HEALTH IMPACT ASSESSMENT FOR THE BALAMA GRAPHITE MINE

COASTAL ENVIRONMENTAL SERVICES

MAY 2013

Digby Wells and Associates (South Africa) (Pty) Ltd (Subsidiary of Digby Wells & Associates (Pty) Ltd). Co. Reg. No. 2010/008577/07. Fern Isle, Section 10, 359 Pretoria Ave Randburg Private Bag X10046, Randburg, 2125, South Africa
Tel: +27 11 789 9495, Fax: +27 11 789 9498, info@digbywells.com, www.digbywells.com

Directors: A Sing*, AR Wilke, LF Koeslag, PD Tanner (British)*, AJ Reynolds (Chairman) (British)*, J Leaver*, GE Trusler (C.E.O)
*Non-Executive

This document has been prepared by **Digby Wells Environmental**.

Report Title: **Health Impact Assessment for the Balama Graphite Mine**

Project Number: **COA2029**

Name	Responsibility	Signature	Date
Vumile Dlamini	Report Writer		3 May 2013
Christian Nyaundi	HIA Consultant		13 May 2013
Natasha Taylor-Meyer	1st Review		14 May 2013
Jan Perold	2nd Review		20 May 2013

This report is provided solely for the purposes set out in it and may not, in whole or in part, be used for any other purpose without Digby Wells Environmental prior written consent.

EXECUTIVE SUMMARY

Introduction and Project Description

Syrah Resources (Syrah) is an Australian resource company with a diversified exploration portfolio located in southeast Africa. The company is developing its Balama Graphite Mine in Mozambique.

Balama Graphite Mine is within a 106km^2 granted prospecting licence located in the Cabo Delgado province in the district of Namuno in northern Mozambique. The Project is approximately 265km by road west of the port town of Pemba, and then via a 45km unsealed road to Balama town. The Project area is only 7km east of Balama town (refer to Plan 1).

Health Impact Assessment Methodology

A Health Impact Assessment (HIA) is a practical, multi-disciplinary process, combining a range of qualitative and quantitative evidence in a decision-making framework. An HIA seeks to identify and estimate the lasting or significant changes of different actions on the health status of a defined population. The methodology of this HIA was based on the Good Practice Note (GPN) for Health Impact Assessments as supported by the International Finance Corporation (IFC). The IFC has published a set of Performance Standards for large projects that will require international funding. Performance Standard 4 which deals specifically with Community Health, Safety and Security, recognises that project activities result in both positive and negative impacts to communities. The GPN has been developed specifically to provide guidance on community health for this Standard.

IFC Performance Standard 4 "Community Health, Safety and Security"

"The client will evaluate the risks and impacts to the health and safety of the Affected Communities during project life-cycle and will establish preventive and control measures consistent with good international industry practice (GIIP), such as in the World Bank Group Environmental, Health and Safety Guidelines (EHS Guidelines) or other internationally recognised sources. The client will identify risks and impacts and propose mitigation measures that are commensurate with their nature and magnitude. These measures will favour the prevention or avoidance of risks and impacts over minimization."

This approach was supported by a systematic and consistent approach to collecting and analysing baseline health data through the environmental health areas (EHA) framework. Twelve different EHAs are described, which provide a linkage between project-related activities and potential positive or negative community-level impacts. This incorporates a variety of biomedical and key social determinants of health. Through this integrated analysis, cross-cutting environmental and social conditions that contain significant health components are identified instead of focusing primarily on disease-specific.

Specific potentially affected communities (PACs) and health impacts related to different activities of the Project have been described.

HIA Activities

The specific activities of the HIA included:

- A desktop literature review outlining the country and community health profile;
- Collecting primary data by participatory means with use of semi-structured focus group discussions and key informant interviews with relevant stakeholders;
- Collecting additional secondary information that was not available in the public domain that is available in published and grey data;
- Understanding project designs, present and planned work activities, project schedule and location of PACs;
- Consider the potential future health impact that the proposed project will have on the health of the respective communities;
- Determine the existing health needs of the community based on health strategies, infrastructure, programmes, service priorities, delivery plans and challenges; and
- Develop evidence-based recommendations to avoid/mitigate negative and enhance positive impacts resulting from the project at the relevant project stage.

The field work was performed by HIAs specialists from Digby Wells supported by Coastal and Environmental Services (CES). The desktop work was completed in March 2013. The field work took place from the 11th to 16th of March 2013.

The HIA team consulted a broad range of stakeholders. Key informant interviews were conducted with district health authorities and medical personnel at the local health facilities and hospitals. Focus group discussions were held in six (6) villages that are in close proximity to the project including; Ntete, Pirira, Nquide, Sikadi, Mualia, and Bairu. Women were selected mainly as they are regarded as the concierges for community health.

Key Findings and Recommendations

The table below lists the most important findings of the HIA and lists specific recommendations to support the HIA process as well as initial management/mitigation measures. As per the IFC methodology, these are presented in the EHA framework.

Key Findings and Recommendations

Key findings	Risk factors	Recommendations
EHA 1 – Communicable diseases linked to housing design and overcrowding		
Most households are large, with several polygamous families. There is enough housing and adequate access thereof in five out of the six villages – overcrowding was reported in only one of the villages. Tuberculosis is widespread in Mozambique. There is poor case detection in the district. Acute respiratory infections are a major cause of morbidity especially in children under five years of age. Poverty, poor environmental health conditions and poor nutrition play a role in community susceptibility to infectious diseases.	The overall development may trigger in-migration to the project area and the risk of overcrowding and housing inflation exists, which may in turn increase the risk of transmission of communicable diseases. Increased traffic load may lead to exposure from dust and air pollution which has the potential to negatively impact acute and chronic respiratory tract diseases. This is likely to be minimal in the operational phases if appropriate exclusion zones are maintained and dust management principles followed.	Support TB knowledge campaigns related to awareness and health seeking behaviour. Influx management and advice with regards to town planning to prevent overcrowding. Health service planning and strengthening to ensure adequate health service capacity for TB diagnosis and management in the project area. These should always be performed in partnership with the local authorities and focussed on prevention and early recognition.
EHA 2 – Vector-related diseases		
Malaria is a major public health challenge in the project area and is regarded as the biggest concern related to burden of disease. It accounts for a significant portion of consultations at the local level. Community knowledge on transmission and prevention of malaria is good. Ownership of insecticide-treated nets is good, although it is difficult to assess proper utilisation. There are a number of interventions in the area to reduce the burden of disease from malaria but monitoring and evaluation activities are limited.	The project may influence malaria through changes to the environment and demographics in the area linked to influx. There is stakeholder concern that vector breeding and thus densities will increase with the project and may create focal high risk areas for malaria transmission. The health of the workforce also needs to be considered, especially as some of them might be from the local community.	Support malaria awareness campaigns in the communities. This can be done in collaboration with the local health authorities. Health systems strengthening with regards to malaria reporting to obtain accurate longitudinal data on malaria incidence.
EHA 3 – Sexually transmitted infections, including HIV/AIDS		

Key findings	Risk factors	Recommendations
HIV/AIDS remains an increasing public health challenge in the area. HIV prevalence is about 6-8% in the general population. Although commercial sex work is not common in the area, there is a potential for this to increase. Knowledge and awareness related to HIV appeared good. However, this does not translate into behaviour change and high risk practices are reported. Stigma was still high within the communities. Moreover, comprehensive knowledge of HIV prevention and transmission is low due to the belief of some misconceptions within the community. There are frequent HIV campaigns in the area. However, the limited functionality of the community health worker units may affect the delivery of services.	The project development has potential to further raise the risk of HIV/AIDS and STI transmission in the local population as a result of a number of factors. These are well described in mining and are often as an indirect effects of the project, but may also be associated with more direct influences such as: • Money: Increased disposal income; • Men who may be away from the family unit with income; • Mobility: access to rural communities. Transport workers are a high risk group; and • Mixing: in-migration and as a result of improved access. Different viral strains can also be transmitted.	Support information & education campaigns as well as peer educator programs in both the workforce and in the community. Develop a HIV/AIDS strategy at workplace and community level. Support health systems strengthening in the area to enhance the work performed by the local health authorities and their partners. This can have a specific focus on the community health worker units. Support projects that can serve as indicators for HIV and other STI prevalence. The VCT and antenatal clinics that function in the area should be supported and used as a source of data to monitor HIV prevalence.
EHA 4 – Soil-, water- and waste-related diseases		
Generally poor access to drinking water sources. Water is generally available during wet and dry seasons. With the exception of Chipembe Dam, improved water sources, such as water pumps are common in some communities while others rely on non-improved water sources. Very few improved sanitation facilities within the communities. The vast majority of households throughout the villages do not have access to their own improved sanitation facility. Diarrhoeal diseases are common. Intestinal parasites and urogenital schistosomiasis are also common.	There is a heavy reliance on non-protected sources of water in the area. Moreover, water microbial quality has not yet been assessed. The presence of the Chipembe Dam in the project area will potentially influence the risk of water borne diseases, particularly schistosomiasis.	Support the provision of safe and clean water in the communities. The establishment of institutional arrangements and mechanisms to ensure the sustainability of community-managed rural water supplies. Assess the quality of available drinking water at source and end user to ensure that the project does not have any detrimental effects on community water sources. Support information and education campaigns that promote community water

