability of rain
dispose the waste in	water harvesting
the three methods	structures
below:	
4. Use of a septic tank of	
sufficient capacity to	
accommodate	
anticipated crew	
numbers	
5. Kitchen waste water	
will be channelled	
through a grease trap	
before going into the	
septic tank	
6. Kitchen sinks, wash	
basins and drains shall	
be permanently	
equipped with	
gratings to retain soils	
and avoid conduction	
line clogging	
■ Where possible rain	
water can be used in	
the drilling process. If	

		pit water is deem	ied				
		uncontaminated					
		can be pumped o	offsite				
		or reused as irriga					
		water for restora	tion				
		of the site perime	eters.				
Air Pollution	3C	 Sprinkling water 	2C	Frequency of	Contractor	Vehicle	Daily
		periodically wher	1	sprinkling water in		maximum speed	-
		operations are ur	nder	times of high dust	EHS Officer	limit of 40	
		way to prevent ra	aising	generation such as		km/hr on	
		of dusts;		during continuous		murram roads	
		 Impose and enfor 	rce	movement of		Use of in-	
		speed limits and		trucks and high		vehicle-	
		provide driving		speed blowing		monitoring-	
		guidelines for vel	nicle	winds		system (IVMS)	
		operators e.g. sp	eed				
		limit of 30kph in	the	Frequency of			
		site area		maintenance of			
		Use of low Sulph	ur	engines to ensure			
		fossil fuel.		effective burning of			
		 Regular maintena 	ance	fossil fuels			
		and services of					
		machines and en	gines	All engines of			
		 Educate and raise 	9	trucks switched off			
		awareness to		during			
		construction wor	kers	loading/unloading			
		on emission redu	ction	on site			
		and emissions tha	at				
		are likely to occu	r.	Availability of dust			
		 Sensitize truck dr 	ivers	masks among the			
		to avoid unneces	sary	employees involved			
		racing of machine	ery	in dusty operation			
		engines at loadin	g,				

		offloading sites, and					
		parking areas and					
		encourage them to					
		keep the vehicle					
		engines off at these					
		points.					
		 Provide workers with 					
		appropriate PPE such					
		as dust masks.					
		 Use of cost effective 					
		technologies and					
		practices to minimize					
		emissions of					
		greenhouse gases and					
		other pollutants					
Oil and	2B	 Requirements of oil 	1B	Availability of a	Contractor	incidence report	Daily
Chemical spill		spill and emergency		response plan			J 2 ,
		plans must be met		r sopramo pram	Supervisor		
		before operations					
		commence.		Availability of	EHS Officer		
		 Apply spill prevention 		reserve containers			
		practices and		for collecting			
		response actions in		emergency spills			
		refueling and vehicle-		0 7 1			
		use areas to minimize					
		accidental					
		contamination of					
		habitats and soil.					
		Address spills					
		immediately per the					
		appropriate spill					
		management plan,					
		and initiate soil clean-					

		up and soil removal if needed. Containerize spent oils and lubes for appropriate disposal or recycling. Containerize contaminated soils that cannot be treated in situ and remove off-site for treatment Conducting maintenance and repair activities in well-established zones having paved surfaces to collect the oil and prevent soil pollution					
Health and Safety Risks	4C	 Placing signs around where there are risks. Signs should meet international standards and should be in English and Kiswahili for easy understanding Placing visible and readable signs to control the movement of vehicles and notify motorists and 	2C	Records of training, induction, tool box meetings, Incident report Availability of PPE Availability of warning signs in areas with occupational, safety and health risks on site	Contractor EHS Officer Medic	Safety observation card system Incident report	Daily

	pedestrians around			
	the, and workers in			
	the site			
	The well pad should			
	be cordoned off to			
	protect the general			
	public from dangers			
	associated with			
	operations work			
	Ensuring there is			
	security in and around			
	the site to control the			
	movement of			
	unauthorized			
	personnel			
	Ensuring all potential			
	hazards such as			
	movable machine			
	parts are labeled			
	Providing safe and			
	secure storage for			
	equipment and			
	materials in the site			
	and maintaining			
	MSDSs			
	1413033			
	 All workers should be 			
	provided with PPE			
	and trained on how to			
	use them. These			
	include safety boots,			
	overalls, helmets,			
L	,,		l .	

goggles, earmuffs,
dust masks, gloves
among others
■ Raising awareness,
educating workers on
risks from equipment,
and ensuring they
receive adequate
training on the use of
the equipment
■ Employing an OSH
plan that will outline
all OSH risks and
provide a strategy for
their management
their management
■ Establishing
emergency
procedures against
hazards and ensuring
the workers stay
aware/educated on
following them and
commensurate to the
magnitude and type
of emergency, by
conducting regular
drills and involving the
neighbors.
■ Providing firefighting
equipment and in
easily accessible areas

		as well as ensuring site personnel are well trained to use them as well as maintaining them regularly Creating safe and adequate fire and emergency assembly points and making sure they are well labeled					
Socio- economic	2B	 Grievance Mechanism will be in place to resolve any employment and local supplier-related grievances. Where feasible look into vocational training programs for the local workforce to promote development of skills required by the oil and gas industry Develop and implement a Health Risk Assessment; and a workforce management plan for 	1A	Number of incidences reported by the community members Frequency of conflicts between the community members and project implementers Availability of risk management plan and work force management plan	CLO EHS Officer Contractors	Grievance mechanism	Daily

		•	Preference should be given to locals as source of labour force for both skilled, semiskilled and unskilled laborers. Observing the cultural					
			setup of the local community in terms of interaction between men and					
Visual	2B	•	women External lighting shall	1A	Number of	Contractor	Grievance	Daily
Impacts	26	_	be as unobtrusive as	IA	complaints and	Contractor	mechanism	Dally
impacts			possible and shall be		reports	CLO	mechanism	
			shielded and directed		1000113	020		
			downwards to		Amount of	EHS Officer		
			prevent side spill. The		vegetated land			
			use of tall mast lights					
			shall be carefully					
			assessed before being					
			used due to proximity					
			of fauna and					
			residential areas.					
		•	Consider site-specific					
			landscaping in					
			selected area to					
			provide screening for					
			resident whose					
			property abuts the					
			project.					
		•	Ensure good					
			housekeeping of the					

	site in order to create			
	a positive image in the			
	eyes of the public.			
	 Landscaping can help 			
	reduce the visual			
	impacts of the wells			
	e.g. forming the soils			
	around the well pads			
	into ridges or gentle			
	berms and planting			
	vegetation on ridges			
	and berms			

8.4. Decommissioning Phase

Impact	Receptor	Impact	Mitigation Measures	Residual	Indicator	Responsible	Performance and	Timing/
		Significance		Impacts		Person/	Monitoring	Frequency
		Rating				Function		
Waste	Environment	2B	 The contractor 	1B	Amount of waste	Supervisor	Waste	Weekly
Generation			should prepare a		generated		Management Log	
			site waste			EHS Officer	Book indicting	
			management plan		Frequency of waste		- Type of	
			prior to		collection,	NEMA	waste	
			commencement of		segregation,		- Weight	
			demolition		transportation, and	County	- Mode of	
			activities.		disposal	Department	disposal	
			Some of the solid			of OHS	and	
			waste produced		Availability of waste		frequency	
			can be recycled for		management and			
			use in future		sensitization sigs on			
			projects or sold off		site			
			as scrap.					

Impact	Receptor	Impact Significance Rating	Mitigation Measures	Residual Impacts	Indicator	Responsible Person/ Function	Performance and Monitoring	Timing/ Frequency
			 Identifying all 					
			sources of wastes,					
			and ensuring					
			wastes are handled					
			by licensed NEMA					
			waste handler					
			Combustible waste					
			material should not					
Noise and	Local	3C	be burned on site Inform local	2C	Noise level warning	Contractor	Grievance	Daily
Vibration	residence	30	residents	20	signs on site	Contractor	Mechanism	Dally
Vibration	residence		beforehand, via		signs on site	Supervisors	Mechanism	
			notices and		Incidence report /	Super visors	Incidence report	
			advisories, of		Grievance from	EHS Officer	incluence report	
			pending noisy		community members	2110 Omice.		
			periods and solicit					
			their tolerance well		Availability of			
			before the		appropriate PPE on			
			commencement of		site e.g. ear muffs			
			demolition works.		_			
			 Limit pick-up trucks 					
			and other small					
			equipment to an					
			idling time,					
			observe a					
			common-sense					
			approach to					
			vehicle use, and					
			encourage workers					
			to shut off vehicle					

Impact	Receptor	Impact Significance Rating	Mitigation Measures	Residual Impacts	Indicator	Responsible Person/ Function	Performance and Monitoring	Timing/ Frequency
Air	Air quality	3C	engines whenever possible. Providing workers with appropriate PPE's such as earmuffs when operating noisy machinery and when in a noisy environment. Sprinkling water on	2C	Frequency of	Contractor	Vehicle maximum	Daily
pollution	Air quality	30	 Sprinking water on the loose road surfaces to reduce dust emission. Imposing speed limits to limit the heavy vehicles from racing through the unpaved road surfaces. Scheduling track movement to reduce the vehicular traffic Use of efficient new technologies having low particulate emissions. 	20	sprinkling water in times of high dust generation such as during continuous movement of trucks and high speed blowing winds Frequency of maintenance of engines to ensure effective burning of fossil fuels All engines of trucks switched off during loading/unloading on site	EHS Officer	speed limit of 40 km/hr on murram roads Use of invehicle-monitoring-system (IVMS)	Dally

Impact Rec	eceptor	Impact Significance Rating	Mi	tigation Measures	Residual Impacts	Indicator	Responsible Person/ Function	Performance and Monitoring	Timing/ Frequency
Safety Risk Hea	ecupational ealth and fety	3C	•	Regular maintenance of vehicles and machines ensuring low emissions. Provision and Use of Personal Protective Equipment (PPE) e.g. dust masks, safety glasses Provision and Use of Personal Protective Equipment (PPE) e.g. dust masks, overalls, gloves, Raising awareness among the workers on the likely risk and hazards and ensure they have adequate training on the use of machines and equipment. Employing a proper OHS plan that will outline all the potential OHS risks	ЗВ	Availability of dust masks among the employees involved in dusty operation Records of training, induction, tool box meetings, Incident report Availability of PPE Availability of warning signs in areas with occupational, safety and health risks on site	Contractor EHS Officer Medic	Safety observation card system Incident report	Daily

Impact	Receptor	Impact Significance Rating	Mitigation Measures	Residual Impacts	Indicator	Responsible Person/ Function	Performance and Monitoring	Timing/ Frequency
			as well as propose a management strategy.					
			■ Proving proper					
			firefighting equipment and establishing fire assembly zones.					
Socio-	Employees	4C	 Zarara will ensure 	1C	Number of grievance	Contractor	Grievance	Daily
economic			all the local employees are well informed on the		from community members/employees	CLO	mechanism	
			project decommissioning and its likely			EHS Officer		
			impacts before the project final					
			closure. Zarara will also consider providing training to build the local skills					
Traffic Impacts	Traffic congestion to the local	3B	Issue notices/advisories of pending traffic	2B	No accident/incident reported	Contractor Supervisors	Vehicle speed limit of 40 kmph	Daily
	residence		inconveniences and solicit tolerance by local residents before the		Availability of warning signs for heavy traffic and trucks on site	EHS Officer	Follow Zarara management policies and guidelines	

Impact	Receptor	Impact Significance	Mitigation Measures	Residual Impacts	Indicator	Responsible Person/	Performance and Monitoring	Timing/ Frequency
		Rating				Function		
		Rating	commencement of works Flagmen/ road marshals should be employed to control traffic and assist mobilization vehicles as they enter and exit the project site. Ensuring that all drivers for the project comply to speed regulations Ensure all vehicles and machinery used for the project are in good working conditions both legally and are commensurate to		Availability of speed limit signage on site Frequency of engine maintenances and servicing	Function	Safety observation card system	
			the intended use.					

CONCLUSION AND RECOMMENDATIONS

Zarara is wholly owned subsidiary of Midway Resource International and operator with a 75% working interest in Blocks L4 and L13. Zarara plans to undertake a hydrocarbon exploration drilling programme on Block L4 and L13 in Lamu County to further explore and appraise the gas discoveries made by Shell in the 1970s, which encountered high-pressure gas, but in an unknown quantity as the well did not fully penetrate the reservoir section and was neither logged nor tested due to technical problems whilst drilling.

EMCA 1999 requires that all new developments that are likely to affect the environment in any way must undertake an environmental impact assessment. The objective of an ESIA process is to aid decision-making and environmental accountability as part of safeguarding sustainable development.

The study finds the project is acceptable if the identified and developed management plans and practises are implemented accordingly. It also recommends appropriate monitoring of the project development and operational activities to ensure that adverse impacts that were unforeseen are identified and addressed in a timely fashion.

Specifically, the following recommendations are made

- 1. As stated earlier, the sands here have a high rate of infiltration, leading to annual precipitation recharge of up to 13.5% rainfall depth. It is therefore important to control runoff from operation areas. Therefore, the following measures should be in place:
 - Any produced water should be trucked / piped to approved disposal ponds;
 - Storage and disposal of drilling cuttings and waste shall be done in such manner that they do not spill onto the local environment. They shall be transported to sites of safe disposal.
 - Mud circulation hoppers/ lined mud-pits shall be used;
 - The pad area shall be protected from entry of surface runoff and from any runoff leaving the area
- 2. Work areas should be clearly defined and demarcated, where necessary to avoid unnecessary disturbance on areas outside the development footprint
- 3. Wastewater can be recycled and used in the drilling process, domestic effluent can also be treated and recycled and sludge from site for safe disposal at a designated disposal site.
- 4. Provision of suitable facilities for the collection, segregation and safe disposal of the wastes. Waste should be segregated in terms of recyclable, reusable, biodegradable, non- biodegradable and providing equipment for handling waste
- 5. Impose and enforce speed limits and provide driving guidelines for vehicle operators
- 6. Inform local residents beforehand, via notices and advisories, of pending noisy periods and solicit their tolerance well before the commencement of any activities
- 7. Employing an Occupational safety and health (OSH) plan that will outline all OSH risks and provide a strategy for their management
- 8. Employ a Grievance Redress Mechanism to record any complaints made by surrounding community members, and procedures to respond on the same.

9. It was established that the water sources have no toxic compounds or elements and there is no evidence of hydrocarbon contamination. Zarara should be committed in putting in place several measures to manage the effects of drilling on the water resources and the surrounding environments. These include transportation of the drill cuttings for safe disposal, using freshwater for drilling operations instead of seawater. It is our recommendation that the project water supply for the project be sourced on the mainland and transported by barge to the drilling site. The water wells can be drilled in the same area and aquifer as the Vumbe wells. Once the project comes to an end, these wells should be handed over to the community to be part of the Faza Water Scheme. The same wells will also be of value if the need to drill on the mainland becomes imperative.

Subsequent projects that might arise as a result of this project should undergo environmental assessment and permitting with NEMA as a prerequisite for any development undertaking. NEMA is advised to license the project since it is a viable project.

REFERENCES

- 1. BBC. 2010. What do we know about the deep water horizon disaster. [Online 8th September 2010] [Last accessed 5th November 2014] Available from: http://www.bbc.co.uk/news/10370479
- 2. International Union for Conservation of Nature (IUCN). 1993. *Oil and Gas Exploration and Production in Artic and Subartic Onshore Regions: Guidelines for Environmental Protection.*Oxford, UK: Words and Publications
- 3. Kenya Law. n.d. *Laws of Kenya*. [Date accessed 4th April 2016]. Available from: http://www.kenyalaw.org:8181/exist/kenyalex/index.xql
- 4. NEMA Environmental Management and Coordination Act (Water Quality) Regulations, 2006 and World Bank Pollution Prevention and Abatement Handbook 1998
- 5. EMCA (Fossil Fuel Emission) Control Regulations, 2006. The regulation shows the standards for both petrol and diesel powered motor vehicle emission standards.
- 6. EMCA (Air Quality) Regulations, 2014. The Act prohibits any person, operator or owner of any facility from causing or allowing fugitive emissions to cause the ambient air quality at its property boundary to exceed the limits prescribed under the First Schedule of this Act.
- 7. climate-data.org, 2015. *Climate Lamu*. [Date accessed 17th May 2016]. Available from: http://en.climate-data.org/location/47680/
- 8. Church J. and Palin O. 2003. The Sea Turtle Conservation Initiative in Kiunga Marine National Reserve, Lamu Kenya, from February 1997 to June 2003. Report, WWF EARPO, Nairobi.
- Benny, P. N., 2002: Variability of Western Indian Ocean currents, 1, 81-90. WIOMSA
- 10. Holiday Weather. 2016. *Lamu: Annual Weather Average*. [Date Accessed 17th May 2016] Available from: http://www.holiday-weather.com/lamu/averages/
- 11. Nicholson, S. E. and Kim, J., 1997: The relationship of the El Niño–Southern Oscillation to African rainfall, International Journal of Climatology, 17: 117–135.
- 12. CSAG, 2012: Current state of knowledge on climate trends and variability, and downscaled climate change projections, for Eastern Africa, report prepared for WWF CEAI by the University of Cape Town Climate Systems Analysis Group (CSAG), 99p.
- 13. (University of Nairobi, 2012)
- 14. World Weather Online. 2015. Manda Airport (LAU) Weather Lamu
- 15. Obura, David O. 2001: Kenya, Marine Pollution Bulletin, 42 (12): 1264-1278, ISSN 0025-326X, Retrieved from: http://dx.doi.org/10.1016/S0025-326X(01)00241-7.
- 16. Schott, F. 2001: The monsoon circulation of the Indian Ocean. Progress in Oceanography, 51(1): 1-123

- Church, J. E. and Obura, D. O., 2004: Management recommendations for the Kiunga Marine National Reserve, based on coral reef and fisheries catch surveys, 1998–2003. CORDIO/WWF KMNR, Lamu, Kenya, 1-57.
- 18. Obura, David O. 2001: Kenya, Marine Pollution Bulletin, 42 (12): 1264-1278, ISSN 0025-326X, Retrieved from: http://dx.doi.org/10.1016/S0025-326X(01)00241-7.
- 19. Spencer, T., Laughton, A. S. and Flemming, N. C., 2005: Variability, interaction and change in the atmosphere ocean ecology system of the western Indian ocean. Philosophical Transactions of the Royal Society, 363(1826): 3-13
- 20. Gert, J. T., 1989: A numerical study of the seasonal variability of the Somali current. PhD Thesis; Department of Geophysical Fluid Dynamics, The Florida State University. 1-141.
- 21. EMCA Noise regulation, 2009
- 22. Kenya Soil Survey, 1985, An Assessment of the Soil Conditions in the proposed extension of Lake Kenyatta settlement scheme (Lamu and Tana River Districts). Site evaluation report No. P62, June, 1985
- 23. Lamu District Environmental Assessment Report, 1985. National Environment Secretariat, Ministry of Environment and Natural Resources. Nairobi.
- 24. Richmond, M. D. (ed.), 2002. A Field Guide to the Seashores of Eastern Africa and Western Indian Ocean Islands. Sida/SAREC-UDSM.461 pp. ISBN 91-6586-8783-1.
- 25. Ruwa, R. K., 1992. Mangrove wetlands in Kenya. *In. Crafter S.A; Njuguna S.G; and Howard G.W (Eds), 1992. Wetlands of Kenya. Proceeding of the KWWG Seminar on Wetlands of Kenya, National Museums of Kenya, Nairobi, Kenya 3-5 July 1991.* Vii+183 pp.
- 26. Kairo, J. G., Kivyatu, B. and Koedam, N., 2002: Application of remote sensing and GIS in the management of mangrove forests within and adjacent to Kiunga Marine Protected Area, Lamu, Kenya. Environment, Development and Sustainability 4: 153-166.
- 27. Weru S. M, Lubia I, Nikes N, Church J, Verheij E, Koyo A. O, Muthiga N, Kavu B. K, Kareko J. K, and Litoro K., 2001: Management plan: kiunga marine national reserve (Hof. T. Ed), Kenya Wildlife Service and World Wide Fund for Nature, Coast Region Headquarters, Mombasa.
- 28. UNEP, 1998: Eastern Africa Atlas of coastal resources: UNEP Regional Reports and Studies, No. 1 Nairobi, Kenya
- 29. Tychsen, J. 2006 (ed.): KenSea. Environmental Sensitivity Atlas for Coastal Area of Kenya, 76 pp. Copenhagen; Geological Survey of Denmark and Greenland (GEUS); ISBN 87-7871- 191-6
- 30. Allen J, V. (1993). Swahili Origins; Swahili culture and the Shungwaya Phenomenon. London: James Currey Ltd.
- 31. Spear, T. (2000). Early Swahili History Reconsidered. Boston: Boston University African Studies Centre.
- 32. ESF Consultants key informants survey data collected from pate Island

- 33. ESF Consultants Household Socio-economic data collected from pate Island
- 34. Magical Kenya. n.d. *Lamu: Where history lives.* [Date accessed 5th May 2016] Available from: www.kenyabrussels.com/ckfinder/userfiles/files/.../Lamu.pdf
- 35. Maiteri, C. (2012). Form and Symbolism of Swahili Architecture in Pate Island.
- 36. Kenya National Bureau of Statistics (KNBS). 2009. Economic survey 2009. Nairobi: KNBS. Kiamba, M., 1994. The Dynamics of Urbanization and Urban Development in Kenya.
- 37. Environmental & Social Impact Assessment Project Report for The Proposed Hindi MJ Road Mokowe Old Jetty Lamu Island's Mnazi Moja– Manda Island 33kv & 11kv Electrical Transmission Line and Associated Substation in Lamu Island, Lamu County
- 38. Ipsos Survey, 2014: Household Development, Marginalization, Security, and Public Participation.
- 39. Lamu County Integrated Development Plan (2013-2017).
- 40. Lamu Holiday Solutions. (2016). County Information. Retreived on 22nd March 2016 from http://www.lamuholidaysolutions.com/aboutlamu/general-information-about-county

APPENDICES

Appendix 1 Background Information Document (BID) in both English and Swahili

Background Information Document (BID)

Environmental Impact Assessment for a proposed Drilling of an Exploratory Well on Blocks L-4 and L13

Background Information and Invitation for Stakeholders to Comment

PURPOSE OF THIS DOCUMENT

This document provides stakeholders with the first opportunity to comment on the proposed exploratory drilling on BlockL-4 and L13 in Pate Island Lamu County.

This document provides stakeholders with initial information on the proposed project, the ESIA process that will be followed and the opportunities available for public consultation.

Stakeholders will have an opportunity to contribute issues of concern and suggestions for enhanced benefits, to verify that their contributions have been considered and to comment on the findings of the specialist assessments. The findings of the ESIA will be submitted to the NEMA authorities for consideration for environmental authorization.

PLEASE SUBMIT YOUR COMMENTS BY: 31ST /MAY /2016

Your comment will ensure that all relevant issues are evaluated by the ESIA. Complete the enclosed reply sheet, write a letter, call or email the public participation officer, or the local liaison officer.

PUBLIC PARTICIPATION OFFICE AND RETURN ADDRESSES FOR COMMENTS:

The Public Participation Office Tel: +254736100205

Email: info@esfconsultants.org

All ESIA documents will also be available on the following websites:

www.esfconsultants.org

BACKGROUND and PROJECT DESCRIPTION

Zarara Oil and Gas Limited (Zarara) is wholly owned subsidiary of Midway Resource International and Operator with a 75% working interest in blocks L04 and L13, as illustrated in the figure below. Other partners to the oil blocks are SwissOil (15%) and Nock (10%). Zarara wishes to undertake a hydrocarbon exploration drilling programme on Blocks L4 and L13 in Lamu County, to further explore ad appraise the gas discoveries made by shell in the 1970s.

Zarara plans to undertake a hydrocarbon exploration drilling programme on Block L4 and L13 in Lamu County to further explore and appraise the gas discoveries made by Shell in the 1970s, which encountered high-pressure gas, but in an unknown quantity as the well did not fully penetrate the reservoir section and was neither logged nor tested due to technical problems whilst drilling. The hydrocarbon exploration drilling programme will concentrate in Pate Island. Exploratory drilling is a temporary and short duration activity and includes site preparation, equipment assemblage, well foundation, rig building, drilling, and restoration of the well site. In the event that potentially commercial volumes of hydrocarbons are discovered additional exploration wells and/or appraisal wells are likely to be drilled in the future to provide greater information on the likely nature and scale of the hydrocarbon resources.

The well pad will cover an area of approximately 200m x 200m and is expected to hold approximately 180 people, storage, the rig, water pit among others. The drilling programme is expected to last 3-4 months (for each well drilled). Material and equipment's will be transported by barge from Mombasa to Mtangawanda, Lamu. There will be approximately 5-10 trucks transporting material to and.

The initial well will be a vertical well to a target depth of 4,600 metres and broadly twin the exploration well Pate -1 drilled by Shell in 1971. Assuming identification of the expected levels of hydrocarbons, a further 1 to 4 appraisal wells will be drilled as part of this campaign. These will use deviated drilling to a depth of between 4,500 and 5, 000 metres.

WHO IS DOING THE ESIA?

ESF Consultants, an independent, internationally recognized company of environmental and social scientists, and public participation practitioners is leading the ESIA for the proposed project. The ESIA will run between February – May 2016 and will include public consultation to ensure that stakeholders' contributions are considered in the studies. The findings of the study will be available in May 2016.

CHANGING INFORMATION

Because the Company is still preparing a drilling plans study and investigating different alternatives on the best options to properly design the project, this information may change. Stakeholders will be informed of changes.

COMPONENTS OF THE PROPOSED PROJECT

The drilling and processing project will include the following:

- General site preparation
- The establishment of a drilling platform
- · The drilling of gas wells
- Testing of Gas (if found)
- The construction of tailings disposal facility
- The building of a waste rock stockpile (storage area).

DRILLING PROCESS

Initially, the land is cleared and levelled and access roads built where appropriate. Because water is used in drilling, it needs to be secured from available sources, be it at surface or by the construction of a well.

A reserve pit, which is used to dispose of rock cuttings and drilling mud during the drilling process, will be constructed and lined with plastic to protect against any possible contamination. If the site is an ecologically sensitive area, such as a marsh or wilderness, then the cuttings and mud will be disposed of offsite and trucked away instead of being placed in the pit.

Once the land has been prepared, several holes are dug to make way for the rig and the main hole. A rectangular pit, called a cellar, is dug around the location of the actual drilling hole, which provides a work space for the workers and drilling accessories. The crew then begins drilling, often with a small drill truck rather than the main rig. The first part of the hole is larger and shallower than the main portion, and is lined with a large-diameter conductor pipe. Additional holes are dug off to the side to temporarily store equipment. When these holes are finished, the rig equipment can be brought in and set up.

The drilling process will look like the figure 2. The process will use water, electricity and other raw materials.

FLARING OF GAS

To test the gas found, the gas will be flared or vented on site.

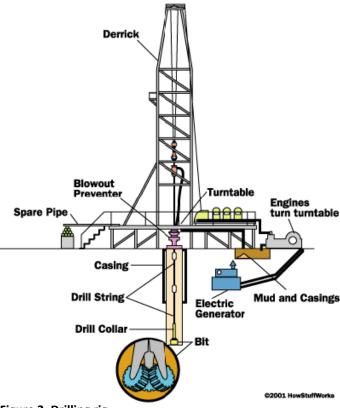


Figure 2. Drilling rig

WASTE AND **E**FFLUENT MANAGEMENT

Waste from the drilling will be treated before being deposited on a tailings disposal facility located close to the site. Waste includes materials such as drill mud, waste water and domestic waste from the camps. The location of the waste dump will be determined as part of the ESIA and project design.

WATER SUPPLY

Water supply for the proposed project is expected to be obtained from within either groundwater or sea water. At least 200 cubic metres per hour of water will be required by the proposed drilling platform and camps for the first phase of the project. Options for recycling this water will be considered in the ESIA.

TRANSPORTATION OF EQUIPMENTS

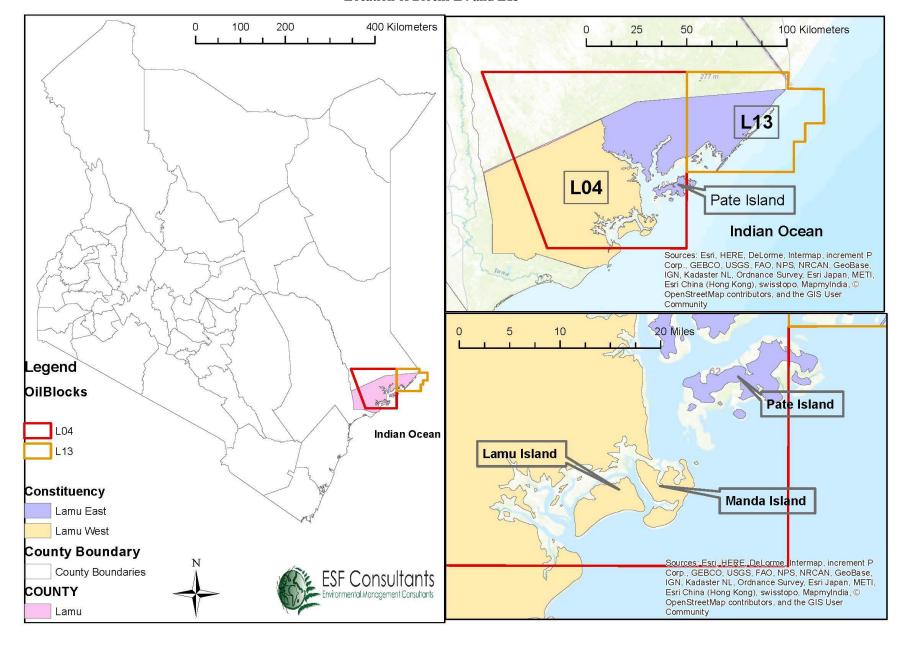
Personnel and equipment will be transported by road to the camps and drilling sites.

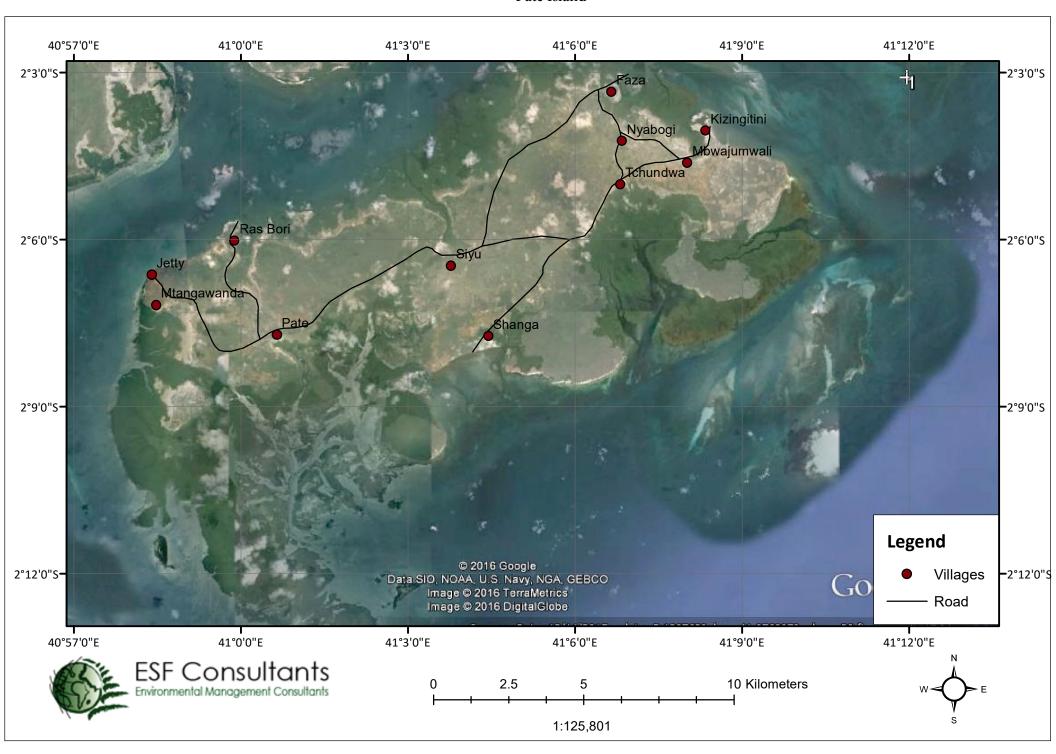
OTHER INFRASTRUCTURE

Other infrastructure that will be constructed may include:

- Sewage treatment plant
- Access roads from the site to the camps
- Water holding dam
- Storm-water controls
- Camps for workers
- · Fencing and access control
- Tailings dam

Location of Blocks L4 and L13





ENVIRONMENTAL IMPACT ASSESSMENT (ESIA) PROCESS

The National Environment and Management Authority (NEMA) require the preparation of an EIA prior to issuance of a permit for the project, in conformance with the Environmental Management and Coordination Act, 1999. The EIA will therefore be prepared in accordance with applicable EMCA, 1999 requirements, and ill be considered complete upon the issuance of an EIA Licence, which will require conformance to or application of international standards or other international guidelines where NEMA has not established their guidelines. This assessment is expected to be completed by the end of May.

It is a study which is undertaken to improve the environmental performance of a development and to assist in government decision making in issuing the environmental license.

The ESIA Study is expected to:

- Identify and assess potential and significant adverse environmental and social impacts of the proposed project
- Recommend measures for mitigation to improve the existing management system.
- Verify compliance with the environmental regulations, industry standards, and in-house environmental policy requirements.

During the ESIA study, ESF Consultants team will undertake specialist studies including

- Hydrological survey
- Noise Survey
- Ambient Air Quality Assessment
- Socioeconomic Survey
- Ecological Survey
- Stakeholder engagement and consultation

All these studies are meant to collect baseline data for the area before the project to enable identify any potential effects of Zarara drilling in the island environment

The consultants will also consult the community members to better understand the local environment and get their views concerning the activity.

Stakeholder Consultation is considered one of the key tasks of the ESIA with the objective of:

- Ensuring that all stakeholders are included in the consultation and disclosure process;
- Disclosing initial information about the project to nontechnical stakeholders and the local population;
- Providing adequate and timely information to projectaffected people and other stakeholders;
- Giving all stakeholders sufficient opportunity to voice their opinions and concerns;
- Ensuring that these opinions and concerns influence project decisions.

The importance of effective and broad public participation in the ESIA process cannot be overstressed

Zarara and the ESIA Team are committed to active and ongoing communication with all communities, organizations, groups and individuals with an interest in this project

ESF and Zarara invite all stakeholders from all sectors. Of the society to participate freely in the ESIA process. The Stakeholder Engagement Process aims to inform a wide range of stakeholders about the Project and the environmental and social assessment process to be followed

The engagement process allows for the public to exchange Project information and to express their views and concerns on the proposed development. The process assists in identifying potential issues and concerns that need to be addressed during the impact assessment. It also captures stakeholder comments and suggestions for inclusion in the ESIA report.

Please ensure that you are registered on the comment registration sheet provided. The registration of your details will ensure that you receive on-going Project communication such as meeting invitations, Project updates and the opportunity to review the draft ESIA report.

ESIA Process

 what are the current environmental and social conditions of the project area? **Baseline Field survey** what are the legal & policy requirements of Literature and the project? legistlative What are past reports in relaton to the project? framework review •Who are the Key Stakeholder groups Public and that need to be consulted? Stakeholder •what are their interests in the project? Consultaton What will the project impact (socially and environmentally)? How will the Impact Identification environment and society change as a result of the project? Are the project impacts significant, if so. how significant? Impact Assessment if the impact is significant what can be Mitigation measures done to avoid, reduce, remidiate or and Environmental compensate for the adverse effects or enhance the benefits? Management plans

RIPOTI KUHUSU TATHMINI YA MAZINGIRA NA ATHARI ZA KIJAMII (ESIA) KWA MAPENDEKEZO YA MRADI WA UCHIMBAJI VISIMA VYA UCHUNGUZI JUU YA VIPANDE L4 NA L13

Usuli wa Mradi na Kukaribisha Maoni ya Wadau

MATHUMUNI YA HATI HII

Zabuni hii inapea Vyama vya wenye Nia na Walioadhariki (IAP) maelezo ya ESIA ambayo itafanyika kutokana na mapendekezo ya mpango wa kuchimba kuchunguza uwezekano wa kuwepo kwa hidrokaboni kwenye vipande L4 na L13 hapa Kaunti ya Lamu

Hati itatoa taarifa kwa IAPs kuhusu; aarifa za msingi kuhusu mradi, namna ya kushiriki katika mchakato wa ESIA; yaani, kuwatia moyo kuhudhuria mikutano ya mradi na kujibu nyaraka zozote kuhuse mradi

Fomu za pembejeo kutoka kwa IAP zitahakikisha kwamba masuala yote kuhusu mazingira yametiliwa maanani mukthada wa maendeleyo yaliyopendekezwa. Matokeo yote ya ESIA yatawasilishwa kwa mamlaka ya NEMA kwa kuzingatia Idhini ya mazingira.

TAFADHALI WASILISHA MAONI YAKO KUFIKIA TAREHE: 31/MEI/2016

Maoni yako yatahakikisha kwamba masuala yote muhimu yatathminiwa na mchakato wa ESIA. Tafadhali jaza karatasi iliyoambatanishwa, andika barua, piga simu au tuma arafa kwa Afisa wa Ushiriki wa Umma, au afisa mhusika wa mtaa.

ANWANI YA OFISI YA USHIRIKI WA UMMA YA KUTUMA MAONI:

Ofisi ya Ushiriki wa Umma Nambari ya Simu: +254736100205 Barua Pepe: info@esfconsultants.org

USULI WA MRADI

Zarara Oil and Gas Limited (Zarara) ni Kampuni tanzu inayo milikiwa na Midway Resource International and Operator inayo miliki asilimia 75% ya haki za uchimbaji wa kubaini uwepo wa mafuta na gesi kwenye vipande L4 na L13 kama inavyoashiriwa kwa mfano wa umbo hapa chini. Washirika wengine kwneye shughuli hii ni SwissOil inayomiliki asimilia 15% na NOCK inayomiliki asilimia 10%.

Kampuni ya Zarara inamipango ya kufanya mradi wa kuchunguza uwepo wa gesi kwa kuchimba visima katika vipande L4 na L13 hapa Kaunti ya Lamu ili kuchunguza kwa umbali na kutathmini madai ya uvumbuzi wa gesi yaliyotolewa na Shell katika miaka ya 1970, walipokumbana na gesi yenye msukumo wa juu lakini isiyoweza kujulikana kiasi cha wingi wake kutoka na kisima hicho kutopenya kikamilifu ili kufikia sehemu ya hifadhi na kushindikana kwa uwezekano wa kupima gesi hiyo kutokana na matatizo ya kiufundi katika uchimbaji wa kisima hicho. Mpango wa utafutaji wa hidrokaboni kwa kuchimba visima utatilia makini katika eneo la kisiwa cha Pate. Uchunguzi wa kuchimba visima ni wa muda tu na ni shughuli ya muda mfupi na inahusisha maandalizi ya tovuti, kukusanya kwa vifaa, kutengeza misingi ya visima, kujengwa kwa rig, kuchimba na marejesho ya tovuti ya kisima kwa hali yake ya awali. Kuatika tukio la kuwa kuna kiasi cha hidrokaboni chenye uwezekano wa kibiashara, utafiti zaida utafanyika ili kutathmini visima venye uwezekano wa kuchimbwa katika siku zijazo ili kutoa taarifa zaidi juu ya asili na ukubwa wa rasilimali ya hidrokaboni.

Pedi ya kisima inatarajiwa kufunika eneo la takriban mraba mita 8000 na inatarajiwa kushikilia watu takriban 180. Mpango wa kuchimba visima unatarajiwa kudumu miezi 3 ama 4 hivi (kwa kila kisima kinachochimbwa). Nyenzo na vifaa itakuwa kusafirishwa kwa majahazi kutoka Mombasa na mzigo kushushwa Mtangawanda, Lamu. Uboreshaji wowote utakaofanyika hivi karibuni utafanywa katika jetty na utahusisha ujenzi wa ramps ili kurahisisha kushushwa kwa mizigo. Barabara za kuelekwa kwa eneo la uchimbaji hazina haja ya kuboresha; Hata hivyo, zitakarabatiwa mwishoni mwa mradi. Kutakuwa na takriban malori 15-20 ya kusafirisha vifaa kueleka na kutoka kwa eneo. Malori haya yatasafirisha vifaa hivi kwa kutumia safari 150-200 hivi.

Kisima cha mwanzo kina tarajiwa kufikia kina cha mita 4600 na kuwa pacha wa kisima cha utafutaji cha Pate-1 kilicho chimbwa na kampuni ya Shell mwaka wa 1971. Viwango vya hidrokaboni vinavyotarajiwa vikitambulika, visima kati ya 1-4 zaidi vya kutathmini rasilimali ya hidrokaboni vitachimbwa kama sehemu ya mradi huu. Vina vya visima hivi vitatofautina kati ya kina cha mita 4,500 hadi mita 5,000.

NANI ATAFANYA ESIA?

ESF Consultants ni kampuni huru inayotambuliwa kimataifa. Ni kampuni ya wanasayansi wa mazingira na kijamii, na watendaji katika ushiriki wa umma na itaongoza ESIA kwa mradi huu uliopendekezwa. ESIA hii itafanyika kati ya Februari – Mei 2016 na itahusisha maoni ya wananchi ili kuhakikisha kuwa michango ya wadau inazingatiwa katika utafiti huu. Matokeo ya utafiti huu yatapatikana kuanzia Mei 2016.

KUBADILIKA KWA MAELEZO

Kwa sababu kampuni bado inaandaa utafiti juu ya kuchimba visima na uchunguzi wa njia mbadala kuhusu chaguo bora vizuri kubuni mradi, habari hii inaweza kubadilika. Wadau wataarifiwa kuhusu mabadiliko yoyote.

SEHEMU YA MRADI ULIOPENDEKEZWA

Mradi huu wa uchimbaji wa visima na usindikaji utahusisha;

- Maandalizi ya ujumla ya tovuti
- Ujengaji wa jukwaa la kuchimba visima
- uchimbaji wa visima vya gesi
- Upimaji wa gesi (kama itapatikana)
- ujenzi wa sehemu ya kutupa taka aina ya tailings
- · ujenzi wa jengo la kuhifadhi taka

MCHAKATO WA KUCHIMBA VISIMA

Mfumo wa kuchimba visima vya gesi unahusisha utaratibu sahii wa matukio baadaya ya kutambulika kwa maeneo ya kuchimba visima na kukamilika kwa ESIA.

Kwa kuanzia, eneo hilo litatayarishwa kwa kuondolewa kwa uoto wa asili, ardhi kusawazishwa na barabara kujengwa pale zinahitajika. Kwa sababu maji yatatumika katika kuchimba visima, yatahitajika kutolewa kutoka kwa vyanzo vya maji vilivyo karibu au kwa kuchimbiwa kisima cha maji.

Kutajengwa shimo la kuhifadhi taka inayotokana na uchimbaji wa visima vya gesi kama vile miamba ya mawe, na matope kutoka kwa visima vilivyo chimbwa. Shimo hili la taka litawekewa bitana ya plastiki ili kuzuia uchafuzi wowote wa mazingira kutokana na taka hii. Kama eneo hili litakuwa lenye umuhimu nyeti wa kiikolojia, kama vile kinamasi au nyika, basi miamba hiyo ya mawe na matope yatakusanywa na kusafirishwa mbali na eneo hilo badala ya kuwa kuwekwa katika shimo.

Baada ya kutayarishwa kwa ardhi, mashimo kadhaa yatachimbwa ili kupitisha rig na kupea nafasi ya shimo kuu. Shimo lenye umbo la mtatili, linaloitwa Pishi, litachimbwa kuzunguka eneo la kuchimba shimo halisi la kisima. Pishi liatoa nafasi ya kazi kwa wafanyakazi na vifaa vya kuchimba visima. Wafanyakazi kisha wataanza kuchimba kisima, mara nyingi kwa kutumia lori dogo la kuchimba badala ya kutumia rig kuu. Sehemu ya kwanza ya shimo ni kubwa lenye kina kifupi kuliko sehemu kuu, na lenye bitana ya kondakta ya bomba ambalo lina ukubwa wa kipenyo. Mashimo ya ziada huchimbwa kando ili kuhifadhi vifaa kwa muda. Mashimo yakimaliza kuchimbwa, vifaa vya rig vinaweza kuletwa na rig kujengwa.

Mchakato wa kuchimba umeashiriwa kupitia umbo nambari 2. Mchakato huu utatumia maji, umeme na malighafi nyingine

UCHOMAJI WA GESI

Ili kupima gesi inayopatikana, gesi hiyo itachomwa hapo kwenye eneo.