Key findings	Risk factors	Recommendations
		use, hygiene and general sanitation. Immediate prioritization of sanitation through the adoption at scale of total sanitation and sanitation marketing approaches for rural areas, and the strengthening of private and public sector capacities to participate successfully in these approaches.
EHA 5 – Food- and nutrition-related issues		
Malnutrition and micronutrient deficiencies are challenges in the project area. These are generally linked to food shortages and poor feeding practices. However, active surveillance of nutritional indicators is limited, due to the fact that some of the health facilities do not have height and weight scales. Anaemia is a major concern in the area although the true burden is not known. It is mainly linked to malnutrition, intestinal parasites and malaria.	The poor socio-economic status of some families living in the wider project area is a significant risk factor for malnutrition. Food security in Mozambique is currently a national challenge. Moreover, most women are poorly educated on proper feeding practices. Food inflation will also need to be considered, itself consequent upon in-migration and changes to supply and demand.	Support nutritional and anaemia programs in the area to enable in the collection of indicators that can be used to monitor the nutritional situation in the area. Equip local health facilities with height and weight scales and provide training for the implementation of a basic nutritional program, which targets children under the age of five years. This will not only serve as a community intervention per se but will support accurate longitudinal data surveillance on the nutritional status of children. This can be performed in association with existing local programs. Support agricultural programs that teach the community members on proper farming practices. This will help increase their food yields.
EHA 6 – Accidents and injuries		
Road traffic accidents (RTA) are the most common	The Project may lead to increased traffic loads in the	Develop a clear policy for the management of

Key findings	Risk factors	Recommendations
form of non-accidental injury in the area. Gender-based violence and crime related injuries such as assault are less common.	local area and has the potential to increase the number of traffic accidents. This is particularly relevant for small children and domestic animals. Alcohol plays a significant role in most forms of accidents and social influences may increase local alcohol abuse.	emergencies or accidents in the community as a direct result of the project. These should consider awareness and education programs, and schools can be a good target. Mitigation measures should be developed as part of a traffic and vehicle management plan.
EHA 7 – Exposure to potentially hazardous materials, noise and malodours		
Communities residing in the Project area live in close contact to their environment and are thus vulnerable to any changes in water and air quality, as well as to noise pollution. There have been no cases of heavy metal pollution or toxicity in the project areas. Exposures and environmental health determinants as a result of the project will be covered in other specialist reports.	The project has the potential to create significant environmental health concerns if such areas are not well managed. Concerns relate mainly to noise, water and air quality. There is a general lack of knowledge and understanding related to mining. This may pose a risk related to perceptions once the project moves into operations as factors and rumours that have no human health risks may flourish and which may create reputational risks. The company may then spend an extraordinary amount of time allaying these fears and misconceptions.	As per air and noise quality specialist reports. Develop clear and proactive communication strategies for potential environmental health risks that can possibly impact on human health.
EHA 8 – Social determinants of health		
Very good health-seeking behaviour in the project area. Very few people consult traditional healers. However, most communities do not have easy access to a health facility. Affordability is an issue as not all health services are free. Transportation to health care facilities is a major determinant in evaluating affordability.	In view of the precedence of the project, various social-determinants may be impacted by its development. Although few people admitted to seeking treatment from a traditional healer, the importance of traditional medicine must not be discounted. The resettlement process, if it takes place, may also	Understand the drivers for health seeking behaviour so that these can be used to support specific health interventions which require mitigation. For example HIV education programs will not be effective if the way the community forms opinions or behaves towards the disease is not understood. In addition, develop good

Key findings	Risk factors	Recommendations
Education is an existing need.	influence general well-being and sense of place. Migration may influence social determinants especially in centres where unplanned growth may occur without the provision of commensurate services.	programs to support good health seeking behaviour. Programs and interventions should support vulnerable groups as required, both in terms of impact mitigation and community development. Most other elements will be addressed in the social management plan. Information and education programs on substance abuse to prevent the problem manifesting at local level.
EHA 10 – Health systems issues		

Key findings	Risk factors	Recommendations
The capacity and quality of health care services is limited in the project area. There are only two health facilities in the immediate Project area. Not all communities have immediate access to a health facility, with accessibility and affordability the main issues. The Mozambican health system has a good structure and the ability to partner for health systems strengthening appears receptive. There is a functioning health information management system in place in the district but it has a few limitations: ■ Data is recorded manually from local health facilities with the risk that there is an error in capturing; ■ The information is maintained on a spreadsheet but no proactive trends are drawn; and ■ Limited diagnostics and human resource skills at the health centre level reduced the fidelity of data around the PACs.	The project has the potential to increase the burden on the already limited health care infrastructure in the area. This is especially a risk in the rural communities where influx to an area may mean that the available services are rapidly outstripped by an increased population. The health information management system has considerable gaps especially at the local health facility level which limits the longitudinal monitoring of health data and these impacts.	Develop a plan to support the health infrastructure in the project area. This strategic investment should consider the existing health needs of the community. Initiate health service planning with local authorities so that health services can manage any influx into area. Improve and support health information management systems to generate longitudinal data sources and thus support the monitoring of management/mitigation plans.
EHA 11 – Non-communicable diseases		
Non-communicable diseases are not well documented in the area due to limited capacity in the local health facilities.	With improved economic status and organised settlement a degree of urbanism may result with associated changes in lifestyles and related diseases	Support health education programs as part of a community health program. These should focus on lifestyle risk factors like diet,

Key findings	Risk factors	Recommendations
	such as obesity, diabetes, hypertension and dental caries. The health care facilities in the rural areas do not have a focus on the management of these diseases, nor do they have the diagnostic capabilities to appropriately recognise and manage these conditions.	exercise, smoking and alcohol consumption. Develop wellness programs in the workforce, with the aim that these are extended to the family unit. Consider health systems strengthening to support improvement of local diagnostics for non-communicable diseases.

Summary Health Impact Assessment

The major health impacts of concern and outcomes of the impact assessment are presented in the table below.

Code	Impact	Without Mitigation					With Mitigation				
		Temporal Scale	Spatial Scale	Severity of Impact	Risk or Likelihood	Overall Significance	Temporal Scale	Spatial Scale	Severity of Impact	Risk or Likelihood	Overall Significance
1.1	Transmission of communicable diseases due to overcrowding	Long Term	Study Area	Severe	Probable	High	Long Term	Study Area	Moderately - Beneficial	Probable	Moderately Beneficial
2.1	Malaria burden	Long Term	Study Area	Severe	Probable	High	Long Term	Regional	Very Beneficial	Probable	Very Beneficial
3.1	Transmission of STIs and HIV/AIDS	Permanent	Regional	Very Severe	Definite	Very High	Long term	Regional	Moderately Beneficial	Probable	Moderately Beneficial
4.1	Soil-, water- and waste-related diseases	Long Term	Localised	Severe	Definite	High	Long Term	Regional	Very Beneficial	Probable	Very Beneficial
5.1	Food and nutrition	Long Term	Localised	Moderate	Probable	Moderate	Long Term	Localised	Moderately Beneficial	May Occur	Moderately Beneficial
6.1	Road traffic accidents and other accidental injuries	Long Term	Localised	Severe	Probable	Moderate	Long Term	Localised	Moderately Beneficial	Probable	Moderately Beneficial