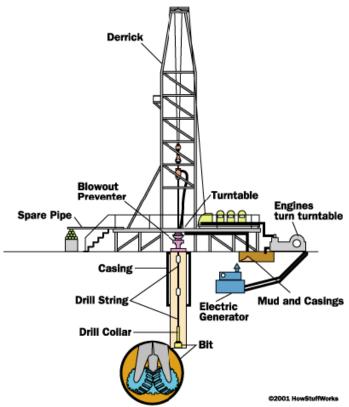


Figure 2. Rig ya Kuchimba Visima

USIMAMIZA WA TAKA NA MAJI CHAFU

Taka kutokana uchimbaji wa visima itakuwa inatibiwaa kabla ya kutupwa kwenye shimo maaulum la kuhifadhi taka aina ya tailings karibu na eneo la mradi. Taka hizi ni pamoja na vifaa kama vile matope kutoka kwa visima vilivyo chibwa, maji kutokana na mafuriko na taka za nyumbani kutoka kambini. Eneo la kutupa taka litatengwa kama sehemu ya ESIA na michoro ya mradi.

USAMBAZAJI WA MAJI

Usambazaji wa maji kwa ajili ya kutumika katika mradi uliopendekezwa unatarajiwa kupatikana kutoka kwenye maji ambayo hufifadhiwa ardhini au maji ya bahari. Takriban kiasi cha lita 200,000 kwa saa za maji zitahitajika kutokana na mapendekezo ya kuchimba jukwaa na kwenye kambi katika awamu ya kwanza ya mradi. Chaguo la kusindika maji haya litazingatiwa katika ESIA.

USAFIRISHIJI WA VIFAA

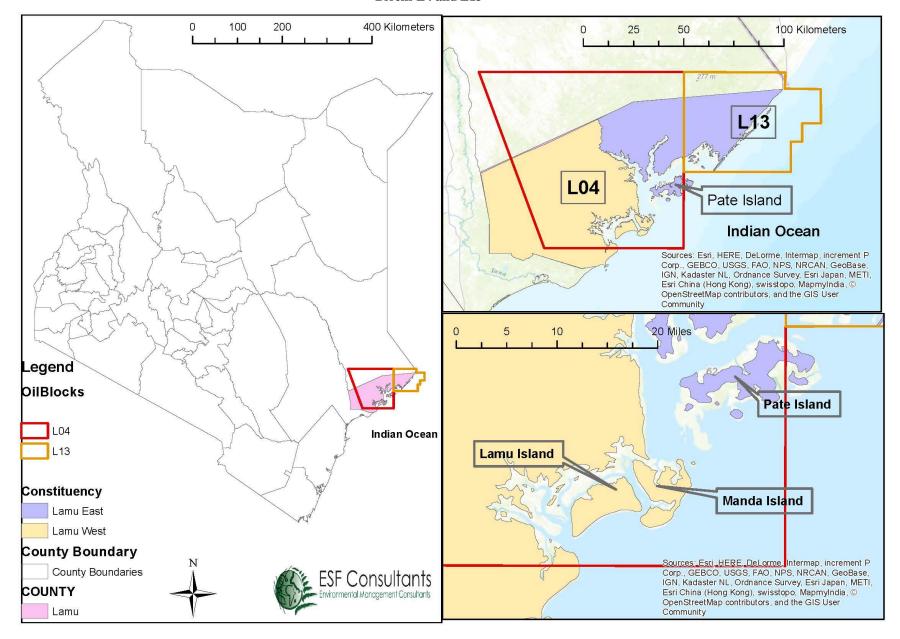
Wafanyakazi na vifaa zitasafirishwa kwa barabara mpaka kambini na maeneo ya kuchimba visima.

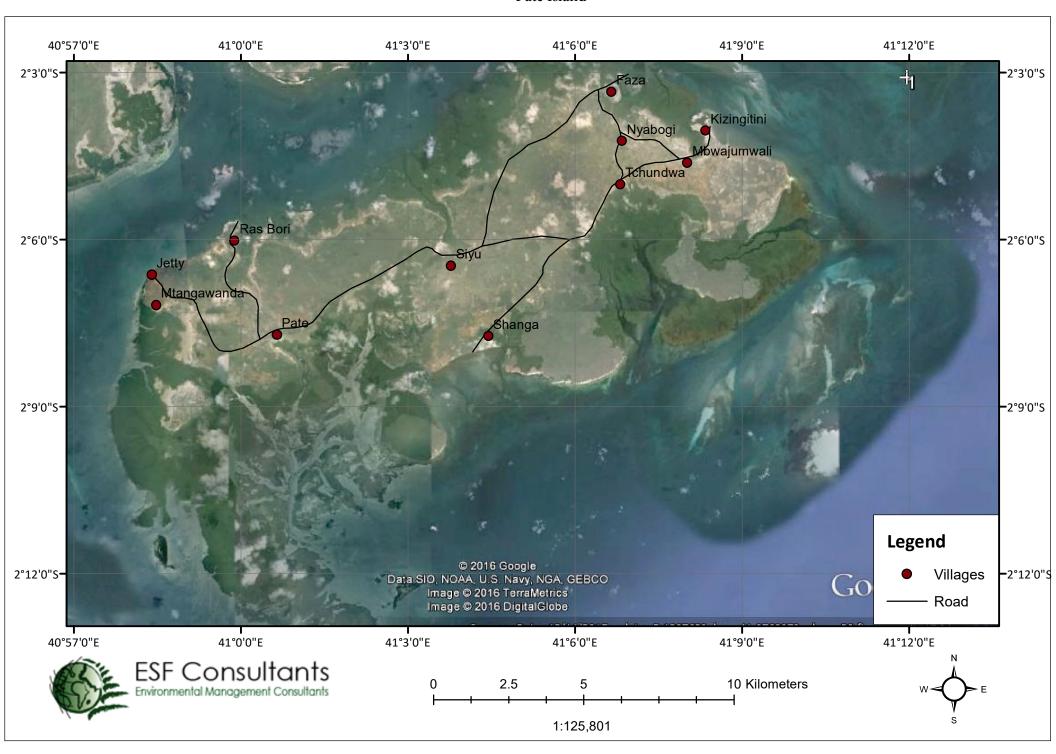
MIUNDOMSINGI NYINGINE

Miundomsingi nyingine ambayo itajengwa ni pamoja na;

- Kiwanda cha kutibu maji taka
- Barabara za kutoka eneo la uchimbaji kuelekea kambi
- Bwawa la kuhifadhi maji
- Miundo ya kuzuia maji ya mvua
- Kambi za wafanyakazi
- Ua la kuthibiti eneo
- Bwawa la kuhifadhi tailings

Blocks L4 and L13





ENVIRONMENTAL IMPACT ASSESSMENT (ESIA) PROCESS

Shirika la kusimamia Mazingira na Usimamizi wa Mamlaka ya Taifa (NEMA), hushurutisha kufanyika kwa EIA kabla ya utoaji wa kibali kwa ajili ya mradi kama huu, ili kuzingatia sheria ya Usimamizi wa Mazingira ya mwaka 1999. EIA hii itafanywa ikizingatia mahitaji ya sheria ya EMCA ya 1999, na itakamilika kwa utoaji wa leseni ya EIA. Leseni hii inahitaji kuzingatiwa kwa matumizi ya viwango vya kimataifa au miongozo mingine ya kimataifa ambayo shirika la NEMA halijapendekeza. Tathmini hii ya EIA inatarajiwa kukamilika mwishoni mwa mwezi wa Mei.

ESIA ni utafiti ambao hufanywa ili kuboresha utendaji wa mazingira ya maendeleo na kusaidia katika kufanya maamuzi ya serikali katika kutoa leseni za mazingira.

Utafiti huu wa ESIA unatarajiwa;

- Kutambua na kutathmini uwezo wa kutokea kwa athari mbaya za mazingira na kijamii kutokana na mradi uliopendekezwa
- Kupendekeza hatua za kukabiliana na athari zozote ili kuboresha mfumo wa usimamizi uliopo.
- Kuhakiki kufuata sheria na taratibu za mazingira, viwango vya sekta, na mahitaji ya kampuni kulinagana na sera yao ya mazingira

Wakati wa utafiti ESIA, ESF Consultants timu kutekeleza utafiti wa kitaalam ikiwa ni pamoja na

- utafiti wa nishati ya maji
- utafiti wa kiwango wa kelele
- Tathmini ya Ubora wa hewa
- · utafiti wa kijamii na kiuchumi
- utafiti wa kimazingira
- ushiriki wa wadau na kushauriana

Utafiti wote huu una maana ya kukusanya takwimu za msingi kwa eneo hilo kabla ya mradi ili kuwawezesha kutambua madhara yoyote yanayoweza kuathiri mazingira ya kisiwa hii ni kutokana na shughuli za Zarara za kuchimba visima

Washauri kutoka ESF Consultants wanatarajiwa pia kushauriana na wanajamii ili kuelewa zaidi mazingira ya kawaida na kupata maoni yao kuhusu shughuli hii.

Ushauri wa Wadau huchukuliwa kama moja ya majukumu muhimu ya ESIA kwa lengo la;

- Kuhakikisha kuwa wadau wote wanahusishwa katika mashauriano na katika kutoa taarifa ya mchakato
- Kufichua taarifa za awali kuhusu mradi kwa wadau wasio wa kiufundi na kwa wakazi wa eneo;
- Kutoa taarifa za kutosha na kwa wakati unaofaa kwa watu walioathirika na mradi na wadau wengine;
- Kutoa fursa ya kutosha kwa wadau wote kutoa maoni na malalamiko yao;
- Kuhakikisha kuwa maoni na matatizo haya yatashawishi maamuzi ya mradi huo.

Umuhimu wa ushiriki wa umma katika ufanisi wa mchakato wa ESIA hauwezi kusisitizwa zaidi.

Kampuni ya Zarara na timu itakayo husika na ESIA ina nia ya kuwepo kwa uendeleaji wa mawasiliano kati ya jamii zote husika, mashirika, vikundi mbali mbali pamoja na watu binafsi wenye nia ya kuhusika katika mradi huu.

Kampuni za ESF Consultants na Zarara zinawakaribisha wote kutoka sekta zote za jamii kushiriki kwa uhuru katika mchakato wote huu wa ESIA. Mchakato wa kuhusisha wadau unalenga kuwajulisha wadau mbalimbali kuhusu mradi na mchakato wote wa kufuatwa katika kutathmini mazingira na jamii.

Kushiriki kwa umma katika mchakato huu unaruhusu umma kutoa maoni na malalamiko yao juu ya mapendekezo yote ya mradi huu. Mchakato huu utasaidia kutambua wasiwasi na masuala yote kuhusiana na mradi ambayo yatahitaji kushughulikiwa wakati wa kutathmini athari za mradi. Mchakato huu pia hunasa maoni na mapendekezo ya wadau kwa ajili ya kushurikishwa katika uandikaji wa ripoti ya ESIA.

Tafadhali hakikisha umesajiliwa kwenye karatasi za maoni zinazotolewa. Usajili wa maelezo yako itahakikisha kwamba utaendelea kupokea mawasiliano kuhusu kuendelea kwa mradi kama vile mialiko kwa mikutano, habari chipuka kuhusu mradi na nafasi ya kupitia rasimu ya ripoti ya ESIA.

MCHAKATO WA ESIA

Mazingira

•Hali ya sasa ya mazingira na jamii eneo la mradi ni gani? Utafiti msingi wa Yapi mahitaji ya kisheria na sera ya Mapito ya Fasihi na Je ripoti za kitambo kuhusiana na mradi Mfumo wa Kisheria zipo? •Makundi gani muhimu ya wadau Ushauriano wa yanahitaji ushauri? umma na wadau •Maslahi yao katika mradi na yapi? husika Athari za mradi zitakuwa zipi? Jinsi gani mazingira na jamii zitabadilika kutokana Utambulisho wa na mradi? **Athari** Je athari za mradi ni muhimu? Kama hivyo, jinsi ya umuhimu wake? Tathmini ya Athari Hatua za kukabiliana •Kama athari ni muhimu nini kifanyike ili kuepuka, kupunguza, kurekebisha au na mipango ya kutoa fidia kwa madhara au kuongeza Usimamizi wa faida za mradi?

Appendix 2 Meeting Presentation

Environmental and Social Impact Assessment (ESIA)
Study for proposed Hydrocarbon Exploration Drilling
Programme on Blocks L4 and L13, Lamu County, by
Zarara Oil and Gas Limited (Zarara)





Outline of the Presentation

- Introduction to ESF Consultants and Zarara
- Project Area
- Project brief and Oil &Gas Exploration Process
- ESIA Process
- Stakeholder Consultation
- Disclosure and Dissemination of Information



About ESF Consultants

- Independent Environmental Management Firm
- Over 15 years experience
- Experience in Oil and Gas in Kenya Seismic Survey & Exploratory Drilling
 - Environmental and Social Impact Assessment
 - Environmental Health and Safety
 - Due Diligence
 - Communication Strategies & Grievance Redress Mechanisms
 - EHS Monitoring
 - Stakeholder Engagement and Consultation
 - Resettlement Action Plans (for onshore projects),

For more information please visit www.esfconsultants.org



Zarara the proponent

- Zarara Oil and Gas Limited (Zarara) is wholly owned subsidiary of Midway Resource International and Operator with a 75% working interest in blocks L04 and L13, as illustrated in the figure below. Other partners to the oil blocks are Swiss Oil (15%) and NOCK (10%).
- Zarara plans to undertake a hydrocarbon exploration drilling programme on Block L4 and L13 in Lamu County, to further explore ad appraise the gas discoveries made by shell in the 1970s.
- The gas if found in commercial quantities will be used to generate electricity



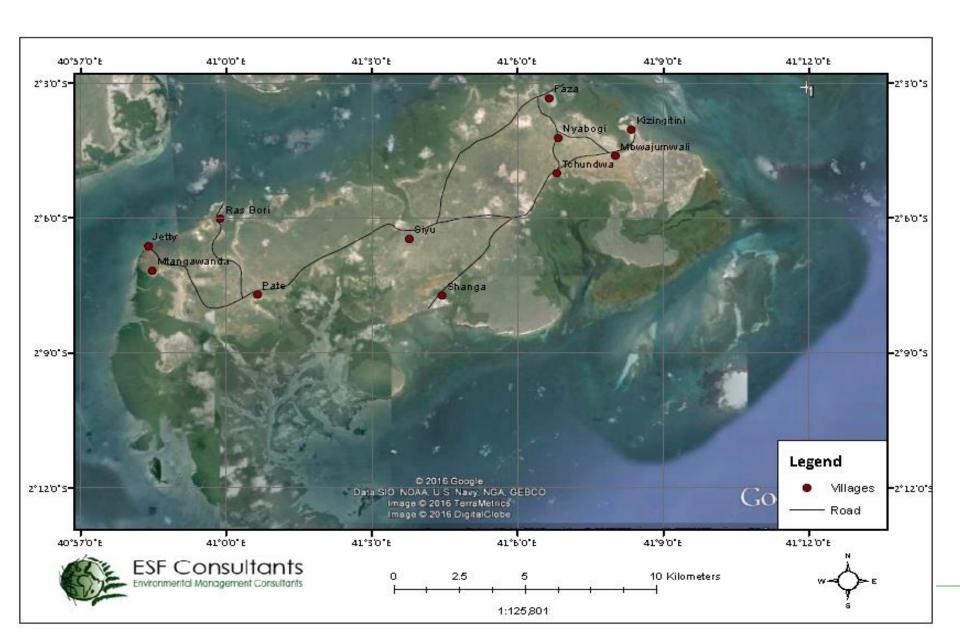
Project Area

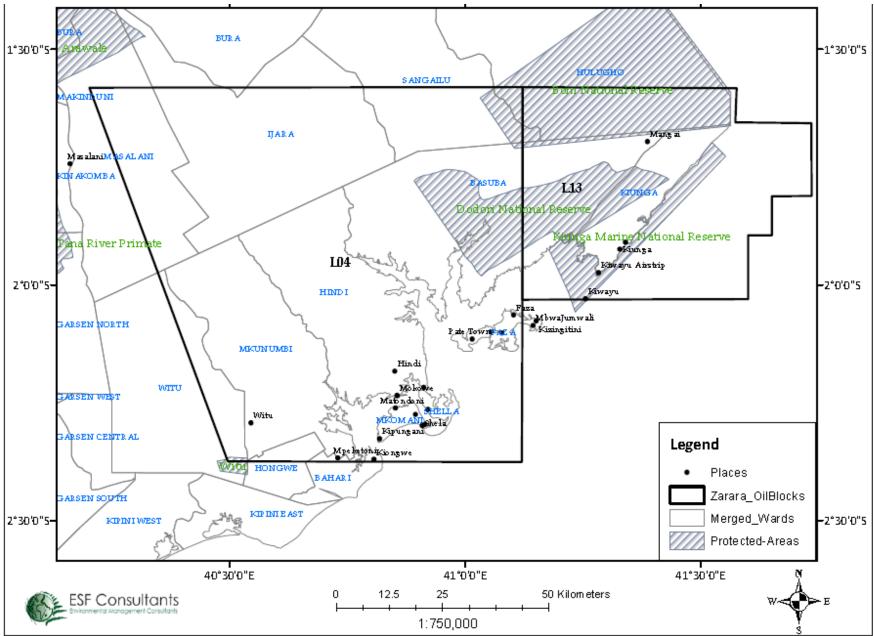
- Block L4 and L13 cover an area of approximately 7,500kms and are located in the Lamu County
- This exploratory drilling will be in Pate Island as shown below





Project Location







Project Background

The plan is to drill one well, with the option to drill up to 4 additional wells to further appraise the prospect.

The first well and optional second well will be drilled from a single site located on Pate Island.

The optional third and fourth wells may be drilled from a further site on Pate Island and an optional fifth well would be drilled on the mainland.



Project Activities

The exploratory drilling programme will concentrate in Pate island. Activities involved in exploratory drilling include:

- Mobilization of equipment (3 weeks intense haulage)
- The establishment of a drilling platform
- The drilling of gas well(s)
- Testing of gas (if found)
- Decommissioning (dismantled and transported from the drill site)

In the event that potentially commercial volumes of hydrocarbons are discovered additional exploration wells and/or appraisal wells are likely to be drilled



Project footprint

The well pad will cover an area of approximately $200m \times 200m$. It will have the following:

The rig,

Ancillary drilling equipment and drilling service units,

Pipe lay down area

Accommodation and offices Camp holding 180 people

Each well is expected to take 110 days to drill.

Material and equipment's will be transported by barge from

Mombasa to Mtangawanda Jetty.

From Mtangawanda, the equipment will be trucked to the drilling sited (estimated 5-10 trucks in the island)



Project input and Output

Inputs

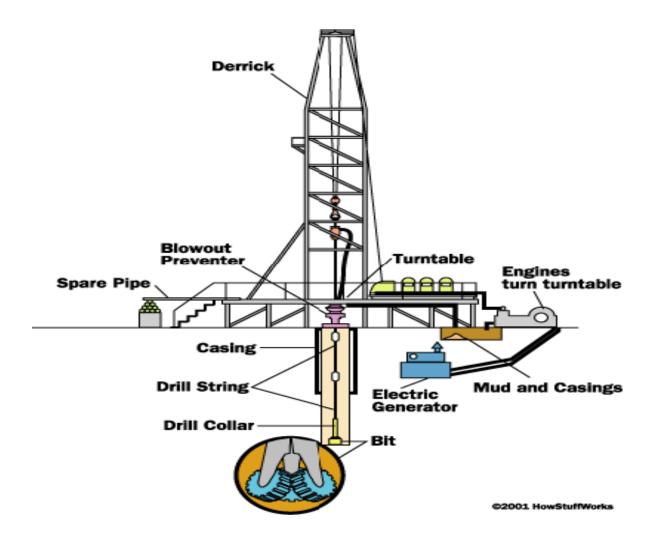
- Water (seawater)
- Drilling mud
- Electricity from generators
- Labour

Outputs

- Waste water-condensate
- Noise –from drilling, generators, trucks and flaring
- Cuttings
- Gas
- Mud



Drilling Rig





Environmental and Social Impact Assessment (ESIA)

...is the process of identifying, predicting, evaluating, and mitigating the biophysical, social and other relevant effects of proposed development proposals prior to major decisions being taken and commitments made.

International Association for Impact assessment (IAIA), 2009



ESIA Process

The ESIA Study is expected to:

- Establish the existing environment where the project falls
- Define the legal, institutional and policy framework of the proposed project
- Analyse the potential impacts of the proposed project
- Analyse the alternatives to the proposed project
- Develop accurate and practical mitigation measures for the significant negative impacts
- Develop an Environmental and Social Management Plan (ESMP) for the significant negative impact
- Identify, consult and involve all stakeholders to facilitate all study objectives



Specialist Studies/components of the study

During the ESIA study, ESF Consultants team will undertake specialist studies including

- Hydrological survey
- Noise Survey
- Ambient Air Quality Assessment
- Socioeconomic Survey –household questionnaires
- Ecological Survey
- Traffic Assessment
- Stakeholder engagement and consultation



Impact Assessment

- Characteristics of impacts
 - Positive and negative
 - Direct and Indirect
 - Long term and short term
 - Probability of Occurrence
 - Site Specific, Local or Regional
 - Reversible or Irreversible



Mitigation measures and project alternatives

- Mitigation measures developed will be economically feasible, socially acceptable and environmentally sustainable
 - avoid, abate, attenuate- reduce the impact, remedy and or compensate /offset
- Alternatives:-
 - -No Project option
 - -Alternative technology
 - -Proceeding with the project with mitigation measures



Environmental and Social Management Plan (ESMP)

- Impacts identified
- Mitigation measures
- Monitoring
- Responsibility
- Resources
- Timeframe



Stakeholder Consultation

Objectives

- Inform about the project
- Inform about the ESIA Study (disclosure)
- Establish a channel to communicate with stakeholders
- Request feedback/issues and concerns of the Stakeholders

Stakeholder Meetings

• Faza Shanga

- Kizingitini
- Mtangawanda
- Pate
- Siyu



Who are the Stakeholders?

- I. County Governor and county ministries
- 2. National government and quasi-government institutions
- Civil Societies and NGO's
- 4. Community members
- 5. Community leaders
- 6. Community conservation/welfare groups and organizations
- 7. Any other interested party(s)



Disclosure and Dissemination of Information

- Background Information Documents (BIDs)
- Power Point Presentation
- Focused Group Meetings
- Emails
- Telephone
- Interviews (household and key informants questionnaires



Thank You

• For more information on the ESIA study, to share or make a comment, please contact,

Duncan Oyaro

Email. duncan.oyaro@esfconsultants.org

Tel: +254 736 100 205

www.esfconsultants.org



ESF Consultants Ltd

Email:

info@esfconsultants.org

Tel:

+254 736100205

Website: www.esfconsultants.org



Appendix 3 Stakeholder Meeting Register Ennumerators training

Date: 18/04/2016 County: Lamu - Lamu East Loc

Location: Faza - CDF Social Hall.