Code	Impact	Without Mitigation					With Mitigation				
		Temporal Scale	Spatial Scale	Severity of Impact	Risk or Likelihood	Overall Significance	Temporal Scale	Spatial Scale	Severity of Impact	Risk or Likelihood	Overall Significance
7.1	Air pollution, noise and mal-odours	Long Term	Localised	Moderate	Probable	Moderate	Long Term	Localised	Moderately Beneficial	May Occur	Low Benefit
7.2	Chemicals, pesticides and heavy metals	Long Term	Localised	Very Severe	Probable	High	Long Term	Localised	Slightly Beneficial	Probable	Moderately Beneficial
8.1	Gender-based violence, alcohol and drugs	Long Term	Localised	Very Severe	May Occur	High	Medium term	Localised	Very Beneficial	Probable	Highly Beneficial
8.2	Social cohesion and Well-being	Long Term	Localised	Very Severe	May Occur	High	Long Term	Localised	Very Beneficial	May Occur	Highly Beneficial
10.1	Health systems strengthening	Long Term	Study Area	Very Severe	Definite	Very High	Long Term	Study Area	Very Beneficial	Probable	Very Highly Beneficial
11.1	Non-communicable Diseases	Long Term	Study Area	Severe	Probable	High	Long Term	Study Area	Moderately Beneficial	Probable	Moderately Beneficial

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

LIST OF PLANS

ACRONYMS AND ABBREVIATIONS

ACT	Artemisinin-based Combination Therapy
AFRO	African Region
AIDS	Acquired Immunodeficiency Syndrome
ANC	Antenatal Care
ARI	Acute Respiratory Infection
ARIEL	Fundação Ariel Glaser contra o SIDA Pediátrico
ART	Anti-retroviral Treatment
BCG	Bacillus Calmette–Guérin (recommended TB vaccine)
BGM	Balama Graphite Mine
BHS	Baseline Health Survey
BMI	Body Mass Index
CES	Coastal and Environmental Services
CFR	Case Fatality Rate
CHMP	Community Health Management Plan
CPLP	Comunidade dos Países de Língua Portuguesa
CSW	Commercial Sex Workers
CVD	Cardiovascular Diseases
DALY	Disability Adjusted Life Years
DEC	Diethyl-carbamazine Citrate
DOTS	Directly Observed Treatment Strategy
DPT	Diphtheria, Pertussis, Tetanus Vaccine
EGPAF	Elizabeth Glaser Pediatric AIDS Foundation
EHA	Environmental Health Area
EIA	Environmental Impact Assessment
EPI	Expanded Program of Immunization
EnvM	Environmental Monitoring
ESHIA	Environmental, Social and Health Impact Assessment
FAO	Food and Agriculture Organization
FGD	Focus Group Discussion
FGM	Female Genital Mutilation
FP	Family Planning
GBV	Gender-based violence
GDP	Gross Domestic Product
HBV	Hepatitis B Virus
HCC	Hepatocellular Carcinoma

HCS	Hazardous Chemical Substances
HDI	Human Development Index
HIA	Health Impact Assessment
Hib	Haemophilus Influenzae Type B
HIV	Human Immunodeficiency Vius
HMIS	Health Management Information System
HMP	Health Monitoring Plan
HSS	Health Systems Strengthening
HT	Hypertension
ICMM	International Council of Mining and Metals
IFC	International Finance Corporation
ICU	Intensive Care Unit
ILO	International Labour Organization
IMF	International Monetary Fund
INSIDA	Inquérito Demográfico e de Saúde (Mozambique HIV/AIDS Indicator Survey)
INH	Isoniazid
IRS	Indoor Residual Spraying
IPT_p	Intermittent Preventive Treatment of Malaria in Pregnancy
ITN	Insecticide-treated BedNet
IWMI	International Water Management Institute
KAP	Knowledge, Attitude and Practices
KII	Key Informant Interview
KPI	Key Performance Indicator
KS	Kaposi's sarcoma
LF	Lymphatic Filariasis
LLIN	Long Lasting Impregnated BedNet
M&E	Monitoring and evaluation
MCV	Measles Containing Vaccine
MDG	Millennium Development Goal
MDHS	Mozambique Demographic and Health Survey
MDR	Multidrug Resistant
MICS	Mozambique Multiple Indicator Cluster Survey
MIS	Malaria Indicator Survey
MMR	Maternal Mortality Rate
MoH	Ministry of Health
MSF	Medecins Sans Frontieres
NCD	Non-Communicable Disease

NGO	Non-Governmental Organization
PAC	Potentially Affected Community
PHC	Primary Health Care
PMTCT	Prevention of Mother-to-Child Transmission
PS	Performance Standard
RDT	Rapid Diagnostic Tests
RMP	Rifampicin
RTA	Road Traffic Accidents
SIA	Social Impact Assessment
SP	Sulfadoxine-Pyrimetamine
STH	Soil Transmitted Helminthiasis
STI	Sexually Transmitted Infection
TB	Tuberculosis
TBA	Traditional Birth Attendant
TFR	Total Fertility Rate
TH	Traditional Healer
TM	Traditional Medicine
ToR	Terms of Reference
tpa	Tonnes per annum
UNAIDS	Joint United Nations Programme on HIV/AIDS
UNGASS	United Nations General Assembly Special Session on HIV/AIDS
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
VCT	Voluntary Counselling and Testing
VIP	Ventilated Improved Pit-latrine
WHO	World Health Organization
XDR-TB	Extensively Multidrug Resistant TB

1 INTRODUCTION

1.1 Project Background

Syrah Resources (Syrah) is an Australian resource company with a diversified exploration portfolio located in south-eastern Africa. In December 2011, Syrah acquired 100% ownership of the Balama Graphite Mine (hereafter “BGM”), located in northern Mozambique, and has since conducted a large diamond drilling resource definition program to establish a graphite resource with very strong potential to be developed into a mining operation (Syrah Resources Ltd., 2013).

Syrah commenced a Scoping Study in July 2012 that was due to be completed in April/May 2013. Syrah then proposes to conduct a Definitive Feasibility Study, which is proposed to be completed by the end of 2013 (Environmental Business Strategies Ltd., 2012).

Whilst the main commodity of interest is graphite, metallurgical testwork is in progress to determine if associated vanadium is also recoverable (Environmental Business Strategies Ltd., 2012).

1.2 Project Location

BGM is located on a 106km^2 Prospecting License in Balama District in the Cabo Delgado Province of northern Mozambique. The Project is approximately 265km by road west of the port town of Pemba. Pemba is a deep water container port and is the third largest port in Mozambique.

BGM is accessed by an excellent sealed road from Pemba to Montepuez, a regional township, and then via 45km of unsealed road which is in the process of being upgraded by the government. The project is only 7km east of the district headquarters of Balama (refer to Plan 1, Appendix A).

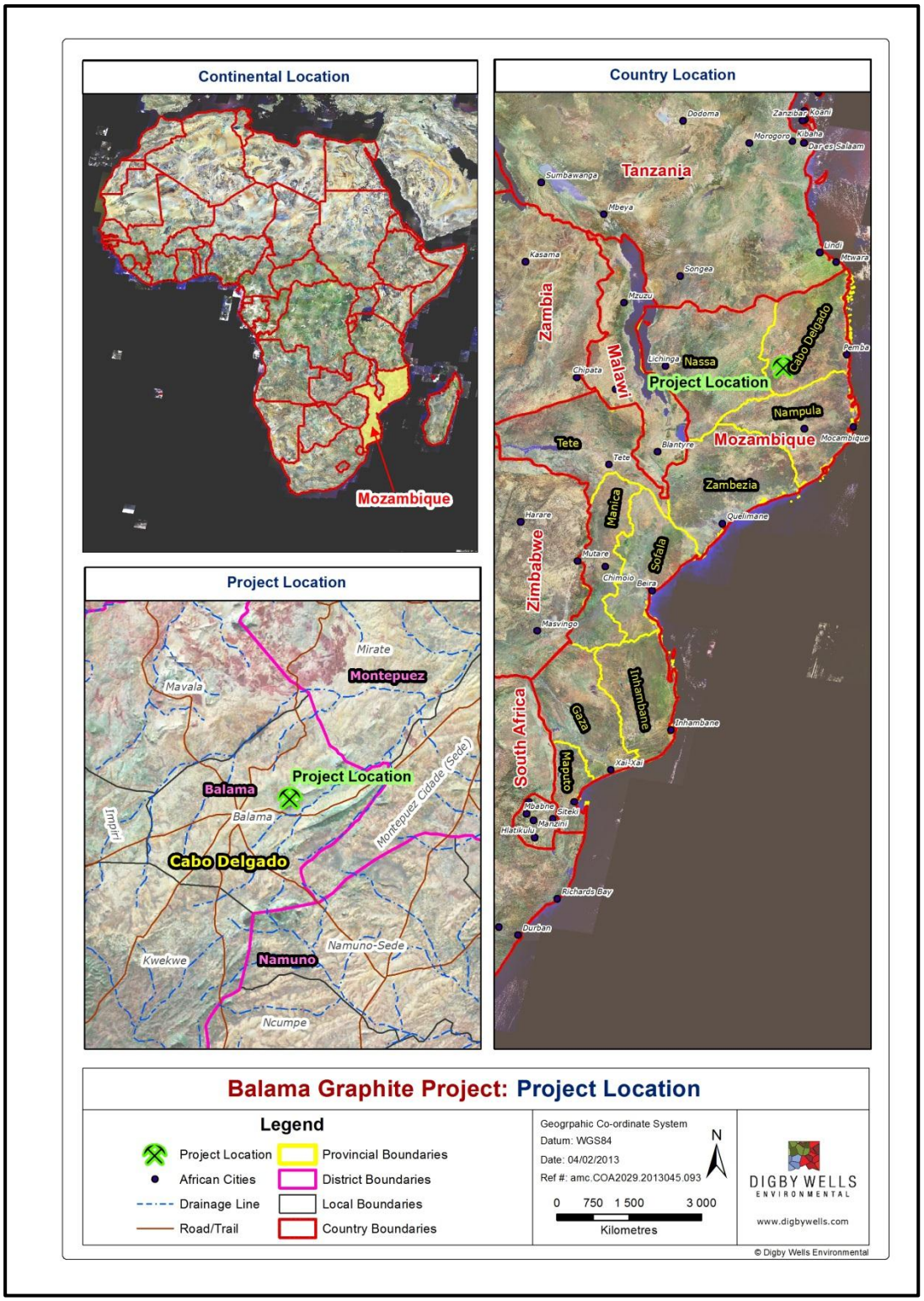


Figure 1-1: Project location

1.3 Terms of Reference

Digby Wells Environmental (Digby Wells) was contracted by Coastal and Environmental Services (CES) (on behalf of Syrah) to conduct a Health Impact Assessment (HIA) for BGM as part of the Environmental, Social and Health Impact Assessment.

The present scope of work for the BGM HIA was comprised of the following activities;

- Desktop literature review in order to:
  - Outline the country and community health profile from a desktop perspective including a literature review.
- A field visit in order to:
  - Undertake primary participatory data collection in the form of semi-structured focus group discussions with men and women in the different potentially affected communities (PACs);
  - Gather additional information that was not available in the public domain during the desktop review. This includes collection of information from health facilities, from the national health information management system, as well as from unpublished reports and documents;
  - Identify key informants and conduct initial interviews using a semi-structured questionnaire;
  - Assess the standards of the local health facilities and functionality of the health management information system; and
  - Visualise the project and location of communities in relation to planned project activities.
- Impact assessment process which:
  - Considered the potential future health impacts that the proposed project will have on the health of the respective communities;
  - Determined the existing health needs of the community based on health strategies, infrastructure, programs, service priorities, delivery plans and challenges;
  - Based on the existing evidence, ranked the likelihood and consequence of different health impacts to outline their significance and prioritisation for mitigation; and
  - Developed evidence-based recommendations to avoid/mitigate negative and enhance positive impacts resulting from the project at the relevant stage.

2 PROJECT DESCRIPTION

2.1 Project Activities

Outcropping graphite-vanadium mineralisation has been mapped over a strike length greater than 7km. Historically BGM has been subject to limited exploration with the only evidence of past exploration activities being some trenching in the north-west of the prospecting area. Therefore, this is a greenfields project for which no prior technical assessments exist.

Key aspects of the Project at this stage included (Environmental Business Strategies Ltd., 2012):

- Resource extraction will take place by means of conventional open pit mining;
- Both graphite to be recovered and sold as concentrate products;
- Conventional flotation processing will be used to recover graphite;
- Process water requirements are estimated at $1m^3$ per tonne of ore processed;
- A tailings storage facility will be required for process plant tailings disposal;
- BGM is anticipated to be a very large graphite deposit. The life of mine may be between 25 and 100 years;
- Process feed rates were not known at the time of this study, but could vary between 200,000 tpa and 8m tpa, with the option of phased ramp-up.

2.2 Proposed infrastructure

No linear developments are included in the TOR besides an 11km pipeline from Chipembe Dam (and pump house and storage tank reservoirs). There is no established infrastructure other than a recently constructed exploration camp.

For this study, the following aspects regarding infrastructure were considered:

- The site camp and offices will need to be upgraded to provide accommodation for a total workforce of 250 people;
- Chipembe, a large regional dam, is located only 13km northwest of the project site. Initial site investigations have determined that Chipembe represents the most secure source of water for processing;
- Power supply for the processing plant is likely to be from a site based diesel generation plant;
- The project infrastructure will include an upgraded road;

- A tailings storage facility will be constructed to dispose of process tailings; and
- A waste rock dump will be constructed to store waste rock from open pit mining.

3 LEGAL REQUIREMENTS

3.1 Country

No specific references were found that legally require the assessment of community health or the use of Health Impact Assessment (HIA) as a requirement for mining project developments in Mozambique. However, the Constitution of the Republic of Mozambique (2004) addresses matters relating to the environment and quality of life in Articles 45, 81, 90, 98, 102 and 117. Article 90 (Economic, social and cultural rights and duties) of Title III (Fundamental rights, duties and liberties), gives the people of Mozambique the right to live in a balanced environment. Moreover, Article 102 specifies that the state shall determine how natural resources may be exploited so that both human wellbeing and national interests are safeguarded.

The Mozambican health and mining laws were assessed during the HIA process. The requirement and nature of health care support provided to the community was also determined. This also included the health provided to the workforce, as some households might have a member who is employed by Syrah Resources.

The following Mozambican laws were relevant to the HIA process (The World Law Guide, 2013):

- The Labour Law (Law 23/07 of August 1, 2007) discusses health and safety requirements and actions; and
- The Law on HIV/SIDA (Law 5 of 2002) discusses, among other things, pre-employment HIV testing and dismissal based on HIV status. It also requires that employers provide employees with HIV education and advice.

3.2 International Management Standards

IFC Performance Standard 4 "Community Health, Safety and Security"

"The client will evaluate the risks and impacts to the health and safety of the Affected Communities during project life-cycle and will establish preventive and control measures consistent with good international industry practice, such as in the World Bank Group Environmental, Health and Safety Guidelines (EHS Guidelines) or other internationally recognised sources. The client will identify risks and impacts and propose mitigation measures that are commensurate with their nature and magnitude. These measures will favour the prevention or avoidance of risks and impacts over minimization."

There are a number of international guidelines or best practice guidelines that refer to community health in developing projects. The World Bank Group's standards and norms, and in particular those developed by its private sector arm, the International Finance Corporation (IFC), are generally considered as the benchmark. The IFC has published a set of Performance Standards for large projects that will require international funding. Performance Standard 4 (PS4): *Community Health, Safety and Security*, recognises that project activities result in both positive and negative impacts to communities (IFC, 2012). The objectives of this PS4 are:

- To avoid or minimise risks to and impacts on the health and safety of the local community during the project life cycle from both routine and non-routine circumstances; and
- To ensure that the safeguarding of personnel and property is carried out in a legitimate manner that avoids or minimises risks to the community's safety and security.

The general PS4 community health and safety requirement states that the client will evaluate risks and impacts to the health and safety of the affected community during all stages of a project, and will establish preventative measures to mitigate and manage the identified health impacts. An Action Plan is to be disclosed and on-going engagement with affected communities is to be established (IFC, 2012).

In addition to being considered the benchmark standards for major projects, the IFC's Performance Standards are applicable to projects seeking financing from either the IFC or other Equator Principles banks.

Mozambique is a signatory to certain international conventions that may be applicable to the project and these may be seen to provide additional direction in the absence or limitation of local legislation or policy. Those relevant to health include the following:

- The International Labour Organisation Conventions (ILO). Mozambique is a member of the ILO since 1960 and has ratified 42 ILO Conventions (International Labour Organizaiton (ILO), 2011);
- The United Nations Declaration on Rights of the Indigenous Peoples;
- Stockholm Convention on Persistent Organic Pollutants;
- Basel Convention on the control of trans-boundary movements of hazardous wastes and their disposal; and
- United Nations Agencies including:
  - United Nations Environmental Program;
  - International Health Regulations as promulgated by the World Health Organisation; and
  - United Nations Development Program. Global and Inclusive Agreement 2002.

3.3 Company Management Standards

Syrah Resources does not have a specific management standard that addresses community health or supports the use of HIA as a tool. However, the company's Occupational Health & Safety Corporate Policy addresses the health and wellbeing of its employees, contractors and visitors in all areas of the company's activities.