NO:	Name	I.D. Number	Position/Role	Location from	Phone Number	Signature
1	MOHAMED ATHMAN	34224788	Ennumerator	Siya	0715977765	ak
2						
	MOHAMED ISHAKA	22593328	Ennumerators	KIZINGITIMI	5714901364.	Motorial
3						
	MoHamEs Burging	20599923	r	MTANGGWARDA	0723007968	(BOXED)
4						
	MUDHIHIR MZEE	22538514	ų	TCHUNDWA	0716802650	Aughorn
5						S
	Murry Romantions	22412993	((PASSE	0729513571	Dunye .
6		120070012				1
	SHAFFI FAHMUN	20562844	16	MENATUMWAL	6727083403	*
7						01
	NUAU ZAKARIA	20405472	11	FAZA	672513414	1 202
8						
	SAID MOHAMED	4026106	ENNYMERATOR	FACA	925632856	W.
9						
	MICHAEL KIBOI	26485693	EST CONSULTANTS		0736 100205	360
10	Anthony Kiovi	25134702	Emmonmental	Est Consultants	6736 100 205	Hungs-

Ennumerators training

Date: 18 4 2016 County: Lamy - Lamy East Location: Faza - CDF social Hall

NO:	Name	I.D. Number	Position/Role	Location from	Phone Number	Signature
1	MOHAMED ATOMAN	3422478		51 44	0715977765	mp
		2		Landence State Control (No.		The second secon
	MOHAMED IS HAKA	22593328		KIZINGITINI	0714901364	Although
	WOHLD BANKER	20599923.			0723007968	
5	MUDHHIR MIEE	22538514		TCHUNDWA	0716 802650	ALIBANDA
	Mwinyi Romandoni	22412993	Enlunces 782	POTTE	0729513571	Berry
	SHAPES FAHMUN	20562844	//	MBWAJIEMWAL	0727083403	soft.
						0 10
	MUHU ZAKARIA	26405472		FARA	0725134147	tool
	SAID MOHAMED	25026106	ENYMERATOR	FAZA	0725632864	SHH.
2/151	LINET MBOVA	25172801	Environmental Consultants	ESF Consultant	0736100205	Macri.
0	Dorothy Suigh Abdulswormed Basheigh	27214948		Est	0936100005	K

ESIA for Proposed Hydrocarbon Exploratory Drilling Programme on Blocks L4 and L13, Lamu County

							12
Date:	814	1Pril	2016	County:	Kano	Location:	Faza.

NO:	Name	I.D. Number	Position/Role	Location from	Phone Number	Signature
1			ASST CLACT			
	JATFAR FAKIL VAN	11140636		FA2A	0703214339	Mi.
2						ty
	MOHAMED ALISAB	3520399	ASIT CLICK	Foza	0.7024612	on the
3						}
	Somot BAMKUU	0654839.		FAZA	0720287332	8
4						
	BATULI MOHANGES			FAZA		BATTLE
5						
	RUKIA SHEHALIMA	1110446		FAZA		RUFIA
6						
	MOHAMED ABASS	24848147		FAZA	0721847768	and .
7						
	MOHAMMEDBWane	25100649		FAZA	6715122800	THE
.8						-9
	Strattby. H. ALI	e654270	Assistant	haca	0714695090	All of
9	1		110000			
	ALL KIDASI BUNIU	6651443	BUSSELPESS -MARY	FAZA	0729249968	A
	11000			<i>—</i>		BOTA
	HASSAN NOUM		muan	FAZA	07.176043	##

Date: 18th April 2016 County: Lono Location: Fara

NO:	Name	I.D. Number	Position/Role	Location from	Phone Number	Signature
1	BAKAR Attrices	22639414	CLERK	FAZA	070665598	BAR
2	ABI OMAR HASSIAN		Fishermen	7A20		XC,
3	Mo HAMED SHARK	2139858	FISHERMEN	FAZA	0700352516	
4	ABOUD O IBRAHIM	0163543	FARMERS	FAL	0706774044	adl
5	ABUDI M. KASSIM	0166714	MARER	FAZA	0710347226	ators
6	HUSSEMN SOMBWAL	9321464		FAZM	071814561	The state of the s
7	KAHME SULUHU		LOKSIN	Fara	07142759	-KANALE
8	SALIM BWANA			FAZA		Hohame
9	Mostanion Sand	1114894	Carlineard	t A 2011	8/1677744g	AC.
	BEWARD B. SIEPHEN	24654934		FAZA	07175833319	Mud

Date: 18th April 2016 County: Lano Location: Faza.

NO:	Name	I.D. Number	Position/Role	Location from	Phone Number	Signature .
1	SOM BWAWA Comm	11141727	FISHERMAN	FAZA	0711366534	
2	612 / B40 K/4/				en verille veriller en	
	ANWAR SAND	10391433	FARMADE	CHUNDWA	0710538799	Ral
3 ·	ABUU M. SHEE	0654552	FISHERIES DEFIN	TAZA	0723879408	Dosc.
4	FADHILUN MOHID		FICHERMAN	FAZA	072690419	
5	FRUMICUM TOTOMIN	200740	4 BHERIMAN		0100114)	
	MOHAMED BAUSI		FISHERMAN	FAZA		ing.
6	MOHAED ATHMA	29899089	F/Bizi	FAZA		100
7	MZE M. SWALCH		FISHERMEN	FAZA		MZEE
8	SEIFE AHMID		EDMRA	FA2A		8
9	HAMISI ALFAN		FAMRA	FAZA	071750833	MS
	DAVID MWAMBANDA	0155879	EDUCATION	FA72A	0772+272374	Stately

And the second second second second second					
Date: (8h A	105il 2016	County:	Long	Location:	taza,

NO:	Name	I.D. Number	Position/Role	Location from	Phone Number	Signature
1	M.S. Aramu Azi	21237267	GREGIGHER.	FOZA	0723971938	Alla
2	Abdul Karın Stut			Forzal	0725815165	1 11
3	MOH! SHEE	1039120		FARA	0790808	
4	ABDU KAHALE		COXNEA	FAZA		Maj
5	HAFI DH SHINGD	27520257	An.	Pozo		you
6	ADASS ABDRUA	0651727	Sich	FAZA		Have
7	FARTI ALI	24728676	Ach	FRZK	D1043444 (C	A
8				L V		
9						•

Date: 18th April 2016 County: Lann Location: Fara

Name	I.D. Number	Position/Role	Location from	Phone Number	Signature
MKUU BUNU			FAZA	072358079	A A A A A A A A A A A A A A A A A A A
Molamed Ali	31405772		PAZA	0715976996	att.
SHALLY S. SHALLY	9352537.	REVENUE CLEARC	FAZA	0714708996	Stuf.
RIMMI ABPALLA			FAZO	072461133	Alasaces
MICHEL KIBOI	26483693	EST CONSULTANTS		0736100205	& Cot
Anthony KIOVI	2(137402	Est Consultants		6786160205	Dung
		Environmental Consultant	ESF Consoltants	0736100205	Mauri.
Dorohy Suph	2721 4948	Environn Potal	ESF Consulter NJ	0736100205	Do.
Abolsomed Bakerkh.		Community Liasion Officer	Zarara Oil and		#
	MKUU BUNU MOGRAMOS ALI SHARRY S. SHARRY RIMMIN ABDALLA MICHAEL KIBOI Anthony KIDVI Linet Mbova Dorony Sign Abdiswood Barrich.	MKUU BUNU Mobamed Ali 31405772 SHARRY S. SHARRY 9352537. RIMMMI ABDALLA 11625989 MICHAEL KIBOI 26483693 Anthony KIDVI 26137702 Linet Mbova 25172801 Doromy Sugn 27214948 Abuisward Bannich.	MKUU BUNU MOLAME & ALI 31405772 SHAKKY S. SHAKKY 9352537. REVENUE CLEARE RIMMIN ABDALA 11625989 MICHAEL KIBO) 26483693 EST CONSULTANTS Anthony KIDVI 2(137402 Consultants Environmental Consultant Touron ental Dorony Sigh 27214948 Consultant Consultant Molama 27214948 Consultant Molama 27214948 Consultant Dorony Sigh Parental About About	MKUU BUNU Mohamed Ali 31405772 PAZA PAZA SHAKAY S. SHAKAY 9352537. REVENUE FAZA RIMAMI ARPALA 11625989 FAZA MICHAEL KIBO) 26483693 EST CONSULANTS Anthony KIOVI 26134402 Consultants Environmental ESF Consultant Consultant	MKUU BUNU MOLEMED ALI 31405772 PAZA O712358079 PAZA O715976996 SHAKAY S. SHAKY 9352537. REVENUE CLEARE FAZA O714708996 RIMMM ARD ALLA 11625959 FAZA O714708996 FAZA O714708996 RIMMM ARD ALLA 11625959 FAZA O714708996 CLEARE FAZA O714708996 O736100205 FISH Consultants O736100205 O736100205 O736100205 Consultants Consultants Consultants Consultants Consultants Consultants Consultants O736100205 O736100205 O736100205

Date: 19/04/2016 County: Location: Kizingitini

NO:	Name	I.D. Number	Position/Role	Location from	Phone Number	Signature
1	ALIFANKUP	28743434				
2						
	DUMILA MADI					
3	XHADIJA OMAR	e e			F020800	4
4						k
5	MOHAMED LOD				· 71084911	
	MOHAMED OMAGE	3164216			5794514204	
6	MAU KAZE					
7	ABUN MOHAMED				e707333232	8 7072231 32
8	mutisin mothamed					
9						
	SHARIFA IMAM				572(537824	Sho

ESIA for Proposed Hydrocarbon Exploratory Drilling Programme on Blocks L4 and L13, Lamu County

1110 t9 t9 t 7 TT

19 27

, 1 /)
Date: 19/04/20/6	County:	Location: LIZINGIAN?
11011210		\sim

NO:	Name	I.D. Number	Position/Role	Location from	Phone Number	Signature
1	KASSIM SHE	2128317	25	KIZINGITA	0703324350	- Kel
2						
	YAHA RAKARIN OMAN	0158998		Kizikamin	072543812	Tourne
3						
	TUSH F OMNR	0654948.		KIZNY INTO	0721846986	ولافساع
4 .	SAID SEIF				071769695	3
5						
	MitIMAH MOHAMER	2648			FO 4071591	عمانتي
6						
	BILAL BAKAR					
7	MOHAMED MUHDHOAR					MOHAMAD
8	Suo KXCE			X12	676867392	
9	SMATO MOJIAMED		The state of the s		07 05 124904	SHOW!
	BUHRTIABUL					

Date: 19/04/2016 | County: | Location: 12/2/1977)

NO:	Name	I.D. Number	Position/Role	Location from	Phone Number	Signature
1						
	RUBEIR SHALI					
2						
	MUSA MOHAMED	10391267	11.0	9)2	6721440401 0711588677	Les
3						
	MASSIM MOHAMED	28854435.		1412	0711588677	.
4						
	ATHMAN SHALI			KIZ		
5						
	NUZHA HAIDAR	25134422		K12	7-2547541	Ath
6						
	SHELALI MOTTAMED				6	Show
7						
	MOHAMMED SHALI				0710369469	moquel
8						
	SWAR ABUD				072593895	
9					*	447,4
	ATIMED SWAZEH					

Date:	County:	Location:

NO:	Name	I.D. Number	Position/Role	Location from	Phone Number	Signature
1	Dwanashee	8520458	Peacher	KIZINGITINO	072172356	IR)-32
2	Issa mond		Shident		07 06 4668	In.
3	Manin ABous	8524763	15 CAMICTEACH	-	1	v sto
4	Moh'd Bamkov	-	Lishermen			MOMAMER
5	Omar Abdallah			Kisingitini		(O.A)
6	Moh'd Athman		Fisherman		0711444691	May
7	About omer		Fishaman	, 0		
8	MOHOD TADY	1162537	5	11	071819602	mose
9	SAMINIOH'D	935393	Zishermen	KIZINGOTI	07047713	Das

Date: 19/04/2016 County: Lamo

Location: Kizingilini

NO:	Name	I.D. Number	Position/Role	Location from	Phone Number	Signature
1						, ;
	AHMED BILALI	22046508		KIZINGITINI		Aul
2						/ 7
	8/2 400 - 1		5/11	1/		01
	Shorking Ali		Shelend	Kisingiani		
3					171/2.17	1
	SAMPL AL MOHE			LIZING. KIN!	0706317	77
4	JAMES PA. WISONS			L' C'NO JOE 110	0 08	DOUTH
	ABOUD 155A		chudoot	12.5		(2)
5	11000D (33H		student	Kizingitini		(Atte
	N. WAT ARKS				-0103337(10	1
	MUHAT OMAR	31631266		KIZI NGILINI	07/0322618	TW .
6	11 1					0
	HUSEIM MOHO		Lisherman	X121NGITIN		4
7	, , , , , ,			N 1 - 7 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -		7
	2010		Refailer	KIZINGITINI		
	OMAR SSA MENSON	30538831	Letaur	KIZINGILINI	0701303740	a
3						
	Michael Kisoi	24182182	ESF CONSULTANTS			4
9	NICTIFIED RIBOT	26485693	EST CONSULAND		0736100205	-664
			ESF		7-1	
	Anthony Kiovi	25134702	Consultants		0736100205	Harry
	Abduswood Basheinh		Community			1
	Al House		Liuliun			

Date:	County:	Location:

NO:	Name	I.D. Number	Position/Role	Location from	Phone Number	Signature
1	Mohand Ar.	1116920		Kiziwatini.	0723 654440	When
2			44-48-14-57			
	Bure KARE	236226	291	1	07033327587	S Best
3						
	SALIDI MOHID	9352412	. 1	Ċ(071744862	1772
4	ATHMAN MUSA	9352336		Kizaltinin	6727803397	Alas
5	JUSUF KAMM	9353949		KIZINGITIN		6
6	1) ISBAHER ALI	3169160		LIZ IN GITAN	0729770633	Min
7	Attmed MuttoHAP	24907274	Ast. chier		0714103499	20
8	ABOND BW: ME		THE THE RESERVE AND A STREET OF		6763207628	110
9	Shakur han	26195554	1	Kizingitini	0725003882	Jan
						7

				1	The state of the s	
Date:	19	County:	LAMU	Location:	MBWAI	UMACI

NO:	Name	I.D. Number	Position/Role	Location from	Phone Number	Signature .
1	MOHAMED S. MOHAMED Owall	0651535	AG. CH EF	MBOUTSUMWING	0722139699	
2						
	MOHAMED HERI MAKUTURE	3164215	HEADMAN	u	0711262242	AH
3	KWELI AHMED KWELI	3164215	ELDER	n.	110	abol .
4	ELIAS MCHENI		FARMER	6		
5	AD ELIAS ARMED		FARMER	tı .		
6	ALI Muhaji Famau		FARMER	MBWAJUMWALI	N	Materia 1
7	ABDUL AZIZ OMARIMA	31700701	LAB OUR	MBWAJUMWAL	O704063871	and in
8	AZI MOHAMEDAL		FXAMER	MEWATUM	phe,	Ale
9	SHBWAND		FARMER	MBW Jumm	11	60
	Baishe Islamu		FARMER	MBWHumun	N N	4

mosting 2

Location: MSwanyumwal

Name Position/Role NO: I.D. Number Location from **Phone Number** Signature 1 FRAMER MOHAMED AHMED 2 ZOUNA MBARYK FARMER. MBW FUMWAL Mhel 23880476 FISHERMEN Myabogi 070038603 4 MBWAJUMWAU AMEER DMK2 FISHERMEN KASIM ALI FISHERMEN MBarajama 6 MBW AJUMWALS 0726839781 SIAKA FISHER MEK YUSSUF MOHAMES FIRMER MEN Blowayumurdi 0713061470 8 FISHEL MEN SIMBLE AVOITI 9 Musa mi FISHER MEN M BW DU C FOOLS

Date:

County:

Meeting 2 Location: MbWanjumWali Date: County:

NO:	Name	I.D. Number	Position/Role	Location from	Phone Number	Signature
1	Hashim Mahid	The state of the s	FARMER			
2	Bakari Ath man		FARMER		0216004521	BAKAK
3	Kasim Ali		FARMER			~ ~
4	SEMBLOWNA		FARMER		070178707	3 B.
5	Mond Somo		FARMER			
6	MR ALI ATHMAN AZI	11625311	TEACHER.	MBWAJY	6724794	AMA
7	MUSTAFA AVUMAR ARU	3524755	TEACHER	MBWEINWA	1,071819624	- V
8	AUUTITI BUNCI		FARMER	11		AUIT
9	BAMSI ISSA		FARMER	MBWMUM	mirtle - =	Bol.
	MOHAMED MADI					

meeting	2

Date:	County:	Location:	Mon any am wale

NO:	Name	I.D. Number	Position/Role	Location from	Phone Number	Signature
1						
	4.		FARMER	M		11.
2	ADI		1 KILMIER	MBNWINNE	, ,	Han
						Λ
	BOWNNAHAMASI AU		FARMER	Ma		CAR sule
3	I WANAHAMASI AU		1104001	Manyuma	1	TO THE
						+ MAS
	ILYAS MCHENI	•	FARMER	MBWAJUMW,	Ku	The.
4	1		Est. 11 L			1
	Anthony Kiovi	25134202	Est Consultant		0736100205	Howard
5	Abdusworad Dasheikh		Companies			11
	Or State of State of		Companies			
	Alany Aborin		Zarara On & gas			
6						
7						
8						
9						
		Linklinder St				
					Activities and the	

Date:	County:	Location:	

SHEE NA MOHAME SAN BWANAM HARL K(BO)	KUU	FARMER FARMER TEACHER	MB W SHIMWALL MBNING UM NIGE TCHINDWA		AME.
NA MOHAME SAN BWANAM	KUU	FARMER	Mennyumara		AME.
NA MOHAME SAN BWANAM	KUU	FARMER	Mennyumara		AMe.
SAN BWANAM	KUU				AMe.
SAN BWANAM	KUU				n
		· TEACHER	TCH, NAMA		
				0710538772	BYHAR
HARL K(BO)					
	26485693	ESF CONSULTANTS		0736100205	need .
			1000		
	*				

Date: 20th April 2016 County:	Lamo	Location: Thumbau	
			9

NO:	Name	I.D. Number	Position/Role	Location from	Phone Number	Signature
1	WALADIWA MUHAJI	0651818	former Consillor	amindosa	6727781414	(Ou) see
2	Sharifu Athmani	1164928	VILLAGE	Chundra	0723003111	Tien
3	AROI M. MOHAMES	11626674	CHIEF	TCHUNONE	0726332636	- Alle
4	Aremas F. mortamas	9353772	SNR ASST CONS	TCHINDWA	0715206320	AS
5	Zan monther has		ELBAR	Tommisusa	Ó1 10 538795	XIA X
6	HINSON MYHELDAR A.		Familyer	Tomrebusa		HSANI
7						
8						
9						

Date: 201 April 2016	County: Land	Location: Tchysolia

NO:	Name	I.D. Number	Position/Role	Location from	Phone Number	Signature
1						1
	MUNA ABOUD.			tch.		AND
2				ч		
	MWANASOMO BIHAFSI			ICH.		
3			(Lamy east)			
	FATMA ARUMII.	11141194	(Lamu east) . W.E.F officer	TCH.	0728345455	Am
4						
	MoHAMED BWANTAUZI			TCH.		
5						
	MAHAMOUD MOHAMED.			TCH.		
6			Part Harri			
	MWANAISHA YUFUNA	10 P/A		TCH.		Marie .
7	7070117					
	RUKIYA SOMBWANA			1cH.	0716127356	Bukin
8 .						
	FIRDAUSI WALAD.	32323163		TCH.	0727781414	fathered
9						
	NASMU MOHAMED.			TCH.	6718692079	400

Date: 20th April 2016 County: Land Location: Tchurcha .

NO:	Name	I.D. Number	Position/Role	Location from	Phone Number	Signature
1						
	MWANASHA. SHEMOTE	24354472	CHRIRLADY	Tick	0723811293	Me.
2						
	ESHA BWANAHERI			ТСН	0708352329	EN.
3						
	BULE SOMBWANA			TCH.		Benoporo
4						
	DURI BWANA	23949025		TcH	0712396893	D .
5						
	KHADITA SHOSI			TeH		WHADIJA
6						
	NYRSHEE HRMAR			TCH.		N.H.
7						
	SAMIA MOHAMED.			TCH.		
8						
	LAE SHEBA.			TCH.	070600274	5
9						
	Tima Budu	Lucia		TCH.		
				ICH.		

Date: 20" Pari 2016 County: Lance	Location: Thypawa

NO:	Name	I.D. Number	Position/Role	Location from	Phone Number	Signature
1						
	MWANAISHA MWENYE			TCH.		
2 ·	i i i i i i i i i i i i i i i i i i i			i CH		
	MWANASUMO BASOMO			TCH.		
3						
	YAYE HUSSEIN			TcH.	0729032566	PAYE
4						
	BULE SAID			TCH.		
5						12 70 10 10 10 10 10
	1 1:					
6	Morro Hamil.			TCH.		
Ь						
	JUBEDA BUNU.			TCH.		
7						
	0.					
0	MADINA SAID.			TCH.		
8						
	JAFFAR MOH'D			TCH.		
9	Julian March			1.97		
	KHAL HA BAMKUU.			TICH.		

Date: 25 April 2010 County: Lamo Location: Tchundua.

Name	I.D. Number	Position/Role	Location from	Phone Number	Signature
- C					
IMA SHUNGWATA			TICH.	0727034498	T.S
dan-in F					
TVCHENDI FUMO			TCH.		8
was make.			TON		6
military in dead			CCH		
ENTE BIBA.			1ch.	07 1852693	1 YAYS
HMA SWALIHIMA.			TCH.		
0				17011673010	NE
NRIMA. BADI.			TCH.	0 1040 108 43	~
IMPER (CIMPIN					
HUBERN SHAFF			TCH		
CHET JONES.					
OHELE NASIBU			ncH.		
VICCONE MAHRMEN.			TCH.		
food monthings			tur'		
	Name TIME SHUNGWATE. NEHENDI FUMO: TIME MAZEE. YAYE BIBA: TIME SWALIHIMA: NAME BADI: HOBEM SHARIF SHEE NASIBU: YUSSUF MOHRMED:	TIMA SHUNGWAYA. NCHENDI FUMO: IMMA MZEE. YAYE BIBA: TIMA SWALIHINA: NAIMA. BADI: HUBEM SHARIF SHEE NASIBU:	TIME SHUNGWAYA. NEHENDI FUMO: THE BIBA: THE BIBA: NAMA. BADI: HOBEM SHARIF SHEE NASHBU:	TIME SHUNGWATA. TICH. NEHENDI FUMO' TICH. THE BIBA: TICH. TIMA SWALIHIMA: TICH. MARMA. BADI: TICH. TICH. SHEE NASIBU: TICH.	TICH. OT27034499 NEHENDI FUMO TICH. THER BIBA: TICH. TICH. TICH. OT 1852693 TICH. NAMA. BADI: TICH. OT 0467384B SHEE MASIBU: TICH. TICH. OT 0467384B

VE						
Date:	Lou April	2016	County:	Long	Location:	Tchromas

Name	I.D. Number	Position/Role	Location from	Phone Number	Signature
					AM
CONO CHERMANA			1011	6703762848	2,1
SHORE SHOWERING			ICH.		
W. 1. 2. (1)					
TRAUB WIHMAN		R Links Mark	1CH.		
OMAR BWANA			TCH:		
Today . Becam			TON		
THINGTED DIGOTIO			141.		
1 - 0					
PUSSUF BWAHERI.			TcH.		
MRENANA LOLA.			TCH.		
				The state seems	
i					
IDARUS MOHAMED			TCH.		
Manager Hassanle			TOU		- LOSALA
IN TOUR HESSELV			ις((MIN-804
NNAA MSAJI			Tch		N.M
	SADA SHEBWANA YAKUB UTHMAN OMAR BWANA TANZILU BASOMO YUSSUF BWAHEAL. MBWANA LOLO: MARUS MOHAMED. MWANAISHA HASSAN'	SADA SHEBWANA YAKUB UTHMAN OMAR BWANA: TANDILU BASOMO YUSSUF BWAHEAL: MBWANA LOLD: IDARUS MOHAMED: MWANAISHA HASSAN:	SADA SHEBWANA YAKUB UTHMAN OMAR BWANA TANDILU BASOMO YUSSUF BWAHERI MBWANA LOLO IDARUS MOHAMEN MWANAISHA HASSAN	SADA SHEBWANA TCH. YAKUB UTHMAN TCH. OMAR BWANA TCH. TANDILU BASOMO TCH. MBWANA LOLO TCH. NARUS MOHAMED TCH. MWANAISHA HASSAN' TCH.	SADA SHEBWANA TH. 07-037-62848 YAKUB UTHMAN TICH. OMAR BWANA TICH. TANZILU BASOMO TICH. MBWANA LOLD TOH. MANANASHA HASSAN TICH.

Date: 12h April 2016 County: Lond Location: Chundwa						
	Date:	17h April 2016	County: Land	Loca	ation: Chun	dwa

NO:	Name		I.D. Number	Position/Role	Location from	Phone Number	Signature
1							
	Ishaq She	tiba			CHUNDWA		
2							
	Yussuf B	asomo	25820703		TCHUNDWA		
3					THE PLAN		
	Bwanahama	id, Faral	30238041		CHUMDWA	0712515584	Thomas
4 ·							
	Abdulaziz Xt	ond	30346446		TCHUNDWA		
5							2100
	Nasru Mo	W4	31511995	a	TCHUNDWA	0714514492	
6							
	Jaafar Abd	allah			TCHUNDWA		
7							
	Abdulkarim ?	Bakar			ICHUNDWA		
8							
	Shemote M	Suo			TCHUNDWA		
9	10						
	Mora Mas	srudin			TCHUMDWA.	0714018192	
10	ALI SWAE	BURI	23988848	OPERATION	TCHUNDWA	071108093	K

Date:	12h April 2016 County:	Lamo	Location: Thunda a

NO:	Name	I.D. Number	Position/Role	Location from	Phone Number	Signature
1	SNAHALI MOHAMED	32614582		TCHUNDWA	0718695328	the land.
2	MOHAMMED BUNU	y VV been		TCHUNDWA	0714895375	The same
3	SWABIR ABDALLAH			TCHUNDWA	0723303839	A sola
4	MOHAMMED KHERI			TCHUNDWA		
5	MOHAMMED ALI	2885852		TOHUNDWA	0717507560	
6	ATHMAN BASOMO	5.00	Cathirin	TCHUNDWA	0700789119	
7	MUAWIYA OMAR	10391431	DRILLER	TCHUNDWA		
8	BIHAFUSI MBWANA	20319704		TCHUNDWA	0703767990	V
9	ALI ABDALLAH	27341980	h. s	TCHUNDUX	A Charles	ten
10	YUSSUF MBWANA	14537132		TCHUNDWA	0712576071	- Alswares

Date: 20th April 2016 County: Lond Location: Tchudson

NO:	Name	I.D. Number	Position/Role	Location from	Phone Number	Signature
1						
	Nasisa ab Allta			= COCK.	271760600	(A)
2	1193139 aboning			LOGE .	0717525835	Wells
	AISHA SAID		t	tich		AND
3	71.9173					
	Vis a To Ass			,		16.1
4	KHADIJA ABBALLA				0703829914	Vitado
4						
	MUNA HASSAN	30523987			0715414029	Will-
5	111111111111111111111111111111111111111	0020101			01121170-1	IM-60
	SUMETA ABULL				0791640108	STAR
6						
	- Dunta					
7	TIMA BHAFSI					
,						
	Afunka fumo.					
8	14770					
	.1					
	NWANAHAWA ROVU.					
9						
	REHEMA FARITI.					
2 - 100 B						

			2 (L. 7. M. 18 M. L. 18 M. 18 M. 18 M. L. 18 M.	
Date: 20 April 2016	County:	and	Location: Trhuc	Wa

Name ·	I.D. Number	Position/Role	Location from	Phone Number	Signature
MWANAKIMWENTE SHARIF					Moss
			1 SE		
Site HO THRONTHIL					
Jonathir Marie III					
SUCAHA GAIN.					
Journal Dilly.					
	MWANAKIMWENTE SHARIF SUKAHA TIRMITHII.	MWANAKIMWENTE SHARIF SUKAHA JAM.	MWANAKIMWENTE SHABIF SUKAHA SAID.	MWANAKIMWEN/E SHARIF SUKAHA SAID.	MWANAKIMWENTE SHARIF SUBAHA SAID.



Date: 20th April 2016 County: 1000

Location: TChumana.

Youth Group. NO: Name I.D. Number Position/Role Location from Phone Number Signature 24354472 CHARLADY 0723811293 ecti. NOHENDI Fumo SHEE 20318641 munber. TICH . 3 0704673843 NBO Nama BADI. MEMBER. ich . Anthony KIOVI 25134702 036100205 0736100205 Consultant. Dorolly Sulen 27214945 Abdusworad Bushpikh CLO 2arara on and gas. 7 . 8

Date: 20h April 2016 County: Lamo Location: Sign

NO:	Name	I.D. Number	Position/Role	Location from	Phone Number	Signature
1	ABURAKAR OMAR	2236191	Adult-teacher	SMU	072424816	flot
2	0,0,0					
	AHMAD MAKA	3165654	Headmen	SHU	07248332	Botto
3						
	ARAS AHMAN	3765779.	felmor	Siyu	0763662680	ARA
4						\wedge
	MWACIM ALI		mom	SINU		MU
5						, J. (.
	RAFFI Shee			SHU		KAR
6						
	MANFULDH SHE		farmer	Siyu		Mar
7	7,1,100					6
	ABUBAKA M.Chuon	1 (a)			316 5783	20135
8						ABOOT
	ABUD M. Chuoni		farmer	snyu		
9						
	SHEBUNU M. BAUST	071161954	10001	SIYU	935044)	shull -
	Swelch famou	11140206	Rixeners	SIYU	070447945	The

Date: 20th npri 1 20th County: Lano Location: Sry

NO:	Name	I.D. Number	Position/Role	Location from	Phone Number	Signature
1	YAHXA Bwanhahi		ASST CHE	SIVU	0725666250	XX
2					0)2472	
	MADIALIMADI	8520488	HORD MAN	SIV	0715122247	
3						
	WALADIMADI	20269780	Fishing	Situ	0712-436973	1921
4	/					
	NASSIR HUSSEIN	4583530	UKULIMA	SIYU	_	Main)
5						
	SHEWH ABUBAKAR	24354478	BUDABODA	SIL	0712848033	2 Sheets
6						
	0.00%					
7						
	ALLNOED ILALE	13618775	Imployee	Suja	67024724r	-
8	JAML OMRI		Farrer	5144		\$
9						
	omar Bwand		fishing	5154	0717716329	90
	MUZAFAR ABUDI	29949034	Fish Monger	SIYU	0700800707	A PAR

Date: 20th npri 1 20th County: Lons Location: Sign

NO:	Name	I.D. Number	Position/Role	Location from	Phone Number	Signature
1	YAHKA Bwanhahi		ASST CHE	Sivu	0725666250	XX
2					0 25000 250	
	MADIALIMADI	8520488	HORN CHAN	SIU	0715122247	
3						
	WALADIMADI	20269780	Pis Hing	Situ	0712-436973	WZi .
4						
	NASSIR HUSSEIN	4583530	UKULIMA	SIYa	C	Main)
5						
	SHEIKH ABUBAKAR	24354478	BUDABODA	SIL	0712848033	& Chulse
6						
	0.00%					
7	· ·					
	ALLMED ILALE	13618775	Imployee	Syl	670247247	· Acc
8	JAML OMRI		Fancer	3144		D
9	omar Brand				-1.01.0990	
	omar Bwann		fishing	Sina	0717716329	200
	MUZAFAR ABUDI	29949034	Fish Monger	SIYU	0700800707	A CONTRACTOR OF THE CONTRACTOR

Date: 20th April 2016 County: Land Location: 5740

NO:	Name	I.D. Number	Position/Role	Location from	Phone Number	Signature
1						
	Sigal Nobale		farmer	Siya		3W
2						
	BAHERO		MKLIMA	5144		Siz
3	7.					0 2
	Borbarkan Dunida		Forence	SIYU	070221864x	de
4						
	Attemaotten		farmer	Situ		Aucs.
5	100000				0-11	
	Abubacar Am		Jem	Sm	703662092	Ar
6						
	AL MOHEMOS		LEBER.	31401		al-
7	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,					
	ATHMAN A. MZEE	13018183	TEACHER	SIYU	0726860438	String
8						
	Alfared BARALO		EMPLEYES	SIGN	OH 5 borg x	100
9						
	YASSIR ABUBAKAN		BoDa	Sici	0700521	6 1
	YASSIR ABUBAKAN DMHX SIRAKN		Fishtman	Sigu		Cap

Date: 20th April 2016 County: Land Location: Siyo

NO:	Name	I.D. Number	Position/Role	Location from	Phone Number	Signature
1	muh's Abdul-Rhman		mor Ket.	Siu	0716162596	Derkh.
2	omar Abubakar	31590705	campetal.	siu	0716170133	SHAD
3						,
	Sombwanavale	5355224	mkulina	514	070624012	6 8
4				3 ()		
	MOHAMED BORA		mkulima	514	072616928	nohaneo
5						
	BAE Lout	3165789	MKUNA	Sia		Blekst
6						
7						
8			•			
9						
		对发展的正				



Date: 20 April 2016	Country	Location: Class	
Date. 20 FIDE 2016	County: Lunu	Location: Sign	
			_

NÓ:	Name	I.D. Number	Position/Role	Location from	Phone Number	Signature
1	ZAHRA ZAID	2412207	SHOPKEPAIL	5144	072031729	, Zalle
2		9 9 10 5 5 11		J	04 00 31424	>
	SUDI HOSSEN		Bushes bulome	Siya	07-017267	29
3	MULHAT OMAR		Home Joss	Sign	0716-240073	
4	SOFIYA SHAKUE		NO. JOB Home Working	Siyu		SUFIZA
5	Asma ALi	0.150		Siyu-		
6		20152150	110 3015	2	0792777768	y ASIGNAD
7	FARAJ ZAID		Mojocyche.	Siyu	041869304	5 1/2
	FORD ARDALIAN	899×	FARMER	SNO	040293880	7 Vue
8	Over Dr. Kombo		Donety	SIYU	07-149463	A.
9	Salim Omor.		Donky	SIYU		Sect.
	ALI SHAMON	5	Usinph.	5170	0729176434	252 z

			y	
Date: 900 April	County:	lan	Location:	SINO

NO:	Name	I.D. Number	Position/Role	Location from	Phone Number	Signature
1			-اه، ماء			
	Athman Zaid maka	27518129	40706	SITU	0715760768	Athere go
2			ESF			3
	Anthony Kiovi	25134702	Consultants		(73610020J	Dangs
3			ESF Convironmenta			The state of the s
	Dorothy Siph	27214948.	Consultant		0736100205	Pan
4	Dorothy Siph Alasy Abzen		CLO Zarara			
	Alaway Abrein		on and gas			
5			3			
6						
7						
8						
	<u> </u>					
9						
		19 Y 2 C L X 1 B X S L X 1				



10:	Name	I.D. Number	Position/Role	Location from	Phone Number	Signature
	HUSSEIN A. ABUBAKAR	85 2 5046	ASST CHIEF	SITU	0717653038	一个一个
	AHMED YUNUS	0160116	CHIEF	SMY LOCATIVA	0719515716	A.
	SWALEH AMMAN	0701479471		SIU	8520489	Stuley
7	ABOULA 212 the Ones	23444631	TEARER	570	0715057313	ARR
	NASSIR - B. MOTTAME	0390091		SMM	0711443339	M
	MBARAK ABUDI	33071683		Siqu	070557540	3 Miles
4	HASSAN ÖMARADI			SMY		Heisen
	Ali OMO~ Slide		CAI P.M.CC	siyu	57256292	16 16
	Mohaved: Mroj.		B. PMCC	grange Ri	64 0720864	46, MA

	Control of the contro		Annual Control of the				
Date:	21/4/	2016	County:	LAMU	Location:	PATE	

NO:	Name	I.D. Number	Position/Role	Location from	Phone Number	Signature
1	ABDALLA ZUBEIR	21/04/92		PATTE	0719577255	
2	HOSSAN SWALEHE			PATTE		HABAN
3	MOHD AZI			7+572	_	-
4	Mohamad				07012908	30 -
5	MOHOD TROUD					
6	THEIDI HASSAN				0712857663	Hart
7	HUSEN BENKUU		- 1		0420869401	STOP S
8	CASIM ISHAPA		-		6712857063	And .
9	HASSAN MOH'D				070467270	A.

Date:	County:	Location:

NO:	Name	I.D. Number	Position/Role	Location from	Phone Number	Signature
1	Comari Buranuteus			PATTE	× -× -×	
2	Bound amost					
	ALI MAGILANA			PATTE	x -	
3						
	SAID BOKARI			HITE	0708/49/22	Soft
4						
	MoHPD SHELALI			PHILE	0	
5						
	AH'MED NOH'D BWANAME	les s		11175	072940533	AHNO
6						
	NOHOS COMBO			PATTE		
7						
	BADA ALI				0702744450	46
8						
	AHMED NADHIRU			-		Ahmell .
9						Language Control
	FARUG MWENYE			- 4		
	West Committee of the C					

Date:	County:	Location:

NO:	Name	I.D. Number	Position/Role	Location from	Phone Number	Signature
1	KASSIM ABDALLAH			PATE	_	ن
2						
	LEOUD STHOMAN		~	PATIE	6718758725	
3	JAMAL OMAR	/ .				40
4 .	Mohammad said		_			- Brand
5	ANDHIA FARUQ					A
6	Onner AL,		112			USAC
7	BACAR ABDALLA					
8	GEORGE					A.
9	Wilson	-		_		aio

Date:	County:	Location:

NO:	Name	I.D. Number	Position/Role	Location from	Phone Number	Signature
1	Mohermed	2950345		PATTE	0418195882	Mhund !
2	HARITH ATHUMAN BAMU			PATTE	07/25/572/3	#
3	ATINED ABII			J*TE		tem
4.	Khuzyma Zibeik			Patte	0701923961	*
5	HMED ABOUD			SATE		A
6	SALIMU IBRAHM			PATTE	0714257899	Gom'
7	Motte Hossan		- 3	SATE		
8	ABUSHEC		_	PATTE		~
9	BACAR Oum BACAR	_		-		P.

Date: 21/04/2016	County:	Location:	VATE LOCATION

NO:	Name	I.D. Number	Position/Role	Location from	Phone Number	Signature
1						A
	ABUBAKARI ATHMAN				07/6/2271	ALL
2	TO A STATE TO THE				0 116 12011	1-700 70
	10.11: 12					1-0
	ISMAIL ILYASI					1824
3						1
	ALI MUHAMED Attman					As Als
4						200
	Zubeir Mohammer				041625194	That
5	74,000					1000
	11 1					1800
6	Abud micky dady				041600462	4
0						The state of the s
	HASSAN SESS				0712529674	
7						1/29
	Faruk Mohammed					(F)
8						,
	BUSANTANKON MOHAD				0118385188	And
9 .						
	MWENYE MON. Stakule					Mes
10	Misladu Ali				070685616	4 Stues

Date: 21/04/2016 County: Location: PATE LOCATION

Name .	I.D. Number	Position/Role	Location from	Phone Number	Signature
					0
OWER BAKAR	11147315			07179CH	
					HASAN
HASSANI SWALLEH	47.3.3				Ç1,1-0, V
					<i>h</i> 2 1
Moherneel Bowazi	28973435			0717696784	* Though
					0 0
Alman Shued	32091561			070755166	Many of
Ahmed Wassir				-	And.
					inva
Hanza Bakar					HOLO
					MO
Mohameel Sti					Care
					~ ~
Ali Jaffar	32445147			0791675681	A
				7 . 100	5
ALI SHALO LALI	27500014			0 + 0406618	200
AHMED ARII	1				A
	AASSANI SWALLEH Mohemed Bawazin Alman Ahmed Ahmed Massir Hanza Bakar Mohamed Ali Ali Jaffar	AASSANI SWALLEH Mohamed Bawain 28973435 Alman Dhued 32091561 Ahmed Wassir Hanza Bakar Mohamed Hi Ali Jaffar 32445147 ALI SHALOLALI 27500014	ONOR BAKAR 11147315 HASSANI SWALLEH Mohamed Bawain 28973435 Almed Massir Hanza Bakar Mohamed Ali Ali Jaffar 32445147 ALI SHALOLALI 27500014	AASSANI SWALLEH Mohamed Bawarn 28973435 Almen Ahned 32091561 Ahned Naszir Hamza Bakar Mohamed Hi Ali Jaffar 32445147 ALI SHALO LALI 27500014	6 Mar BAKAR 11147315 AA85ANI SWALLEH Molisanced Bowarin 28973435 Allman Dhied 32091561 Ahmed Naszir Hama Bakar Mohamed 849 Ali Jaffar 32445147 O791675681 ALI SHALOLALI 27500014 O7046618

Date: 21/04/2016 County: Lamo Cocation: Pate.

NO:	Name	I.D. Number	. Position/Role	Location from	Phone Number	Signature
1		26485693	EST CONSULTANTS		0736100205	- NA
2	Anthony Kiovi	28734702	Consultants Consultants Consultants Consultants Consultants Consultants Consultants Consultants		0736100205	Dong
3	Anthony Kiovi		Zarara oil			d v
4)			
5						
6						A 12. W. 1
7				в		1.6
8						
9						
		-				

Date: 21 42016 County: CANV Location: MTAN GAWANSA

NO:	Name	I.D. Number	Position/Role	Location from	Phone Number	Signature
1						
	MOHAMES BWANA.	20579923			923007968	(prim)
2						
	BAKARI SHALI					
3						
	SHERWANA DUME					
4				A STATE OF		
	MALAU OMAN					
5						
	TULA ISSA TULA					
6						
	HASSAN MITE					
7						
	BURNO MOHAMED					
8						
	JAFFAR ABOALLA					
9	STORY SALANDARA					
	ABUU M. SHITAI					

Date:	County:	Location:	

NO:	Name	I.D. Number	Position/Role	Location from	Phone Number	Signature
1						
	Mottames Meiming					
2	1.10(10)11(67)					
	MZEE KTHMAN					
3						
	Hussein amo					
4						
	BAWARI SIZI					
5	312					
	SIZI MALAU					
6						
	SH2-0 - 00					
7	SHEBWAND BAKARI					
	Suo Attores	1.75				
8						
	Mottames BW. Hamisi					
9	10 may 11/60 BWI HAMISI					
9						
	SHEBWAND KUPI					
	SHEBWAND KUPI 1BRAHIM MOHAMES					
	16 RAHIM MOHAMES					

Date:	County:	Location:

NO:	Name	I.D. Number	Position/Role	Location from	Phone Number	Signature
1						
		1 - 2 - 2 -				
2	MAKA ABOALLA			MIANGAWANDA		
2						
	W.477 At 2 CG ()-			f,		
3	MYELALI BULOK			1)		
3						
	SOME BUANA			41		
4	00000					
	KHADIJA SIZI			1 11		
5						
6	HUWEDA AU				0727875820	
Ь	Note that the second					
	Allers			ſ,		
7	NAJMA AHMED					
	BIBI SIZI			1,		
8	5161 3712					
	AMINA BWANA			1		
9	William Booms					
	MARKET BWONA					
	MATTER BUONA	Per alle da una	PARAL BASE			
	Cinia Ruania			1		

Date: 21	04/	2016	County:	LAMU	Location:	MIANGAWANDA.	