4 HEALTH IMPACT ASSESSMENT METHODOLOGY

4.1 Introduction and Definition

A Health Impact Assessment (HIA) is a practical, multi-disciplinary process, combining a range of qualitative and quantitative evidence in a decision-making framework. An HIA seeks to identify and estimate the lasting or significant changes of different actions on the health status of a defined population (Winkler et al., 2010). HIA may be defined as "*a combination of procedures, methods and tools by which a project may be judged as to its potential effects on the health of a population, and the distribution of those effects within the population*". The objective of an HIA is to deliver evidence-based recommendations to maximize potential positive health benefits and prevent or mitigate any detrimental health impacts that a project may have on the potentially affected communities (PAC) (WHO/ECHP, 1999, IAIA, 2006).

The World Health Organisation (WHO) defines health as a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity. This is influenced through complex interaction of social, economic, genetic, and environmental factors (WHO, 2010c).

The ultimate deliverable of an HIA is a community health management plan (CHMP) (Winkler et al., 2011). This plan would be based on evidence and stakeholder input, prioritised according to impacts and needs and having clear indicators to monitor and evaluate project impacts and programs. The CHMP will also facilitate the development of social development programs linked to health.

The holistic model of health used in the HIA process acknowledges that the health status of a population is affected by factors known as health determinants (e.g. education, income level, health services, etc.). All of these are closely interlinked and differentials in their distribution lead to health inequalities. These include both biophysical and social determinants of health as well and not just purely health outcomes. The methodology allows HIA practitioners to consider how a project affects these determinants of health, as well as health outcomes.

4.2 Overview of the HIA Process

A standardised approach was considered for the HIA to ensure that evidence based recommendations supported the impact assessment and community health management plan. To ensure compliance with the IFC performance standards, and especially PS4, the methodology outlined in the Good Practice Note for HIA from the IFC, was adopted (IFC, 2012, International Finance Corporation (IFC), 2008). The main elements of this are discussed briefly below so that the context of the HIA is understood.

Figure 4-1 presents the framework that is commonly used for HIA and which follows a 6-step process (IFC, 2009):

- Screening (preliminary evaluation to determine the necessity of an HIA);

- Scoping (identifying the range of potential project-related health impacts and defining the terms of reference for the HIA, based on published literature, local data and broad stakeholder consultation and how these may be influenced by the proposed project);
- Risk assessment (qualitative and quantitative appraisal of the potential health impacts in relation to defined communities and the project development, including stakeholder participation);
- Appraisal and mitigation (development of a CHMP) based on the findings of the risk assessment);
- Implementation and monitoring (realisation of the CHMP including monitoring activities that allow for adaptation); and
- Evaluation and verification of performance and effectiveness (key step to analyse the HIA process as a whole).

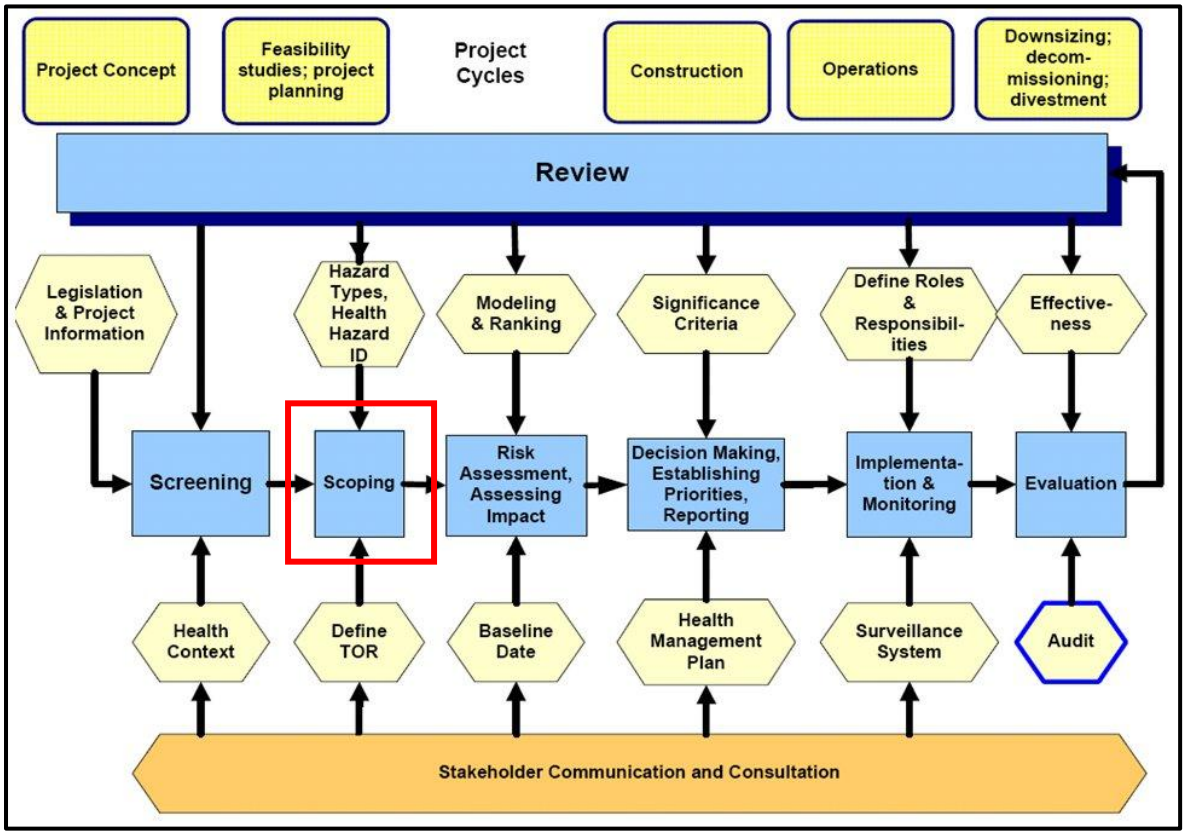


Figure 4-1: HIA Road map

4.3 Scoping the HIA

The HIA for the project is being conducted at the exploration stage and as a prospective assessment. It will thus be available to influence design and inform the construction, operation and decommissioning phases of the project. As HIAs are dynamic iterative processes they do require flexibility in their methodologies and tools - so that they can be fit for purpose for different projects.

Thus, the form of HIA for the project needed to be defined from the outset based on the three levels of HIA that are currently performed as described in Table 4-1 (IFC, 2009). Based on the scope of work proposed by BGM; a rapid appraisal approach was considered the most suitable based on the nature of the project. The fact that the HIA could gain information from social and other specialist environmental surveys supported this.

The activities undertaken in the rapid HIA are highlighted in the coloured area on the table. Performing a rapid appraisal HIA does not mean that the level of effort or analysis of the HIA is minimised, or that the potential for significant health impacts is missing. It only implies that new primary data (especially biomedical indicators) are not collected (IFC, 2009).

Table 4-1: Levels of HIA (IFC, 2009)

Level of HIA	Characteristics
Desktop HIA	■ Provides a broad overview of possible health impacts; ■ Analysis of existing and accessible data; ■ No new project specific survey data collection.
Scoping/Rapid Appraisal HIA	■ Provides more detailed information of possible health impacts; ■ Analysis of existing data; ■ Stakeholder and key informant analysis; and ■ No new project specific survey data collection.
Comprehensive HIA	■ Provides a comprehensive assessment of potential health impacts; ■ Robust definition of impacts; ■ **New project specific survey data collection**; and ■ Participatory approaches involving stakeholders and key informants.

A comprehensive HIA consists of a detailed process that is suitable for large, complex and high profile projects. Comprehensive HIAs typically involve collection and analysis of substantial baseline health-related data. The actual level of the data collection can be variable; however, data collection is an essential component of the process.

A rapid appraisal uses information already available or easily accessible. In-country field visit confirms the literature review and acts as “ground-truthing” verification. New data collection is not considered and this is a defining characteristic. Some type of limited workshop or discussion with key internal and external stakeholders is planned. Specific and relatively narrow boundaries or parameters are specified. A fully quantitative risk assessment exercise is not performed; however, a qualitative assessment is documented. As a second phase, when an evidence-based CHMP must be developed, further specific field work will be required. This could include a quantitative baseline health survey on key indicators of concern as part of the community baseline HIA to strengthen evidence.