NO:	Name	I.D. Number	Position/Role	Location from	Phone Number	Signature
1	# 1. Sh. Delta					
	MUHARHA KAZE					
2	CHACHIN PALE			MIANGAWANDA		
	UMI CHUVO			1	07/95/5568	
3	Circle Oil Good				0-114-21-2208	
4	ZENTUNI SHAMBU			11	0701726602	
4						
	MARIAM BWANA					
5	South State					
	MYESHALI BAKARI			(1		
6						
7	Suoi Athrico			le le		
	Times amount			11		
8	Times MAR					
	LYADIJA MOHANTED			/	0186535905	
9					0 1200 535 (85	
	MWAPAHALENA CHUNO			<u> </u>	0726206665	
	SIMA HASAN					
	I (ine A HASTAN			/	0728200781	

Date:	County:	Location:

NO:	Name	I.D. Number	Position/Role	Location from	Phone Number	Signature
1						
2	MYROWANA BURROWA			MANGAWANDA		PO (0.70
2	Ruga HASSAN	24928887		M TOWG AWANDA	0720 868025	
3						
4						
5 .						
6						
7						
8						
9						

Date: 24/04/2016 County:	Limiz	Location: Mtangavandas

NO:	Name	I.D. Number	Position/Role	Location from	Phone Number	Signature
1						
	Kafii gayo					
2						
	Mario SAZIM					
3						
	MICHAEL KIBOI	26485693	ESF CONSULTANTS		0736100205	Natio
4	0		DOF			41
	MICHAEL KIBOI Anthony Kiovi Flavy Prozein	2513472	+ Consultants		6736100205	Allengs .
5			zarara -			· ,
	flowy Albania		oil and gais			
6	J. D. C.					
					of the state of th	
7						
8						
9						

Date: 18th April 2016 Island County: Lemo Location: KPA offices, Position/Title NO: Name Organisation Phone Number Email Signature 1 Project othicer, Boni - bodori SFM Project akomen@wwtkenyq.org 0723724394 wwf-Kenya 2 0721616455 Jonathanhebasa Quainon Assistant Jonathan Chebaca County County county Natronal govt 3 072118 4 DIRELOT C736100205 ESF (unsultants Manable Zarara 611 081

Date: 19h April 2016 County: Lamo Location: KMA Offices - Lamo

NO:	Name	Organisation	Position/Title	Phone Number	Email	Signature
1	ESWARS WANEGHUE MVLOAGO	KMA	BRANCH VESSEL INSPECTOR	0724	2 mulongo@ King	Mare de Carolio
2 .	LINET MBOVA	ESF Consultant	Environmental Consultant	0736100205	linet mbova@ esfconsultants.org	Mueni.
3	Dorothy Such	ESF	Consultat	0736100205	dorolly Sileno excussilentions	R
4	Alany Abzein	Zarara ORI cod gui	Community Liaston Officer			
5						

Date: 19 M April 12016	County: Land	Location: KPA	guilles lans
			30

NO:	Name	Organisation	Position/Title	Phone Number	Email	Signature
1	Mahmon S H. Ari	KPA	SENIOR Superliviaus avi	072231890	2 Mharia (pa.w.)ce	lunfi
2	Linet Mbova	ESF Consultants	Environmental Consultant.	0736100205	Linet · mbova@ eppeonsutants·org	Atreni.
3	Dawy suem	Consultant	Kavron mentalist	073400205	dordny. Suence esfconsitutions	Pa.
4	Allawy Abzein	Zarara on cad yus	CLO			
5						

Date:	19th April 2016 C	ounty: Lenno		L.	ocation: Lanu Islan	9
					CKWS)	
NO:	Name ·	Organisation	Position/Title	Phone Number	Email	Signature
1	BU S. BHAND	COMPERCIATION & COMPENSATION	CHAIRPERSON	0722274 578	ali, shebuara agma	Anymont
2	Linet Mbova	ES F Consultants	Environmental Consultant.	0736100209	linet mbova@ esfconsultants-org	Aturni.
3	Dorony sulen	ESF	Environmentalist	776100201	estions tant org	R.
4	Many Abzein	zoraro un 8 gus	CLO			
5						

Date: 19th April 2016 Coi y: Juns Location: KTS Offices - Land

NO:	Name	Organisation	Position/Title	Phone Number	Email	Signature
1	ALI OSMAN FERUZ	LENYA FOREST SERVICE.	COPPOL	0722325326	gman ferveorgmail	As'
2	Linet Mbora	ESF Consultants	Environmental Consultant	073610020	linet·mbova@ esfconsultants·o	Aturio
3	Dorolly Sulph	ESE	Environmentalle	0736100205		ler.
4	Alawy Abzein	Zararu Oil ond gus	CLO			
5						

Date: 19th April 2016 County: Como Location: Public health office -lam

NO:	Name	Organisation	Position/Title	Phone Number	Email	Signature
1	FLORENCE KUVUMA	PUBLIC MEAGH	PUBLIC HEARTH	0710941431	umortant poece Baron	con Macre
2	Selim Mwasena	public Health Department	PIHI O SCHOUL HE OUTH CO-ODINATUR LAMU COJUTT		Solimmaksence gnail. Com	De po
3	Abbac Salim	Harreld DEPT	Proble Harect	697438170S	9566SGlim44 Qyahoo Com	Abworm
4	DINI BONON	Hearter DEPT	И	0मा २५२ १२५ ०मा३ ४१५ ६५४		
5	Linet Mbora. Dorohy Sulph	ESF Consultants 11	Environmental Consultant	0736100205	Linet · mbova@ estconsultants · org	Atomic Ken -

Alawy Abzein

Date: 20th A.phil 2016 County: Jamo

Location: Save luno offices land

NO:	Name	Organisation	Position/Title	Phone Number	Émail	Signature
1	IS'HAQ XBUBAKAR	SAVELAMY	BOARD MEMB	1 071093993	ishakbakar 2030 @ gmail · Com	Most.
2	April PARCAR MOHRMED ALI	SAVELAMM	CHAIRMAN	0713205188	amaclamudy a yahoo. com.	Mede
3	MAHMOUD HUSSEIN	PAVE LAMU	INTERN	0707865379	mahamondhuscena gmail.com	Martinal.
4	Sherrins.	Save Larny	Shoon of	0718287290	Khadya shekuwa Q gmai	· Khadyo
5	Hussein Sond Elmany	Save Lamu	Member	0729488688	hussensond@g: con.	Agin

Date: 20h April 2016 County:

tamo

Location: Save land gire -lamb

NO:	Name	Organisation	Position/Title	Phone Number	Email	Signature
1	Walid Almed	ham Yordh Allioniet -Save hams	Secretary	0726613166	Masternalidese- yalos.com	hallas
2	Hadija Forst	Savehamu	Treasury	0722859594	Savebun Egmont com	for Alab
3	MICHAEL KIBOI	EST CONSULTANZ		0736100205	Michael-Kiboi @ effon Suttants - org	-NOT-
4	Linet Mbora	ESF Consultants	Environmental Consultant	0736100205	linet mbova@ ex-consultants-ovg	Marini.
5	Alawy Abzern	Zararu Oil and gus	CLO		espense that one	1 -

					/ Carrier 1997 1997 1997 1997 1997 1997 1997 199			
Date: 20h April	20/6	County:	Lano		Location:	NIMIK	offices	(mc)
		The second second					Chi I	

NO:	Name	Organisation	Position/Title	Phone Number	Email	Signature
1	HAJT MOHAM P Conservation offer Lance no	LAMU MUSEUM	Conservatio	228	ali hajimshamad@phoa	Moo
2	MICHAEL KIBOI	CONSULTANTS		0736100205	Michael-kiboi @ esfconcultants. org	Kal
3	Linet Mbova	ESF Consultants	Environmental Consultant	0736100205	linet·mbova@ estionsultants·org	Mani.
4	Alany Abzen	Zarara Sirond gar	(10			
5						

Date: 201 April 2016 County: Jam Blad,

NO:	Name	Organisation	Position/Title	Phone Number	Email	Signature
1	ERIC MVIEII NJEAV	NMK	ARCHAEOLOGIST	07276048-	emmuteti@gmail.com	, to
2	MICHARD KIBO (EST CONSULTANTS		0736100205	Michael-Kiboi @ effaonsuthents: org	Yed
3	Linet Mbora	ESF Consultant	Environmental	0736100205	linet·mbova @ esfconsultants·org	Auenie
4	Alawy Abzein	Zarara Vil cod gas	CLO			
5						

Date: 20 April 2016 County:	Long	Location: Law Island.
		741100 130410

NO:	Name	Organisation	Position/Title	Phone Number	Email	Signature
1	KHALIFA BWANAMARA KHALIFA		ADMINISTRATION	8701468112 ED.	Khalifanabahary 198 B G moil-Com	
2	Linet Mbora	ESF Consultants	Environmental Consultant	0736100205	Linet·mbova @ esfconsultants·org	Davi
3	Doromy	ESF	Envisonmentally	0736100205	docomy. Sumo estenanting, asa	Du -
4	MICHAEL KIBOI	EST CONSULTANTS	ENVIRONMENTAL CONSULTANT	0736100205	Michael · Kiboi @ efflonsultants. org	- MAC
5	Anthony Kiovi	ESF Consultants	Environmental		anthony-Kiovi @ esfconsuitonts-org	AMB

Date: 21st April 2016 County: Lomo Location: Kiznyishi

NO:	Name	Organisation	Position/Title	Phone Number	Email	Signature
1	PHILIP OLOO MOLO	Ministry of Interior & Corordination	Assistant County Commission Kizing Hini Div		1 jawarigao Qyahoo.com	Uhm
2	LUQMAN ABOUD BNANA.	17	CHIEF RICIALA	0712212042	Brana bugman Gind	Dung-
3	MOHAMED S. MOHAMED	č r	AS- CITIE MBWASumwine	072213-9699	Mohamedsher Omar	Mar
4	MOHAMED ISHAKA	v	Numarator	0714901364		Michael
5	Linet Mbora	ESF Consultants	Environmental Consultant	0736100205	linet mbora @ est consultants org	Atun':
	OSEDMY SUPH	. 11	"/	.11	doculary suitan @	Pu.

ESIA for Proposed Hydrocarbon Exploratory Drilling Programme on Blocks L4 and L13, Lamu County

widne and question. Cultures 22/04/2016 County: Lamu Date: NO: I.D. Number Name Position/Role Location from Phone Number Signature 1 Frandunguzuro @ yahoo.com C. O-TRADE, TODRISM, CULTURE WILDLIFE of FORESTRY LAMIN PLORENCE MOUNCE MARIE 21784182 0710968317 2 ESF 6736100205 Consultants KIOVI 25134702 nthom 3 MICHAEL EST CONSULTANTS 0736 100 205 KIBOI 26485693 4 ESF 0736100205 25172801 Consultants ESF CUNIVINIST 077610024 27214448 Cooking Suigh 6 7 8 9

The state of the s		
Date: 22 MAPTIL 2016 County:	lans	Location: NEMA Office Land
		7 (1)

NO:	Name .	I.D. Number	Position/Role	Location from	Phone Number	Signature
1	Zephainal Mangror	12511698	Intern	Lamu	0722474803	Thorn
2	Anthony Kisvi		ESF Cornultants		A36100205	The same
3	MATONY KIOVI	2513422	Corpugans		0,750,000	(Hannis
	MICHAEL KIBOI	26485693.	ESF CONSULTANT		0736100205	red .
4	Linet Mbova	25172801	ESF Consultants		0736100205	Harne
5	Doromy With	77214914x	Est consulbants		0736100205	Per.
6						
7		l l				
8						
9						

Appendix 4 Comments Registration Sheets (CRS)

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR THE PROPOSED HYDROCARBON EXPLORATORY DRILLING PROGRAMME ON BLOCK L4 AND L13, LAMU COUNTY

COMMENT REGISTRATION SHEET

return to either of the addresses below

ESF Consultants Tel: +254 736 100 205

Nairobi, Kenya Email: <u>info@esfconsultants.org</u>

NAME	Barkatch mukholi cliff	ORGANIZATION	NEMA
EMAIL	cliffbarkatch@gmail.com	PROFESSION	ENVIRONMENT OFFICER
ID NO.	21796978	TEL NO	0723710517

COMMENTS (please use separate sheets if you wish) Do you prefer to have the question as far and wide broad?

1. In your opinion, what Environmental, Social and Economic benefits do you think will arise from the proposed project?

Environmental Benefits

a) none

Social Benefits

- a) JOB CREATION
- b) IMPROVED INFRASTRUCTURE
- c) improvement in social amenities

Economic Benefits

- a) IMPROVED ECONOMY
- b) IMPROVED PER CAPITA INCOME
- 2. In your opinion, what **Environmental, Social and Economic negative impacts** do you think will result from the proposed hydrocarbon exploratory drilling project?

Environmental Impacts

- a) clearance of vegetation
- b) air pollution
- c) water pollution
- d) land pollution
- e) waste problems-drilling agents and staff camp
- f) health and safety concerns

Social Impacts

- a) cultural impacts from immigrant workers
- b) HIV AND AIDS spread /threat.
- c) local people resentment

e)							
f)							
3. Do you ha	Do you have any suggestions of measures to mitigate problems identified in question 2 above?						
a) promote p	romote public education on cultural impacts						
b) create awa	reate awareness and education on HIV and Aids						
c) involve loc	cal people in the project						
d)							
e)							
4. In your op	inion, should the hydrocarbon exp	oloratory drilling project be implement	ted? Yes [] No []				
If YES/NO,	why?						
yes.the be	nefits outweigh the costs						
5. Do you ha	ve any other comments regarding	this hydrocarbon exploratory drilling	project?				
involve all	the key stakeholders .the involver	ment must be genuine.					
6. Please incl	lude any other relevant stakeholde	ers you think should be consulted in th	nis exercise.				
Name:	Rashid Galgalo	Sector/Organisation:	National Museums of Kenya-Lamu				
			world heritage sites				
Telephone &	0721660645						
Address:							
Name:	Fatma Abubakar	Sector/Organisation:	Secretary,NLC -Lamu				
Telephone &	0720015100	<u> </u>					
Address:							

d) prices of property may increase

Name:

Telephone & Address:

This information will be used to inform our study in information such as baseline data, potential impact identified and suggested mitigation measures. For further information or concerns please communicate using contact details above.

Thank you for your participation

Sector/Organisation:

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR THE PROPOSED HYDROCARBON EXPLORATORY DRILLING PROGRAMME ON BLOCK L4 AND L13, LAMU COUNTY

COMMENT REGISTRATION SHEET

return to either of the addresses below

ESF Consultants Tel: +254 736 100 205

Nairobi, Kenya Email: info@esfconsultants.org

NAME	Mohamed Hashim	ORGANIZATION	County Assembly of Lamu
EMAIL	fumomh@gmail.com	PROFESSION	Speaker
ID NO.	8454908	TEL NO	+254 722 412131

COMMENTS (please use separate sheets if you wish) Do you prefer to have the question as far and wide broad?

1. In your opinion, what Environmental, Social and Economic benefits do you think will arise from the proposed project?

Environmental Benefits

- a) The hydrological survey to be done will provide a source of environmental information for any future underground activities.
- b) The access roads to the sites will improve accessibility of the area hence environmental challenges and other illegal environmental activities such logging and poaching will reduce.
- c) The Ambient air quality survey and Ecological survey will also provide a much needed data on the environment for the current and future projects and the community at large.

Social Benefits

- a) The socio-cultural diversification that will take place due to the mixing of non-local labourers at the sites and the local community.
- b) Integration: the locals (non skilled labourers) will be able to socialize with other Kenyans brought to work at the sites (mostly skilled) and hence building the integration between Kenyans from different areas.
- c) Improved accessibility due to opening up of the sites will improve the ability of the locals to access social services provided by the Government and the NGO's.

Economic Benefits

- a) Employment of semi-skilled and unskilled labourers from the local community.
- b) Improved retail business.
- c) Land speculation might increase the value of the land in the site areas and their neighbourhoods.
- 2. In your opinion, what Environmental, Social and Economic negative impacts do you think will result from the proposed hydrocarbon exploratory drilling project?

Environmental Impacts

- a) Noise pollution from the drilling process.
- b) Air pollution from emissions of generator and other machineries. Dust from road clearance and site preparation.

- c) Loss of Flora and Fauna due bush clearance and cutting of trees.
- d) Waste from the drilling and the site workers may cause environmental risks.
- e) Ocean pollution: the Mtangawanda jetty may not able to host large barge transporting the drilling machineries.

Social Impacts

- a) Population pressure.
- b) Retrogressive cultures from the labourers who come with their own cultures and some of the cultures are retrogressive.
- c) Social vices such as prostitution.
- d) Cultural shocks and local youth's resistance to influx of many labourers from other areas.
- 3. Do you have any suggestions of measures to mitigate problems identified in question 2 above?
- a) Employment of local youths to work at the site, even if it is for semi-skilled and unskilled labours.
- b) Analysis of the cultural values of the local communities.
- c) Analysis and studies on the flora and fauna found at the sites.
- d) Proper site preparation on waste disposal.
- e) After exploration, site restoration must be done.
- 4. In your opinion, should the hydrocarbon exploratory drilling project be implemented? Yes [$\sqrt{\ }$] No [] If YES/NO, why?

Yes, the exploration process is going to benefit the locals and if the gas deposits are found it is going to change the economy of Lamu and Kenya in general.

- Do you have any other comments regarding this hydrocarbon exploratory drilling project?
 It's good to explore the natural resources in a country but we must respect the local communities and empower them in order to ensure peace and harmony.
- 6. Please add the following colleagues / friends to your mailing list

Name:	Mboche Wanyoike Sector/Organisation: County Assembly of Lamu							
Telephone &	+254 723 252849							
Address:	mboche79@gmail.com							
Name:	Omar Ahmed	Omar Ahmed Sector/Organisation: County Assembly of Lamu						
Telephone &	+254 721778019							
Address:	omarahmedali@gmail.com							
Name:	Kale Ahmed Sector/Organisation: County Assembly of Lamu							
Telephone &	+254 721778019							
Address:	abuhafswa@gmail.com							

This information will be used to inform our study in information such as baseline data, potential impact identified and suggested mitigation measures. For further information or concerns please communicate using contact details above.

Thank you for your participation

Appendix 5 Public and Stakeholder Meeting Pictures

Meeting: Faza CommunityS: 02°03′43.84″Date: 18th April 2016Venue: Faza Social HallE: 41°06′21.62″



Meeting: Kizingitini Venue: Kizingitini Social Hall **S:** 02°04′12.8″ Date: 19th April

E: 41°08'28.5" Elevation (m):







Meeting: Mbwajumwali community members which included some community members from Nyabogi Venue: Mbwajumwali Location **S:** 02°04′34.7″ **E:** 41°07′53.8″

Date: 19th April





Meeting: Tchudwa CommunityS: 02°04′38.2"Date: 20th AprilVenue: Tchudwa LocationE: 41°06′50.1"2016





Meeting: Siyu community members which included some community members from Shanga

Venue: Siyu Social Hall

S: 02°06′04.6″ **E:** 41°03′43.2″

Date: 20th April 2016





Meeting: Pate Community

Member

Venue: Pate Social Hall

S: 02°09'21.79"

E: 40°55′25.18″



Date: 21st April 2016

Meeting: Mtangawanda Community Member

Venue: Mtangawanda Location

S: 02°06′46.33″ **E:** 40°58′28.14″

Date: 21st April 2016





20th April 2016



Save Lamu - in Lamu Island





20th April 2016

Tafakur Livestock Keepers Self Help Group - Tchundwa Location





Appendix 6 Issues and Response

Issues and Response Report

This document records the issues and comments contributed by stakeholders during public consultation for proposed **exploratory drilling in Block L04 and Block L13, Lamu County**. The consultation exercise was carried out from the 18th to22nd April, 2016 in Lamu and Pate Islands, Lamu County. The comments were made during community focused group meetings, National and County government representatives' meetings, email and telephone communications. Responses provided by members of the ESIA team are included. The comments are categorized as follows:

- Biodiversity (flora, fauna, avifauna)
- Waste Management
- Noise and Vibration
- Air Quality
- Water Quality
- Health, Safety and Security
- Socio-Economic Issues
- Issues Related to the ESIA
- Need and Desirability of the Proposed Project
- Other Issues (Not related to the ESIA)

COMMUNITY MEETINGS

1 FAZA LOCATION

Health and Safety Issues

COMMENT RAISED	COMMENTATOR	RESPONSE
Flaring of the gas during gas testing,	Fundi	ESF Consultants
how will it affect the health of the		Flaring will not pose any health related issues to the residents living
people living adjacent to the well pad?		adjacent to the well pad since natural gas is just similar to methane.
Will the health sector be upgraded so	Mohamed Ali	Zarara Oil and Gas Ltd
that those affected by flaring get		As it has been mentioned earlier, flaring will not pose any health related
medical attention		issues. But Zarara Oil and Gas Ltd will look into the different CSR options it
		has, if health sector upgrade will be critical, there will be an upgrade.

Socio-Economic Issues

COMMENT RAISED	COMMENTATOR	RESPONSE
The load that will land at		Zarara Oil and Gas Ltd
Mtangawanda jetty is expected to be		Zarara carried out an assessment/ survey of the roads in Pate and the
large. Will the local roads be upgraded		airstrip. It was found that the status of the roads was good but an upgrade
so as to accommodate the		of the road, culverts and bridges might be needed to handle the weight of
transportation of the rig since we are		the trucks transporting the rig and other equipment.
talking about 5-10 trucks? The roads	Mohamed Ali Mohamed	
are narrow at the moment.		
Employees working during gas drilling		Zarara Oil and Gas Ltd
process, will they be sourced from		During BGP seismic survey, most of the jobs were sourced from within Pate
Pate Island?		Island. Out of the 220 employees, 175 came from Pate Island. Zarara Oil
		and Gas Ltd intends to maintain the same hiring policy during drilling,
		except that drilling requires fewer workforce as compared to seismic
		survey.

Most of the people at Faza Location		ESF Consultants
are fishermen. As you have explained,		Drilling will be done on land and no drilling activities will extend to the
drilling will be done on land. How will		sea/ocean. No effluent or solid waste will be dumped in the sea. Therefore,
drilling process affect fishermen?		fishing activities will not be affected.
If the 200mx200m intended for		Zarara Oil and Gas Ltd
construction of well pad lies on		Once the drilling site has been identified and before any work commences,
someone's land, what compensation		Zarara will meet with the relevant land owners to reach an agreement on
will be given to the land owner?		compensation.
Will the transportation of the barge		Zarara Oil and Gas Ltd
from port of Mombasa to		During seismic survey, equipment was transported by barge. It did not
Mtangawanda Jetty affect our fishing		affect fishing activities. Therefore, no effect on fishing activities is
activities?		anticipated either.
How will the Pate community benefit	Maalim Frank	Zarara Oil and Gas Ltd
in the event that gas is found by Zarara		According the proposed energy bill, the government will decide on the
Oil and Gas Ltd?		sharing of royalties to all parties involved, including: the company (zarara),
		national government, county government and the communities. The
		percentage allocated to the communities will bring about economic
		advancement to pate Island residents.

Issues related to ESIA

COMMENT RAISED	COMMENTATOR	RESPONSE
ESF has experience in undertaking oil	Ibrahim	ESF Consultants
and gas drilling and exploration		Impacts arising from oil and gas drilling vary from place to place. We, as
projects. Thus, you are in a better		environmental consultants cannot give an umbrella impacts of what is to
position to understand the advantages		be expected. This can only be done after we complete undertaking of
and disadvantages of gas drilling. Why		environmental baseline study that includes measurements of
don't you share with us for better		environmental parameters (e.g. hydrology, nose, air quality and socio-
understanding what to expect from		economic surveys). That coupled with stakeholder engagement gives us an
gas drilling?		insight of the expected impacts.