4.4 Stratification into Potentially Affected Communities

To identify and quantify potential health impacts, an accurate population profile needs to be determined. This is important to distinguish between differences in exposure and susceptibility (Mindell et al., 2001). Therefore, besides a demographic profile of the at-risk population and the identification of the most vulnerable groups, it is essential to understand how the development, construction and operation activities are likely to impact at both a household and community level. Impacts caused by resettlement, shifts in the social structures or influx in population density are considered within the overall assessments (Winkler et al., 2010).

The relevant overall population is divided into potentially affected communities (PACs). A PAC is a defined community within a clear geographical boundary where project-related health impacts may reasonably be expected to occur. PACs are inherently prospective and simply represent best professional judgments. PACs are likely to change over the course of project implementation; and there may be changes in the project design, and thus its longer term implications are never fully known. This implies that the definition of PACs may need changing as more is known about the project. (Winkler et al., 2010).

Mitigation strategies also require specific considerations for the different PACs. On the one hand, not all the EHAs may require mitigation measures for the individual PACs. On the other hand a separate risk assessment for a PAC may be indicated due to a particular susceptibility to a specific health impact (Winkler et al., 2010).

Plan 2 (Appendix A) shows the rough spatial arrangement of the different PACs that were defined during the field visit. The PACs have been defined as follows:

PAC 1: The communities located in close proximity to the project site. These include Ntete, Pirira, Nquide and Mualia. They are impacted due to their relative proximity to the project and also due to the fact that some households in these communities may have to be resettled.

PAC 2: The communities located near Chipembe Dam. These communities include Sikadi and Bairu.

4.5 Impact Categorisation and Environmental Health Areas (EHAs) Framework

4.5.1 Environmental Health Areas (EHAs) Framework

The IFC methodology makes use of twelve Environmental Health Areas (EHAs) to support the systematic analysis of health considerations. These are summarised in Table 4-2. The set of EHAs provides a linkage between project-related activities and potential positive or negative community-level impacts and incorporates a variety of biomedical and key social determinants of health. In this integrated analysis, cross-cutting environmental and social conditions that contain significant health components are identified instead of an HIA focusing primarily on disease-specific considerations – as is frequently done in many biomedical analyses of potential project-related public health impacts. The EHA framework is based on an analysis performed and published by the World Bank (IFC, 2009, Listorti, 1996, Listorti and Doumani, 2001).

Table 4-2: Environmental Health Areas

	Environmental Health Areas (EHAs)
1.	**Housing and Respiratory Issues** – Transmission of communicable diseases (e.g. acute respiratory infections, pneumonia, tuberculosis, meningitis, plague, leprosy, etc.) that can be linked to overcrowding and housing inflation. It also considers indoor air pollution related to use of biomass fuels.
2.	**Vector-related Diseases** – Mosquito, fly, tick and lice-related diseases (e.g. malaria, dengue, yellow fever, lymphatic filariasis, rift valley fever, human African trypanosomiasis, onchocerciasis, etc.)
3.	**Sexually Transmitted Infections (including HIV/AIDS)** – Sexually-transmitted infections such as syphilis, gonorrhoea, chlamydia, hepatitis B and, most importantly, HIV/AIDS.
4.	**Soil- and Water-borne Diseases** – Diseases that are transmitted directly or indirectly through contaminated water, soil or non-hazardous waste (e.g. diarrhoeal diseases, schistosomiasis, hepatitis A and E, poliomyelitis, soil-transmitted helminthiases, etc.)
5.	**Food- and Nutrition-related Issues** – Adverse health effects such as malnutrition, anaemia or micronutrient deficiencies due to e.g. changes in agricultural and subsistence practices, or food inflation; gastroenteritis, etc. This will also consider feeding behaviours and practices. Access to land plays a major role in developing subsistence farming contexts.
6.	**Accidents and Injuries** – Road traffic or work-related accidents and injuries (home and project related); drowning, etc.
7.	**Exposure to Potentially Hazardous Materials** – This considers the environmental health determinants linked to the project and related activities. Noise, water and air pollution (indoor and outdoor) as well as visual impacts will be considered in this biophysical category. It can also include exposure to heavy metals and hazardous chemical substances and other

	Environmental Health Areas (EHAs)
	compounds, solvents or spills and releases from road traffic and exposure to mal-odours. There is a significant overlap in the environmental impact assessment in this section. Ionizing radiation also falls into this category.
8.	**Social Determinants of Health** – Including psychosocial stress (due to e.g. resettlement, overcrowding, political or economic crisis), mental health, depression, gender issues, domestic violence, suicide, ethnic conflicts, security concerns, substance misuse (drug, alcohol, smoking), family planning, health seeking behaviours, etc. There is a significant overlap in the social impact assessment (SIA) in this section.
9.	**Cultural Health** – Role of traditional medical providers, indigenous medicines, and unique cultural health practices.
10.	**Health Services Infrastructure and Capacity/Program Management Delivery Systems** – Physical health infrastructure (e.g. capacity, equipment, staffing levels and competencies, future development plans); program management delivery systems (e.g., malaria-, TB-, HIV/AIDS-initiatives, maternal and child health, etc.)
11.	**Non-communicable Diseases** – Cardiovascular diseases, cancer, diabetes, obesity, etc.
12.	**Veterinary Medicine/Zoonotic Issues** – Diseases that normally exists in animals that can infect humans (e.g. bovine tuberculosis, swinepox, avian influenza) or that that can be transmitted from animals to humans (e.g. rabies, brucellosis, Rift Valley fever, Lassa fever, leptospirosis, etc.)

4.5.2 Impact Assessment

The core activity of an HIA is the prediction, evaluation and mitigation of impacts (IFC, 2009). The significance of identified health impacts can be evaluated by drawing on: (i) the available health data from the literature review; (ii) the information generated through stakeholder consultation; (iii) the knowledge of the project context and developments; (iv) input from other specialist studies that inform the elements of the ESHIA and (v) experience of previous HIAs in similar settings (Winkler et al., 2010).

To ensure consistency across the different EHAs, a standardized impact assessment guideline was adopted for this study. This is described in Section 6.2.

4.6 Data Collection

The data collection activities of the HIA were conducted in a structured manner so as to gather as much information as possible. This included a desktop literature review, participatory data collection (stakeholder input) and direct observation. This structured method allows for the triangulation of data and provides a robust description of data as shown in Figure 4-2 (Winkler et al., 2011).

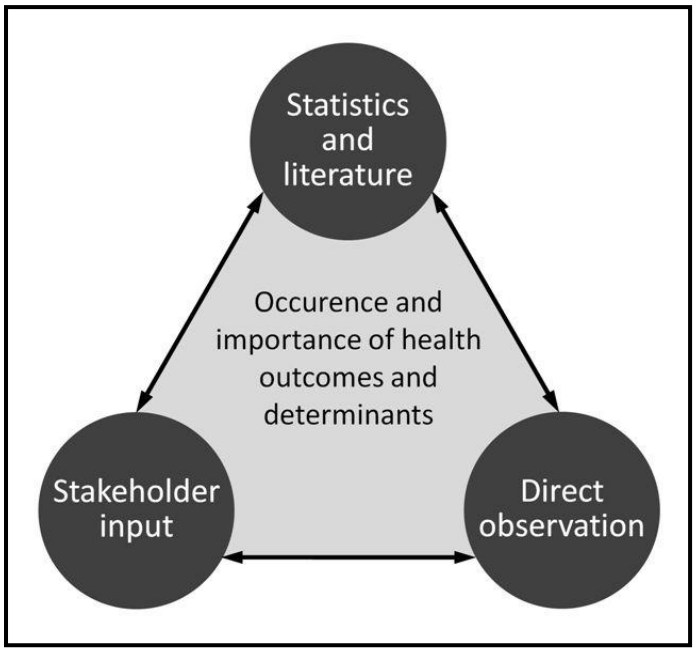


Figure 4-2: Triangulation of data (Winkler et al., 2011)

4.6.1 Desktop Work

This involved a literature review of health related data in the public domain as well as a review of existing project documentation and related secondary data. The literature review was completed before the field visit so that data gaps could be identified and questioning routes for key informant interviews (KII) and focus group discussions (FGDs) could be developed. Priority was given to topics that contributed the most towards the burden of disease in Mozambique and the project area and also to health-related incidents related to mining.

The desk top work included an extensive literature review to inform the health profiling of the region and where possible the population in the project area. The literature reviews focused on the national, provincial and (where available) local level, in a step down fashion, where information was available. The desk top work described the broad health status of the population, based on a systematic review of the 12 EHAs. It must be noted that there is limited information in the public domain regarding the health profile in Mozambique, especially at the local level.