Is the drilling on Block L4 only?	Mohamed Ali Mohamed	ESF Consultants
		The drilling locations have not been confirmed; however, the area of
		interest is on Pate Island.
Zarara Oil and Gas Ltd is the third	Ali Kidadi	Zarara Oil and Gas Ltd
company to do exploration in Pate		Shell intended to drill oil during their initial drilling but found gas. Zarara
Island after Shell and Roggers, so is		Oil and Gas Ltd is intending to find gas if it will still be available. Resources
this exploration and drilling you are		put by Zarara Oil and Gas Ltd in gas exploration is much. This is not a
talking about a waste of time?		waste of time.
In 1971 when Shell was drilling for oil	Maalim Frank	Zarara Oil and Gas Ltd
but found gas, the gas was directed to		Shell's intention was to find oil but found gas. They did not have a
the mangroves ecosystem for three		mechanism to contain the gas. That is why they directed the gas into the
days before the well was sealed. This		mangroves for three days before they plugged the well. Zarara Oil and Gas
greatly affected the mangrove		Ltd's intention is to find gas. If found, it will be harnessed, not directed into
ecosystem. Is this going to be the case		the mangroves as was done before. Furthermore, drilling technologies
again?		have advanced since then. The drill rig has a mechanism of controlling any
		substance from leaking out of the well.
If the environment will be tampered	Chea Mumo	ESF Consultants
with, how will NEMA act on the		The EIA license issued by NEMA, contains conditions that the proponent
negative impacts of the project or will		must follow during the implementation of the project. NEMA officers
NEMA overlook the impacts of the		normally inspect such projects to ensure the conditions are followed.
project due to the economic gains to		However, if the negative impacts of the project exceed gains that might
the government and Zarara Oil and		come along with the project, a license will not be issued.
Gas Ltd and let us die?		

Other Issues (not related to ESIA)

COMMENT RAISED	COMMENTATOR	RESPONSE
Since it's our first time to visit Pate	Mohamed Ali Mohamed	ESF Consultants
Island from your headquarters in		Our contract with Zarara Oil and Gas Ltd runs for a short period of time
Nairobi, would it be much easy if you		unless otherwise. This short period of contractual time does not allow for

have your satellite offices at Pate Island		setting up of satellite offices
so as to better understand the area.		
Since 1971 during shell discoveries,	Ali Mohamed	ESF Consultants
what advancements have been made?		It is good to understand that issues related to oil and gas exploration take
The project seems to be a waste of time		time. For instance, from the exploration to production stage of oil and gas
and resources?		development projects, it can take up to five years or more.
		In 1971, Shell was drilling for oil but in the process found gas. That was not
		their interest. Currently Zarara Oil and Gas Ltd is drilling for gas. Therefore,
		it's good to give the company time for their exploration as it is not a waste
		of time.
Is there an agreement between Pate	Chea Mumo	Zarara Oil and Gas Ltd
Island residents and Zarara Oil and Gas		If gas is found, Zarara Oil and Gas Ltd will sign a Memorandum of
Ltd?		Understanding (MOU) with Lamu County government and elected leaders
		from Pate Island.

2 KIZINGITINI LOCATION

Biodiversity impacts

COMMENT RAISED	COMMENTATOR	RESPONSE
How will aquatic life forms be	Musa Hassan	ESF CONSULTANTS
affected?		Drilling will happen on land (onshore). No activities will take place on sea.
		No untreated wastes will be dumped in the sea. Therefore, aquatic lives will
		not be affected by activities of drilling.

Waste Management

COMMENT RAISED	COMMENTATOR	RESPONSE
Where does the waste from the project	Ali Awadhi	ESF Consultants
get disposed?		Waste generated from drilling will be treated before being deposited on
		the tailings disposal facility located in the well pad.

	Inorganic waste such as water bottles, plastic bags among other wastes
	will be handled and transported by NEMA licensed waste handler.

Water related issues

C	COMMENT RAISED				COMMENTATOR	RESPONSE		
٧	Vill	there	be	sur	face	water	Musa Hassan	ESF Consultants
c	ontan	nination	due	to	the	drilling		The reserve pit used to dispose of rock cuttings and drilling mud from the
p	roces	s?						drilling process will be constructed and lined with plastic to protect against
								any possible leaching which may lead to underground water contamination.

Health, Safety and Security

COMMENTATOR	RESPONSE
Bakari Bunu Abubakar	Zarara Oil and Gas Ltd
	Gas is a clean source of energy. If found to be of commercial value, the gas
	drilled will be used to generate electricity.
Musa Hassan	Zarara Oil and Gas Ltd
	The drilling rig to be used will be of international standard. It will have
	numerous valves that protect against any gas leakages that would
	otherwise affect the local residents.
Said Seif	Zarara Oil and Gas Ltd
	There will be a perimeter fence on the 200m X 200m well pad, highly
	guarded. Only authorized movements will be allowed into and out of the
	well pad.
	Workers will also undergo induction to make them aware of the do's and don'ts that they should adhere to during the entire project period.
	Bakari Bunu Abubakar Musa Hassan

Socio-economic issues

COMMENT RAISED	COMMENTATOR	RESPONSE
What benefits are expected to arise	Mohamed Ali	Zarara Oil and Gas Ltd
from the project?		There are numerous benefits that might arise from the proposed
		development such as: economic growth of the area; employment during
		drilling period; indirectly residents may supply services like food to the
		people working in the well pad.
Where will employment be sourced	Said Seif	Zarara Oil and Gas Ltd
from for the proposed drilling?		During BGP seismic survey, most of the employment were sourced from
		within Pate Island. Out of the 220 employees, 175 came from Pate Island.
		Zarara Oil and Gas Ltd intends to maintain the same hiring policy during
		drilling. Except that drilling requires fewer workforce as compared to
		seismic survey
Those affected by the project, how will		Zarara Oil and Gas Ltd
they be compensated?		Those from whom their land will be used for drilling, or used to provide
		access routes to the drilling site, the company will have to agree with the
		individuals and agree on compensation terms.
Is there a company that will stand to	Musa Haida	Zarara Oil and Gas Ltd
compensate those affected by the		In case of any compensations, Zarara Oil and Gas Ltd will compensate
drilling project?		those affected by the project
The government is not transparent; it is	Ali Awadhi	Zarara Oil and Gas Ltd
blinding us through such consultative		There is a new and reformed system of governance currently in Kenya.
forums.		Everything is done in a transparent manner. That is why we are carrying
		out such consultative meeting with the community to listen to their
		concerns, issues, suggestions and grievances about the project. It's up to us
		as citizen to stand up on matters that might affect our livelihoods. We
		should have faith in the system of governance in place.
Given the population at Lamu, and Pate	Musa Hassan	Zarara Oil and Gas Ltd
Island, how will sharing of resources be		According the proposed energy bill, the government will decide on the

effected?	sharing of royalties to all parties involved, including: the company (zarara), national government, county government and the communities. The percentage allocated to the communities will bring about economic advancement to pate Island residents.
During seismic survey Zarara Oil and Gas Ltd gave promises on CSR activities to the community, but nothing has been done yet. Was it a lie to the community?	Zarara Oil and Gas Ltd During the seismic survey, it was hard to tell whether the process will be successful or not. But as you can see, we are at the second phase of the gas exploration. We still remember the promises we made on the CSRs. They will be effected after the production phase of the gas exploration kicks on. Let's be patient on the ESIA process to finalize and hope we move on to the next phase successfully.
The Zani Bill on sharing of mining related proceeds, can the figures be amended so as to have a bigger percentage coming to the locals. At the moment, lions share (75%) is divided between for the government and Zarara Oil and Gas Ltd company.	Zarara Oil and Gas Ltd The Zani bill can only be amended by the National Assembly, not by Zarara Oil and Gas Ltd.
How will the 5% affect the people of Pate Island?	Zarara Oil and Gas Ltd 5% of gas related proceeds is enough to change the economic livelihood of an area.

Issues related to the ESIA

COMMENT RAISED	COMMENTATOR	RESPONSE
What environmental impacts of the	Bakari Bunu	ESF Consultants
project are likely to affect fishing		Drilling process will take place on land (on shore). No drilling activities will
activities, given that Kizingitini is a		happen on the sea (Offshore). Therefore, it is expected that fishing
fishing location.		activities will continue undisturbed.
What are the negative effects of the	Mohamed Ali	ESF Consultants

project?		As mentioned earlier each project has specific impacts depending on the nature, type and location of the project. That is why we are carrying out stakeholder consultations to help in highlighting the expected potential environmental impacts.
Where specifically is the drilling site	Kassim Shekh	ESF Consultants
located?		The location of the drilling site is still unknown to us. After the seismic survey report is out, the drilling engineers will decide on which area will drilling of the well take place.
If the drilling will be approved, what	Bakari Bunu Abubakar	ESF Consultants
environmental impacts are likely to be		Each project has specific impacts depending on the nature, type and
expected?		location of the project. That is why we are carrying out stakeholder
		consultations to help in highlighting the expected potential environmental
		impacts.
Will the negative impacts of the project	Musa Haida	ESF Consultants
be as those of Lead battery recycling at		Each project has specific impacts depending on the nature, type and
"Owino-Uhuru"?		location of the project. That is why we are carrying out stakeholder
		consultations to help in highlighting the expected potential environmental impacts.
Why are ESF Consultants team divided	Yusuf Athrmani	ESF Consultants
into two teams, one on Pate Island and		In order to meet our stakeholder consultation requirements- and to give a
the other one at Lamu Island?		platform for everyone to air their views, comments, suggestions and
		complaints about the project- we need to have two teams to cover as
		many meetings as possible within the timeframe we will be in Lamu.
Who is carrying out the ESIA?	Ali Awadhi	ESF Consultants
		ESF has been contracted by Zarara Oil and Gas Ltd to carry out the ESIA
		project.
When is the ESIA done, before or after		ESF Consultants
the project?		ESIA is done before the project begins and that is why we consultants are
		on the ground to do stakeholder consultation. We will compile the ESIA report and submit to NEMA to issue the EIA license if approved. After the

		project has commenced, further monitoring in terms of Environment Health and Safety measures, and Audits follow.
Where does the ESIA report go after it		ESF Consultants
leaves the consultants desk?		Copies of the report will be printed and submitted to NEMA Headquarter, who will then distribute copies of the report to various relevant agencies to
		review.
Who is in charge of implementing the		ESF Consultants
ESMP?		ESMP will be implemented by Zarara Oil and Gas Ltd, and all contractors
		involved in the drilling project.
Are all departments in the government	Maalim	ESF Consultants
(both national and county) involved in		Yes, everyone has been involved and scheduled to participate in the ESIA
the ESIA process?		process. ESF consultants is divided into two teams, one is consulting the
		National and County government and the other team is us consulting the
		communities in Pate Island.
Shall we, as local residents, have a	Bakari Bunu Abubakar	ESF Consultants
feedback or the copy of the report		After the report has been received by NEMA it will be reviewed and later it
submitted to NEMA?		will be a public document subject to public scrutiny. Lamu NEMA County
		Offices will also have a copy which you can access from there.
For future consultative meetings, we	Musa Hassan	ESF Consultants
should have an initial team to carry out		Noted.
awareness creation to the residents		
before the ESIA team arrives so that		
residents can be better positioned to		
participate in the ESIA consultations		
You are only elaborating on the	Musa Haida	ESF Consultants
benefits expected to come out of the		Every project is expected to have its benefits and negative impacts on the
project, what about the negative		environment and the social lives of the host population. We give emphasis
impacts that might arise on the		on negative impacts to that we can be prepared for them and have
commencement of the project?		appropriate mitigation mechanisms. Examples of negative impacts will be
		noise pollution, traffic on our road, light impact from the site because

	drilling will be done on 24 hours' basis to mentioned but a few.
	,

Other Issues (Not related to the ESIA)

COMMENT RAISED	COMMENTATOR	RESPONSE
Is there a political good will in the	Yusuf Athrmani	ESF Consultants
project? Why are we not co-invited in		As mentioned earlier this gives a platform for everyone to air their views,
the consultation forum alongside with		comments, suggestions and complaints about the project, we need to
the representatives from the National		regroup to have different meetings running concurrently to one another.
and County Government?		The National and County Government are also consulted during this period.

3 MBWANJUMALI LOCATION

Health, Safety and Security

COMMENT RAISED	COMMENTATOR	RESPONSE
How will drilling affect local residents'	Athman Ali	ESF Consultants
health?		Effects of drilling are expected to be site specific. However, we cannot rule
		out any health concerns that might arise from the drilling process. Workers
		onsite will be provided with PPEs and the well pad will be fenced off to keep
		unauthorized persons and animals from accessing the site.

Socio-economic issues

COMMENT RAISED	COMMENTATOR	RESPONSE
Compensation should not only benefit		Zarara Oil and Gas Ltd
the land owner but to the entire Bajuni		Once the drilling site has been identified and before any work commences,
community		Zarara will meet with the relevant land owners to reach an agreement on
		compensation.
	Mustafa Roy Mwalimu	According the proposed energy bill, the government will decide on the sharing of royalties to all parties involved, including: the company (zarara),

Payment made to workers should be worth the drilling worker.		national government, county government and the communities. The percentage allocated to the communities will bring about economic advancement to pate Island residents. Zarara Oil and Gas Ltd Noted. Payment terms will be discussed later once company gets the EIA License to start drilling.
Lands that will be used as access routes to the wellpad, will the land owners be compensated?		Zarara Oil and Gas Ltd Once the drilling site has been identified and before any work commences, Zarara will meet with the relevant land owners to reach an agreement on compensation.
Due to the high illiteracy levels at Pate Island, how will the locals benefit in provision of the work force?	Athman Ali	Zarara Oil and Gas Ltd Employment opportunities vary depending on skill levels and qualifications. Exploration drilling will require less staff with higher qualifications compared to seismic. However, Zarara will take your comments into consideration and employee more locals in their operations.
What benefits will the project bring to the community?	Ahmed Makuturu	There will be social and economic benefits in the area, such as: employment opportunities, infrastructural developments such as roads. Also, according the proposed energy bill, the government will decide on the sharing of royalties to all parties involved, including: the company (zarara), national government, county government and the communities. The percentage allocated to the communities will bring about economic advancement to pate Island residents.
As witnessed in other areas where oil drilling has taken place, will there be scramble for land at Pate Island?	Kassim Ali Shali	Zarara Oil and Gas Ltd Land at Pate Island might increase in value during future development such as the production phase. People might want to settle at Pate Island due to the expected potential economic boom in the area.
What happens in the event one refuses	Mohamed Ali	Zarara Oil and Gas Ltd

to accept compensation terms	Compensation terms will be discussed between Zarara Oil and Gas Ltd and
presented to him and insists to be paid	the land owner(s). This will be subject to land valuation by land value
in terms of percentage of the gas to be	assessors. We pray that we may reach an agreement.
harnessed from the ground (His land)?	

Issues related to the ESIA

COMMENT RAISED	COMMENTATOR	RESPONSE
When will the drilling start?	Mustafa Roy Mwalimu	Zarara Oil and Gas Ltd
		Drilling is expected to commence in the 14 months which we have been
		extended by the government of Kenya. This is however subject to issuance
		of ESIA license from NEMA.

Other Issues (Not related to the ESIA)

COMMENT RAISED	COMMENTATOR	RESPONSE
Seismic survey caused damage to my	Community member	ESF Consultants
crops and killed calves. Will it be the		Unlike seismic survey exploration which covered a wide area, with many
same during drilling period?		effects on livestock and crops; drilling will have site specific impacts which
		will be managed extensively within the wellpad. Other impacts will be
		compensated against in the event they occur, but they are expected to be
		minimal.

4 TCHUNDWA LOCATION

Health, Safety and Security

COMMENTS RAISED	COMMENTATOR	RESPONSE
What are the health impacts of gas	Omari	ESF Consultants, most of the impacts resulting from gas drilling will be
drilling to the community and animals		mitigated and EMP will be developed to show who is responsible and the
		time frame. Zarara will have to abide to the local and international

standards on health, safety and security. The waste from drilling process
will be managed onsite for safety disposal.
Zarara Oil and Gas Ltd, the policy of the company is to make sure safety of
employees and community is not compromised, the well pad will be
fenced off and their will guides to man the areas, this will prevent
unauthorized persons from entering the well pad.

Socio-Economic Issues

COMMENTS RAISED	COMMENTATOR	RESPONSE
I bought land and it has not been	Shariff Athmani	Zarara Oil and Gas Ltd
surveyed, if the well pad happens to fall		it will be good to acquire title deed for your lands because this will show
on my land will I be compensated.		land ownership. Also the company will be in a good position to discuss
		compensation with the right land owner.
If the well pad falls on my land will I be	Muhaji (former	Zarara Oil and Gas Ltd
compensated?	Councilor)	If the 200mx200m falls on your land there will be agreement between the
		affected individual and Zarara company on compensation.
During employment youth's and	Fridahous Walaji	Zarara Oil and Gas Ltd
women should be factored in the		During seismic most of youths employed were men, during this time
program.		everyone will be given equal opportunity, but it will be confirmed when
		the project starts.
What qualification will be needed for	Waladi	Zarara Oil and Gas Ltd
employment?		The drilling process is very intensive and will require qualified personnel.
		However, Zarara will take your comments into consideration during the
		employment period.
If the project site is found to be in	Community Member	Zarara Oil and Gas Ltd
Tchundwa Location, how will the		The Natural Resources (County Royalties) Bill 2013 which has been tabled
community benefit from this?		in parliament for discussion, the Bill seeks to make provisions for
		sustainable exploitation and equitable apportionment of royalties with
		other accruing benefits by allocating 20 per cent of the proceeds to county

	government, 75 per cent to the national government and 5 per cent to the local community where activities are carried out.
	The company will come up with CSRs after agreement with communities.

Issues Related to the ESIA

COMMENTS RAISED	COMMENTATOR	RESPONSE
During seismic most of the activities	Yusuf Bwaheri	Zarara Oil and Gas Ltd
involved entry into our properties/		Drilling will be site specific within the well pad 200mx200m meaning that
land. Will Gas drilling entail the same		all activities will be carried there.
activities?		
When will the gas drilling start	Community member	ESF Consultants
		Gas drilling will only start once the EIA license has been issued by NEMA.
		For an EIA License to be issued it takes 45-90 working days.
		Zarara Oil and Gas Itd
		The GoK has extended the license for Zarara by 14 months, once we get
		the EIA license we will start the process of gas drilling.
From the BID you given us the blocks	Omar	Zarara Oil and Gas Itd
are LO4 and L13, what is the difference?		The government divides oil block covering different sections of land. Hence
		Block L4 covers Pate Island and L13 cover most of the Lamu main land
		Lamu.

Other Issues (Not related to the ESIA)

COMMENT RAISED	COMMENTATOR	RESPONSE
During Seismic most of our crops and	Idarus	Zarara Oil and Gas Ltd
vegetation's where affected, will this be the same case during the drilling phase?		Drilling will require 200mx200m, the only the vegetation loss will be within the well pad and during construction of access roads. During the seismic a survey was carried out to ensure that all crops that

		were damaged were compensated. There is a record of those affected and who were compensated.
During the rehabilitation/ decommissioning stages of seismic most of the holes mad during seismic were not filled well, hence posing safety risks of falling in by both human and livestock.	Anwar	Zarara Oil and Gas Ltd All seismic lines where rehabilitated and holes covered, they have been vegetated and you cannot locate them, but the holes in question might have been uncovered during the rainfall.
Why drill gas yet we have Amu coal mining and can be used to generate power	Anwar	Zarara Oil and Gas Ltd Gas will be used to produce energy, all nations are turning to clean source of energy such as wind, solar and natural gas which is clean source of energy.

5 SIYU LOCATION

Socio-Economic Issues

COMMENTS RAISED	COMMENTATOR	RESPONSE
How will the community benefit from	Chief Siyu Location	ESF Consultants
the project?		We have involved enumerators from each location to assist in social economic data collection.
		Zarara Oil and Gas Ltd
		The project will employ local community but this time the number will not
		be the same as during the seismic process because activities will be within
		200mx200m, hence will require less number of employees.
What will be the percentage of youths	Mohamed Ali S.	Zarara Oil and Gas Ltd
to be employed?		It currently unknown how many youths will be employed; however, it is
		assured that youths from Pate Island will be employed during the
		implementation of the project.

If drilling occurs in private land how will	Omar Hussein	Zarara Oil and Gas Ltd
the land owner benefit?		Once the drilling site has been identified and before any work commences,
		Zarara will meet with the relevant land owners to reach an agreement on
		compensation.
The community need CSR such as	Abas	Zarara Oil and Gas Ltd
improving the local hospitals?		Noted
During seismic BGP improved the roads,	Abubakar	Zarara Oil and Gas Ltd
we do hope that Zarara will consider		Due to the heavy nature of drilling equipment's and the rig there will be an
improving the roads.		impact on the road and culverts. Zarara carried out an assessment/ survey
		of the roads in Pate and the airstrip. It was found that the status of the
		roads was good but an upgrade of the road, culverts and bridges might be
		needed to handle the weight of the trucks transporting the rig and other
		equipment.

Issues Related to the ESIA

COMMENTS RAISED	COMMENTATOR	RESPONSE
What are the positive and negative	Madi Ali Madi	Zarara Oil and Gas Ltd
impacts of the project?		The project will create employment to the community, it will improve
		livelihood of the community creating business opportunities.
		ESF Consultants
		Apart from the positive benefits, project will have negatives impacts such
		as noise pollution, air pollution, impact on traffic; however, mitigation
		measures will be developed to reduce /avoid the negative impacts. An
		ESMP will be developed to show who is responsible in implementing the
		ESMP and in what timeframe/frequency.
In Siyu location there are land issues,	Abas	Zarara Oil and Gas Ltd it will be good for everyone to have a land title
because majority of the people don't		deed, because drilling cannot be done in areas with land issues to avoid
have a title deed for their lands. This		conflicts.
issue should be sorted first before		

drilling starts.	

Need and Desirability of the Proposed Project

COMMENTS RAISED	COMMENTATOR	RESPONSE
The project is ours because it will	Chief Siyu Location	Zarara Oil and Gas Ltd; Noted
benefit the community; I welcome it in		
the area.		
We need the project in Siyu Location	Abas	Zarara Oil and Gas Ltd; Noted
and Pate Island for it will bring		
development in the area.		