Some core documents were consulted in the literature review. These included (i) the preliminary report of the 2011 Mozambique Demographic and Health Survey (MDHS) (Instituto Nacional de Estatística (INE) et al., 2012); (ii) the 2009 Mozambique HIV/AIDS Indicator Survey (INSIDA) (Instituto Nacional de Saúde (INS) et al., 2010); (iii) the 2008 Mozambique Multiple Indicator Cluster Survey (MICS) (Instituto Nacional de Estatistica and UNICEF, 2009); (iv) the 2007 Mozambique National Malaria Indicator Survey (MIS) (National Malaria Control Programme et al., 2009) (v) the 2003 Mozambique Demographic and Health Survey (Instituto Nacional de Estatística (INE) et al., 2005); and reports from the World

Health Organisation (WHO) and United Nations Children's Fund (UNICEF). Other sources are available within the references.

The outcomes of the literature review are presented in Section 8.2 of this report and have been combined with the information that was acquired during the field visit and subsequent project documentation review.

4.6.2 Field Visit

The field work took place from the March 11th to March 15th 2013. This was conducted by Christian Nyaundi and Vumile Dlamini from Digby Wells and supported by Anton Hough and Lungisa Bosman (Social Scientists) from Coastal and Environmental Services (CES). BGM supported and facilitated some aspects of the field work by facilitating KIIs with district health authorities in Balama town.

A crucial part of the field visit was to consult stakeholders who have special knowledge of the health status as well as socio/cultural behaviours and norms of the PACs. The aim was to gain a comprehensive picture of the general health situation and to better understand potential health impacts of the project. It is acknowledged that broad stakeholder engagement is an important element throughout the HIA process and the district health authorities were consulted to support this. The objectives of these meetings were to inform the health authorities about the proposed project and of the overall objectives and process of an HIA. During these meeting it was emphasised that BGM, CES and Digby Wells view the relationship with the health authorities as important and that consultation and activities in the area would occur with due consideration of respected protocols and where possible in partnership.

The field visit was initiated with a visit to Jacinta Jacob, *Directora Distrital da Saúde Mulher Acção Social de Balama* (Balama District Director of Women's health and Social Action) at Balama. The meeting was well received and permission to conduct field work in the project area was facilitated. During this meeting, the objectives of the HIA were outlined. In addition, a brief KII was held to understand existing health service delivery, as well as behavioural and disease profiles of the local population. Routine health information system statistics were also requested.

The field visit also provided an opportunity to visualise and assess the prevailing situation in the communities and their relation to the proposed project. This was important in order to understand the potential areas of influence of the project and also the general living conditions in the communities living in the project area.

4.6.3 Key Informant Interviews

With the support of the district health authorities, the local health facilities in the immediate project area were visited. The objective was to gain a better understanding of the structure and capacity of the local health system and also to enquire what health statistics were available at the local level and where possible obtain authorised copies of statistics and reports. KIIs were conducted with the health personnel at these facilities, using a semi-structured questionnaire. This included specific questions about health, social and

environmental determinants but with a different emphasis, depending on the level and role of each key informant being interviewed. Interviews and discussions were open and conducted in Portuguese. Some of the key informants consulted during the field visit are shown in Table 4-3.

Table 4-3: Key informants that were consulted during field work

Location	Name of key informant	Function of key informant	Date of interview
Balama Town	Jacinta Jacob	Directora Distrital da Saúde Mulher Acção Social de Balama	March 11, 2013
Centro Saúde du Ntete	Maria Jose	Nurse-in-charge	March 11, 2013

4.6.4 Focus Group Discussions

In addition to visiting the local health facilities, FGDs were conducted in the immediate and wider project area (Table 4-4). It was decided to only include women groups during the field visit as they are generally considered to be the gatekeepers to family health and usually have a good understanding of critical issues that influence health at the community and household level. This allows for a high level understanding of the health challenges, from both a biophysical and social health perspective. The discussions were conducted in *Makua*.

Table 4-4: Location of focus group discussions

Village	Setting	Date of FGD
Ntete	Community located in close proximity to the Project area	March 11, 2013
Pirira	Community located in close proximity to the Project area	March 12, 2013
Nquide	Community located in close proximity to the Project area	March 12, 2013
Mualia	Community located in close proximity to the Project area	March 13, 2013
Sikadi	Community located in close proximity to Chipembe Dam	March 13, 2013
Bairu	Community located near the Chipembe Dam	March 14, 2013

4.7 Gap Analysis

This HIA has focused on understanding the high level health issues in the project area. The HIA also looked for health data gaps that may exist and determined what additional information would be required to inform a more comprehensive health evidence base. The assessment has a prospective view on which health needs and potential future health impacts can be analysed. Development of indicators that can be used to measure the outcomes and impacts of programs/mitigation measures will be important, as will be the

establishment of baseline health conditions which will serve as a tool to measure how the project impacts the health of the community over time. These have been described in Table 7-1.

A gap analysis is necessary in order to establish whether sufficient data is available to inform a risk/impact analysis and mitigation phase or whether additional baseline data is required.

The gap analysis focuses on the health outcomes and determinants of major concern as described above. This includes critical appraisal of data quality of sources identified during the HIA process. Importantly, data on major health outcomes and determinants of concern require a high level of accuracy on a regional and/or local level allowing for evidence-based risk and impact assessment and subsequent monitoring and surveillance. Based on these requirements, the available quantitative and qualitative information was ranked as follows: (i) low level of fidelity, (ii) moderate level of fidelity, and (iii) high level of fidelity (Winkler et al., 2011).

If important data gaps are identified then primary data collection activities are generally required to support the overall HIA process. These strategies and activities need to be highly focussed and linked to specific key performance indicators (KPIs) and include:

- **Baseline Health Surveys (BHS):** This can entail the collection of qualitative and quantitative data to inform representative KPIs that can be utilised to monitor mitigation and management strategies. These surveys may need to be repeated based on a similar methodology for surveillance purposes. A modular approach is generally recommended (Winkler et al., 2012).

- **Health Service Data and Health System Strengthening (HSS):** This can support the collection of longitudinal data from the local health facilities that serve the PACs. The HSS can occur through reinforcing the diagnostic accuracy and reporting systems of these local health facilities. This is not only an important means to obtain longitudinal data, but also the preferred strategy for indicators that are difficult to assess in a cross-sectional study (e.g. incidence of respiratory disease and number of traffic accidents).

- **Health Information Systems (HIS):** This includes accessing, collection reviewing and analysing secondary data which is generated through routine health information systems in a systematic manner. This may be linked to HSS in order to obtain accurate data for longitudinal monitoring. This is only likely to be established as an on-going process as a continuum of the BHS and impact assessment process.

A summary table of health outcomes and determinants of major concern, adequacy of data and suggested measures for addressing gaps is described in Table 4-5.

Table 4-5: Gap analysis

Environmental Health Areas (EHA)						
	Sub sections	***Occurrence at local level***	***Major health outcome/ determinant of concern***	***Fidelity of local data (low level, moderate level, high level)***	***Is additional baseline data collection required***	***Suggested measures for addressing gaps***
EHA #1 – Communicable diseases linked to living environment						
	Tuberculosis	***Occasional***	***Yes***	***Moderate level***	***Yes***	***HSS/HMIS***
	Respiratory Tract infections	***Frequent***	***Yes***	***Moderate level***	***Yes***	***HSS/HMIS***
	Measles	***Few cases reported***	***No***	***Moderate level***	***No***	
EHA #2 – Vector-related diseases						
	Malaria	***Frequent***	***Yes***	***Low level***	***Yes***	***BHS/HSS/HMIS***
	Filariasis	***No cases reported***	***No***	***Low level***	***No***	
EHA #3 – STIs, including HIV/AIDS						
	HIV/AIDS	***Low prevalence***	***Yes***	***Moderate level***	***Yes***	***BHS/HSS/HMIS***
	STIs	***Frequent***	***Yes***	***Moderate level***	***Yes***	***BHS/HSS/HMIS***
EHA #4 – Soil-, water- and waste-related diseases						
	Water quality and practices		***Yes***	***N/A***	***Yes***	***BHS/SIA***
	Sanitation practices		***Yes***	***N/A***	***Yes***	***BHS/SIA***
	Diarrhoeal diseases	***Frequent***	***Yes***	***Moderate level***	***Yes***	***HSS/HMIS***
	Schistosomiasis	***Occasional***	***Yes***	***Low level***	***Yes***	***BHS***
	Soil-transmitted helminthiases	***Frequent***	***Yes***	***Low level***	***Yes***	***BHS***
EHA #5 – Food- and nutrition-related issues						
	Malnutrition	***Common***	***Yes***	***Moderate level***	***Yes***	***BHS/HSS/HMIS***
	Anaemia	***Not known***	***Yes***	***N/A***	***Yes***	***BHS***