Other Issues (Not related to the ESIA)

COMMENTS RAISED	COMMENTATOR	RESPONSE
This is for all the youths in siyu location,	Abubakar	Zarara Oil and Gas Ltd; Noted
we urge you to be educated so that you		
can be employed in good jobs in the		
future especially on issues relating to		
gas.		

6 PATE LOCATION

Biodiversity (Flora, Fauna, Avifauna)

COMMENT RAISED	COMMENTATOR	RESPONSE
In 1970s, gas found by Shell was	Ahmed Mohamed	Zarara Oil and Gas Ltd
directed towards the mangroves. If the		Shell's intention was to find oil but found gas. They did not have a
gas being drilled becomes uncontained,		mechanism to contain the gas. That is why they directed the gas into the
will it be directed towards our farms?		mangroves for three days before they plugged the well. Zarara Oil and Gas
		Ltd's intention is to find gas. If found, it will be harnessed, not directed into

the mangroves as was done before.

Waste management issues

COMMENT RAISED	COMMENTATOR	RESPONSE
After drilling, how will you handle and	Ali Gafa	ESF Consultants
dispose of the wastes generated?		Wastes generated from the drilling process will be treated before being
		deposited on the tailings disposal facility located in well pad. Also waste
		will be handled by NEMA waste license hander.

Water issues

COMMENT RAISED	COMMENTATOR	RESPONSE
After BGP carried out seismic activities,	chief	Zarara Oil and Gas Ltd
water quality in three wells were		Pate location residents complained. And their voices were heard. We
affected. Will the scenario repeat itself		talked to the BGP contractor only to find out they had rented two private
again during drilling?		wells which later were over-abstracted. After consultations with BGP, there
		was no more fetching of drinking water from Pate wells. Water was
		collected from Lamu Island and Hindi. We have learned from the past and
		the scenario will be rectified to ensure this does not happen again.

Health, Safety and Security

COMMENT RAISED	COMMENTATOR	RESPONSE
What effects would gas pose on	Hassan Swaleh	ESF Consultants
livestock, crops and humans?		Unlike seismic survey exploration - which covered a wide area - drilling will
		have site specific impacts which will be managed extensively within the
		well pad. Other impacts will be compensated against in the event this
		occur, but they are expected to be minimal.

Socio-economic impacts

COMMENT RAISED	COMMENTATOR	RESPONSE
If gas is found, what benefits will it		Zarara Oil and Gas Ltd
present to the residents of Pate Island?		There will be social and economic uplift in the area; your land will increase
		in value; there will also be infrastructural developments such as roads that
		will spring up.
		According the proposed energy bill, the government will decide on the
		sharing of royalties to all parties involved, including: the company (zarara),
	Mohamed Hassan	national government, county government and the communities. The
		percentage allocated to the communities will bring about economic
		advancement to pate Island residents
What will happen in the event that my		Zarara Oil and Gas Ltd
land falls in the well pad whereas		Noted.
someone else was wrongfully allocated		We hope such incidences will not arise. We are however not discussing
my deed during the recent land title		land matters today. Such should be followed up with land's ministry and
deed allocation. Who will be the		the National Lands Commission
rightful person to be compensated?		
Will we be considered for employment?		Zarara Oil and Gas Ltd
		During BGP seismic survey, most of the jobs were sourced from within Pate
		Island. Of the 220 employees, 175 of them came from Pate Island. Zarara
		Oil and Gas Ltd intends to maintain the same hiring policy during drilling.
		Except that drilling requires fewer workforce as compared to seismic
		survey.
Will Zarara Oil and Gas Ltd consider to		Zarara Oil and Gas Ltd
do CSRs on educational sector and		If the ESIA is approved and the company is given a license to carry out
Hospital?		drilling and the gas found is of economic value CSRs will be done. There will
		be another forum then to discuss on the production phase of gas
		exploration.
Will compensation be individual or	Bw. Mkuu Mohamed	Zarara Oil and Gas Ltd

communal?		Once the drilling site has been identified and before any work commences,
		Zarara will meet with the relevant land owners to reach an agreement on
		compensation
How will the proceeds from the gas	Ali Gafa	Zarara Oil and Gas Ltd
harnessed be shared?		According the proposed energy bill, the government will decide on the
		sharing of royalties to all parties involved, including: the company (zarara),
		national government, county government and the communities. The
		percentage allocated to the communities will bring about economic
		advancement to pate Island residents.
Who dictates on what economic		Zarara Oil and Gas Ltd
projects or use to put the 5% intended		The 5% will be used to enhance the host community's livelihood through
to benefit the host community where		infrastructure developments or other income generating project. When
gas is found?		that time comes, there may be a forum with your elected representatives
		from the county government to discuss on what course of project to
		undertake.
Will there be equitable compensation	Mohamed Hassan	Zarara Oil and Gas Ltd
rates for those affected/ displaced on		Compensation terms will be discussed by Zarara Oil and Gas Ltd and the
the onset of the project regardless of		affected people. This is dependent upon the valuation report from
our low levels of education? Or will the		resettlement planners and land valuers. No one will be intimidated upon.
leaders intimidate us?		
Since the drilling will take place on	chief	Zarara Oil and Gas Ltd
200mX200m on Pate Island, why will		The land owner will discuss compensation terms with the company. This
the 5% go through the county		5% is the proceeds derived from gas prospects. This one is released to the
government and not directly to the land		local residents through the county government. It's meant to uplift the
owner?		area to which the proposed project was done. It's not for individual benefit.
When discussing compensation terms,		Zarara Oil and Gas Ltd
there should be a compensation		A compensation committee can be formed depending on the number of
committee to discuss compensation		people to be displaced or relocated. If they are few and decide to engage
terms, not individual consultations with		with company. Also during compensation there will be a chief, also the
the company		individual can have services of a lawyer if possible.

Since Pate location people are poor in	Hamadi	Zarara Oil and Gas Ltd
comparison to other villages on the		Employment opportunities vary from highly skilled openings to jobs that do
island, the local residents of Pate		not require much skills. Similar to what was done during Seismic
location don't have relevant skills in		exploration, there will be different classes and levels of jobs only that the
drilling jobs. How will they benefit from		opportunities will be fewer. Anyone can be employed depending on his/ her
the few available job opportunities?		skills.

Issues related to the ESIA

COMMENT RAISED	COMMENTATOR	RESPONSE
Where will the wells be located?	Mohamed Hassan	Zarara Oil and Gas Ltd
		The specific sites for location of the wells is still unknown. Once the drilling
		engineers have the seismic survey report, they will then identify the specific
		area where drilling will be done.
What would be the extent of the	Hassan Swaleh	Zarara Oil and Gas Ltd
potential benefits and negative impacts		The project will create employment to the community, it will improve
of the drilling process?		livelihood of the community (creating business opportunities).
		ESF Consultants
		Apart from the positive benefits, the project will have negatives impacts
		such as noise pollution, air pollution, impact on traffic, but we will develop
		mitigation measures for all anticipated impacts. Will also develop EMP to
		show who is responsible and the time frame.

7 MTANGAWANDA

Biodiversity (Flora, Fauna, Avifauna)

COMMENT RAISED	COMMENTATOR	RESPONSE
Is there assurance that the sea and	Hassan Mote	ESF Consultants
land will not be affected during the		Drilling will be done onshore on Pate Island, no drilling activities will be
drilling period?		done in the sea. Though a barge will be used to transport the rig and

C	drilling equipment's from Mombasa to Mtangawanda Jetty.
ı	Waste will be treated within the well pad before being disposed of.

Water issues

COMMENT RAISED	COMMENTATOR	RESPONSE
What amount of water will be used	Enumerator	Zarara Oil and Gas Ltd
during drilling process and where will		The sources where water will be tapped for drinking purposes has not yet
it be sourced from? Will wells dry up		been established. But there will not be a repeat of the drying and
as was the case with seismic survey		contamination of wells as was the case during seismic exploration.
exploration that caused wells at Pate		As part of the ESIA, there will be hydrological survey in the area to
village to dry up?		establish the volume and availability of underground and surface water in
		Pate Island.

Socio-economic issues

COMMENTATOR	RESPONSE
Zulfa Fahaza	Zarara Oil and Gas Ltd
	There will be social and economic uplift in the area; land will increase in
	value; there will also be infrastructural developments such as roads that
	will spring up.
	As was with the case during seismic survey exploration where 220
	employed 175 were from Pate Island. Zarara wishes to continue its
	employment policy; however, drilling jobs are fewer as compared to
	seismic survey related jobs.
	Also, 5% of gas related proceeds to be shared with the host community is
	enough to change the economic livelihood of an area according to the
	Energy Bill.

During compensation, individual land		Zarara Oil and Gas Ltd
owners should be involved in the		Compensation terms will be discussed by Zarara Oil and Gas Ltd and the
negotiations. Chiefs and other leaders		affected people. No one will be allowed to negotiate on behalf of the land
such as village heads should not be		owner unless permitted by the land owner.
allowed to negotiate on behalf of the		
land owner		
BGP made a temporary jetty (wooden)	Enumerator	Zarara Oil and Gas Ltd
at Mtangawanda. Will that be done		During seismic survey, BGP did not want to inconvenience locals from
again, or will we share the current		carrying out the activities at the jetty, that is why they opted to make use
jetty with the drilling crew?		of a temporary wooden jetty. Which they later decommissioned after they
		finalized their activities.
		It is not yet established whether a temporary jetty will be constructed to be
		used during drilling period. There is also a probability of the current jetty to
		be upgraded and used during drilling period.
		be apgraded and ased during arming period.

SECONDARY STAKEHOLDER MEETING

Date	Contact Person	Institution	Position Role	Comments
18 th April 2016	Ann Komen	WWF Kenya	Project Officer, Boni- Dodori SFM Project	The stakeholders consulted wanted to know specifics of the project such as:
2010	Jonathan Chebesa	County Commissioners Office	Assistant County Commissioner	 If the proposed site for the drilling will be private or public land What will the distance of the proposed site to the sea? What is the timeframe for the proposed project? The proponent should ensure to have an extensive stakeholder
	Kamal Sharif	Department of Fisheries, Livestock and Co-operative	Director	consultation exercise with the community and relevant government agencies.
19 th	Edward Wanekhwe	Kenya Maritime	Branch Vessel	Stated that special consideration should be put in place to address waste
April 2016	Mulongo	Authorities (KMA)	Inspector	disposal. If any waste is to be disposed into the sea Zarara should get permission from relevant authorities.
				Zarara should also ensure that any vessels used in the operations should be registered.
				Zarara should also consider writing a letter to KMA to get a list of regulations or permits that they may need during operations.
				Stated that the barge will need to be surveyed to ensure that all safety regulations are observed.
	Mahmoud H. Ali	Kenya Ports Authority	Senior Superintendent	Mr. Ali was for the project. They have had communications with Zarara before and stressed they are willing to work with Zarara in the future: especially in issues regarding to the use of the barge for transportation.
	Ali S. Bwana	Kenya Wildlife Services (KWS)	County Wildlife Conservation and Compensation Committee (CWCCC)	He stressed the need for further education and awareness reach with the local communities to understand the positives and negatives of the proposed project. There should be clear transparency in highlighting project impacts and clear mitigation measures provided. Mitigation measures should also be put in place to mitigate negative impacts that

Date	Contact Person	Institution	Position Role	Comments
				might arise from the proposed development.
				There should be continuous stakeholder consultation to avoid conflict with the communities. He also provided information that there is a marine community conservancy in Pate Island, which includes a representative from each Beach Management unit (BMU) in the Island.
				The proponent should also consider providing alternative sources of livelihoods for the community if the proposed project will affect their economic status.
				The proponent should also consider impact to wildlife in the area, wild pigs and dik diks are found on the island. The island is also a breading/feeding site for wild marine animals such as dugong and sea turtles
				Mr Bwana also provided information that there have been cases of human wildlife conflict in the area and KWS are in the process of mitigating this
	Ali Osman Ferul	Kenya Forest Services	Corporal	He is for the project since it will bring development to the area and improve the economic standing of the area.
				He also promised to share information with the rest of his team and his seniors.
	Representatives from the Public Health Department (Please see register in Appendix 3)	Public Health Department		The team was for the project since it will open up Pate Island for economic development, which will in turn benefit the community. However, some issues were raised by the team, which are as follows: 1. What will be the water sources for operations? 2. How will the waste be disposed? 3. The proponent should also consider CSR project to benefit the communities.

Date	Contact Person	Institution	Position Role	Comments
20 th April 2016	Save Lamu Members (Please see Appendix 3 Stakeholder Meeting Register and appendix 5 Public and Stakeholder Pictures)	Save Lamu NGO		 Abubakar Mohamed Ali, a member of Save Lamu: Explained how Lamu county is comprised of many tribes and cultures both indigenous and those who migrated to Lamu. Among the indigenous are the Bajuni, Orma and Boni communities. Immigrants include Arabs, Indians, Portuguese and Turkish origin people during the pre-colonial era. According to him, for a long time Lamu residents have been marginalized. The residents have been inhabitants of Lamu for a long time yet they live and are treated as squatters in their own land. He explained that the county has poor road network coverage; security challenges which affects the economy, leads to closure of hotels and affects fishing activities. The pre-colonial set up of the Railway line marginalized Lamu and made its economy decline. He hopes that that the standard gauge railway will lead to economic boost in the county and improve the livelihoods of the local residents. They welcome the project, as the county has no much investments neither do they have industries. Such will open doors for more development opportunities in the county He explained that LAPSSET hire youths from Lamu, but this only took place after SAVE Lamu is against projects that lead to environment pollution especial non-renewable sources of energy such as coal energy. The is however for green energy projects such as wing energy, tidal power and gas. Asked whether we have consulted the county government, and the National Museums already.

Date	Contact Person	Institution	Position Role	Comments
				 stakeholders among them the national government and Museums will be consulted before the end of the exercise. What CSRs does Zarara intend to do to uplift the livelihood of the people of Pate Island to compensate for the negative impacts they are likely to face What will be the percentage of locals to be employed? The employment opportunities that might be available should be both skilled and unskilled so as also those with low academic qualifications at Pate Island can get an employment opportunity. He fears that the Mkanda channel might be closed and make residents of Lamu East affected during the transportation of the rig by barge. Is the drilling well pad located on a wetland? Who is contracted to doing the drilling? How many megawatts are expected to be to be harnessed from the project? There is need for good compensation package to the locals. Requests to be offered a copy of the report before submission to NEMA; emphasizes that all details be incorporated in the report
				Zarara Response: The barge that will transport the rig will come by sea from the port of Mombasa to Jetty at Mtangawanda. Mkanda channel
				 will not be affected. The Contractor has not yet been sourced Expected power output is 1000 megawatts. During well testing, 50 megawatts power will be expected

Date	Contact Person	Institution	Position Role	Comments
				 Zarara wishes to use the same recruitment procedures as when used during the seismic Only that during drilling, there are fewer jobs as compared to seismic survey exploration. Compensation packages will be discussed and agreed upon by the individual land owners and Zarara. ESF Response: No, the drilling well pad sites have not yet been identified. However, the site will be on land on Pate island. None of the site will be allowed to be situated on wetlands. Wetlands need protection from human activities. All stakeholder findings will be incorporated in the ESIA report. ESIA reports are only submitted to NEMA for review and a copy sent to the proponent (Zarara). After NEMA has reviewed the document, it becomes a public document.
				Husein
				Asked whether there will be drilling of only one well or drilling of numerous wells (4) at different areas
				 How will treatment of waste water be done? Will the waste water cause impacts on the ground water reserves before treatment? How will treatment of waste water be done? Will the waste water cause impacts on the ground water reserves before
				treatment? 4. Why will the pit be lined with plastic?
				ESF Response:
				The initial well will twin the exploration well Pate-1 drilled by

Date	Contact Person	Institution	Position Role	Comments
				Shell in 1971. Assuming identification of hydrocarbons, a further 1-4 appraisal wells will be drilled as part of this campaign. • Waste water treatment will be done before being disposed into the tailings disposal facility located close to the site. A reserve pit used to dispose of rock cuttings and drilling mud will be constructed and lined with plastic which will prevent seepage of water into ground water reserves • Plastic lining helps protect against leaching and possible contamination of ground water reserves Isasck 1. Is the area inhabited by people?
				 Enquired whether the exercise we are carrying out is an information session of consultative engagement. They want it to be understood clearly so that at the end of the session, they would not be told that they consented to the project whereas they understood that it was an information sharing session. We say that we (ESF) will carry out studies on Pate Island in relation to hydrological survey, noise survey, socio economic survey, ambient air quality assessment and ecological survey; after the studies, will we present the findings to them as an organization? Pate Island experiences drinking water challenges. What impacts will the proposed project pose on the current water issues in the area? Will the impacts occur on land only given that we state that the

Date	Contact Person	Institution	Position Role	Comments
				 impacts will be site specific? 5. What choice of water will be selected for drilling purposes; will it be sea water of underground water? 6. Where will drinking water be sourced from? 7. Waste water recycling option should come out clearly. 8. How much water will be used per hour per activity? 9. What are storm water controls and tailings dam? 10. Since most of the people are either fishermen or farmers, will the project pose any challenges to their economic livelihood existence? 11. What duration is the drilling process expected to take? ESF Response: At least 200 cubic meters of water will be used per hour during drilling and camping for the first phase of the project. Storm water controls help in managing, directing and controlling run-off rain water. Tailings dam are the waste water storage facilities to contain waste drilling dam before treatment. The well pad will be located on land of approximately 200m X 200m. The potential impacts will be site specific. No drilling activities or waste dumping will take place in the sea The drilling process is expected to take 110 working days
	Haji Mohamed	Lamu Museum	Conservation Officer	According to Mr. Haji, there is need for Archeological Impact Assessment to be done before the proposed drilling project commences. This will help identify and mark out important archeological sites from tampering during the drilling phase. At Shanga, Siyu, Pate and Faza, there are abandoned sites, old town ruins and living towns. Such areas are prime and should not be touched.

Date	Contact Person	Institution	Position Role	Comments
	Eric Muteti Njeru	National Museums of Kenya	Archaeologist	According to Mr. Mutethi, there are sensitive archeological sites at Pate, Shanga and Siyu where the National Museums of Kenya visits for historical and cultural collections. He is hesitant as an archeologist of new adventures into such protected areas and the effects the proposed project will pose. Ruins at Pate and Siyu fort (monument) at Siyu are gazette sites. An archaeological Impact Assessment needs to be included in the report particularly for the areas of Shanga, Pate, Siyu and Faza. Only protected areas will be out of bound, however, open spaces within the island can still be used for other activities of exploratory drilling. He requests Zarara that during drilling, if they happen to come across archeological events, they should communicate them to the National Museums of Kenya.
	Khalifa Bwanamara Khalifa	Lamu County Government	Faza Ward Administrator	He supports the project and stated that he and the County are willing to help in any way possible. He also stressed that there should be extensive public and stakeholder consultation to avoid any future conflicts with community members.
	Mr. Salim	Ministry of Water	Hydrologist	Mr. Salim understands the geology and hydrology of Pate and Faza which was carried out by Southern Engineering company from China, contracted by ENI company. He has the Siyu / Faza boundary survey report. However, he asks that a geosurvey needs to be done for the other towns at Pate Island. Geosurvey has only been done upto the wells at Faza. He stated that brackish water can be found at a depth of approximately 10 meters. However, such information is subject to confirmation
	Executive Members	Tafakur Livestock Kee	epers Self Help Group –	This is an NGO group with 15 registered members whose main activities

Date	Contact Person	Institution	Position Role	Comments
		Tchundwa Location (Please see Appendix 3 Stakeholder Meeting		include: volunteer cleaning of Siyu center; advocating for environmental conservation; and involved in poultry keeping and table banking.
		Register and appendi Stakeholder Pictures	x 5 Public and	The NGO welcomes the project in Pate Island for it will create employment opportunities for youths; and improve the living standard of the communities by providing CSRs such as improvement of health
				facilities, education.
				The NGO wants Zarara Oil and Gas Ltd to fund or sponsor their activities on environmental conservation and cleanup activities, by providing equipment's such as; wheel barrows, brooms, spades, nose muffs, gloves among others.
				Also they requested Zarara to purchase their poultry products like eggs and meat which is a source of their income.
21 st	Philip Oloo Molo	Ministry of Interior	Assistant County	In full support for the project. The people, chiefs and his office are willing
April		and Coordination	Commissioner	to work with the proponent to ensure the project runs smoothly.
2016			Kiingitini Division	Stressed that the project will bring a lot of benefits to the area, hence
	Luqman Aboud		Chief Kizingitini	more education programs need to be carried out to educate community
			_	members of the positive impact of the projects.
	Mohamed S. Mohamed		Assistant Chief	The group and the cold also are side and destablished CCD in the case
			Mbwajumwali	The proponent should also consider undertaking a CSR in the area.
				The proponent should also be aware that compensation is a key issue in
				the area.
22	Florence Ndungu	Ministry of Trade	Chief officer Trade,	There should be equal opportunities for people in Lamu, since Lamu has
April 2016		and Tourism	Tourism, Culture, Wildlife and Forestry	a unique culture. The proponent should consider employing majority of the youths.
				The proposed project has potential to create environmental and economic impacts; for example, disrupt fishing and farming activities (which are key activities in the area); and disturb possible graves on the island. However, due to the size of the project the impacts will be site

Date	Contact Person	Institution	Position Role	Comments
				specific and what will be the environmental impacts of the project? Before commencement of the project the proponent should have extensive consultations with community members and land owners.
18 th May	Shakila Abdalla		Lamu County Women Representative	Pate Island has a rich cultural history of immigrants dating back to the 7th Century when Arabs, Persians and Hindus settled at the area, hence fear that with an influx of population into the area could lead to cultural pollution. Hence, as one of the mitigation measures the proponent should an induction period to educate new employees of the dos and
2016	Athman Shariff		Lamu East Member of Parliament	
	Mr. Abubakar			She alleges that there are some grave sites at the island that could date back to the 18th century. Also, the presence of the archaeological ruins at Pate and Siyu should be noted and well preserved. She raised concerns that since the inhabitants of Pate Island are farmers and fishermen and rely on these activities for their economic subsistence. How will the proposed drilling activities impact on their way of life? She asked whether there would be relocation of the inhabitants to pave way for the proposed drilling exploration. However much that the impacts will be site specific, how will Zarara ensure rehabilitation and recovery of vegetation, shrubs and trees on the pad? She wanted to know whether there would be transportation of the gas during production phase or a set-up of industries to produce electricity within Pate Island.