Abbrev: BHS- Baseline health survey; HSS- Health systems strengthening; HMIS- Health management information system; SIA- Social Impact Assessment; EnvM- Environmental Monitoring

Environmental Health Areas (EHA)						
	Sub sections	***Occurrence at local level***	***Major health outcome/ determinant of concern***	***Fidelity of local data (low level, moderate level, high level)***	***Is additional baseline data collection required***	***Source of data***
EHA #6 – Accidents/Injuries						
	Road traffic accidents	***Rare***	***Yes***	***Moderate level***	***Yes***	***HSS/HMIS***
EHA #7 – Hazardous materials, noise, malodours						
	Environmental health determinants	***Not known***	***Yes***	***N/A***	***Yes***	***BHS/EnvM***
EHA #8 – Social determinants of health						
	Health seeking behaviour		***Yes***	***N/A***	***Yes***	***BHS***
	Life style and wellbeing		***Yes***	***N/A***	***Yes***	***BHS***
	Inequalities		***Yes***	***N/A***	***Yes***	***BHS/SIA***
	(Health) education		***Yes***	***N/A***	***Yes***	***BHS***
	Domestic violence	**Occasional**	***Yes***	***N/A***	***Yes***	***BHS/SIA***
EHA #9 – Cultural health practices						
	Role of traditional medicine	***Occasional***	***Yes***	***N/A***	***Yes***	***BHS/SIA***
EHA #10 – Health systems issues						
	General health infrastructure		***Yes***	***Moderate level***	***Yes***	***BHS***
	Maternal health		***Yes***	***Moderate level***	***Yes***	***BHS/HSS/HMIS***
	Child health and immunization		***Yes***	***Moderate level***	***Yes***	***BHS/HSS/HMIS***
	Health management delivery syst.		***Yes***	***N/A***	***No***	
EHA #11 – Non-communicable diseases						
	Cardiovascular diseases	***Occasional***	***Yes***	***Low level***	***Yes***	***BHS/HSS/HMIS***
	Diabetes	***Occasional***	***Yes***	***Moderate level***	***Yes***	***HSS/HMIS***
	Cancer	***Ocassional***	***No***	***N/A***	***No***	
	Chronic respiratory disease	***Occasional***	***No***	***Moderate level***	***No***	
EHA #12 – Veterinary medicine and zoonotic diseases						
	Zoonotic diseases	***No cases reported***	***No***	***N/A***	***No***	

Abbrev: BHS- Baseline health survey; HSS- Health systems strengthening; HMIS- Health management information system; SIA- Social Impact Assessment; EnvM- Environmental Monitoring

4.8 Limitations of the HIA study

The following are the recognized limitations of the HIA study:

- The HIA study often refers to local level data which has some limitations that need to be understood and respected. There are minimal diagnostic facilities and some of these diagnoses may not have been made correctly. Reporting of the data is also completed manually and while commendable efforts are made by the local health authorities, it is likely that the recording may lack required accuracy. This information is invaluable in understanding the health challenges in the area, although the limitation must be considered when evaluating information, as the ability to use it as a robust baseline and to use it to monitor relevant health impacts is limited;
- Not all the data that would have been crucial in obtaining a robust baseline of the area was collected. No household questionnaire survey was conducted, which would have included biomedical indicators which are often the measure for several diseases. In addition, microbial analysis of community water sources as well as end-user water at the household level was not obtained. A gap analysis is presented in Section 4.7.

5 SUMMARY OF THE COMMUNITY HEALTH PROFILE

5.1 General Health Profile of the Country

The Mozambican health system is characterized by insufficient resources and by increased demand due to demographic increases, the epidemiological transition, emergence of major public health problems, such as HIV/AIDS and re-emergence of diseases that in the past were easily treated with few financial resources, for example: the resurgence of chloroquine-resistant malarial strain.

The health indicators for Mozambique describe a challenging situation and some health data for the country are lower than the average for other sub-Saharan African countries. Mozambique has a population of nearly 23 million and an annual population growth of about 2.8%. Life expectancy at birth is 48.2 years for men and 50.4 years for women in 2009 compared with the 52 and 54 respectively for the WHO African Region (WHO, 2011c). The national infant and under-five mortality rates are 96 and 142 per 1,000 live births respectively compared with regional figures of 80 and 127 in 2009, respectively (WHO, 2011c, UNICEF, 2009). Similarly, in Mozambique the density of (i) physicians and (ii) nurses and midwives per 1,000 population is 0.027 and 0.322 compared to regional figures of 0.217 and 1.172 respectively. In contrast, immunization coverage among 1-years-olds (e.g. measles 77%, DPT3 72%) in Mozambique is above the mean of the other sub-Saharan African countries (66% for both) (WHO, 2006c).

Mozambique has an epidemiological profile that is typical of developing countries, with significant levels of infant malnutrition and predominance of infectious diseases such as malaria, tuberculosis, HIV/AIDS, etc. This profile is worsened by natural disasters such as droughts and floods, making the population vulnerable to diseases of epidemiological nature, with emphasis on cholera, dysentery and other diarrhoeal diseases (Ferrinho and Omar, 2007).

The disability-adjusted life year (DALY) is a measure of overall disease burden. It is designed to quantify the impact of premature death and disability on a population by combining them into a single, comparable measure. The DALY is an important indicator and it is a health gap measure that extends the concept of potential years of life lost due to premature death to include equivalent years of ‘healthy’ life lost by virtue of being in states of poor health or disability. According to the last estimate of disease burden by the WHO in 2004 the total DALY in Mozambique in 2004 was almost 10 million (WHO, 2004a), as seen in (Table 5-1).

Communicable diseases remain the main health problem in Mozambique. 73% were attributable to communicable diseases with the remainder divided between non-communicable diseases and injuries. Overall HIV/AIDS accounted for the most DALYs with 22.4%, followed by perinatal conditions (e.g. prematurity and low birth weight; neonatal infections) (10.6%), malaria (9.4%), respiratory infections (8.0%) and diarrhoeal diseases (6.3%). A quarter of the DALYs of the non-communicable diseases are due to neuro-psychiatric conditions and mental illness. Road traffic injuries contribute substantially to total injuries (WHO, 2009a).

Table 5-1: Estimated DALYs ('000) by cause, 2004

Cause	High income countries		Sub-Saharan Africa		Mozambique	
Population (000)	*949 818*		*749 269*		*20 078*	
	(000)	***(%)***	***(000)***	***(%)***	***(000)***	***(%)***
TOTAL DALYs	**117 841**	**100.0**	**390 800**	**100.0**	**9 656**	**100.0**
I. Communicable diseases, maternal and peri-natal conditions and nutritional deficiencies	**6 579**	**5.6**	**276 438**	**70.7**	**7 052**	**73.0**
Infectious and parasitic diseases	2 513	2.1	165 196	42.3	4 588	47.5
Tuberculosis	*156*	*0.1*	*11 431*	*2.9*	*316*	*3.3*
STIs excluding HIV	*190*	*0.2*	*3 488*	*0.9*	*70*	*0.7*
HIV/AIDS	*609*	*0.5*	*47 296*	*12.1*	*2 167*	*22.4*
Diarrhoeal diseases	*343*	*0.3*	*33 235*	*8.5*	*606*	*6.3*
Childhood diseases	*51*	*0.0*	*13 523*	*3.5*	*115*	*2.0*
Meningitis	*97*	*0.1*	*5 448*	*1.4*	*84*	*0.9*
Hepatitis B (d)	*77*	*0.1*	*379*	*0.1*	*3*	*0.0*
Hepatitis C (d)	*151*	*0.1*	*158*	*0.0*	*1*	*0.0*
Malaria	*4*	*0.0*	*32 172*	*8.2*	*905*	*9.4*
Tropical diseases	*2*	*0.0*	*6 412*	*1.6*	*142*	*1.5*
Leprosy	*0*	*0.0*	*25*	*0.0*	*0*	*0.0*
Dengue	*0*	*0.0*	*9*	*0.0*	*1*	*0.0*
Japanese encephalitis	*3*	*0.0*	*0*	*0.0*	*-*	*-*
Trachoma	*0*	*0.0*	*719*	*0.2*	*1*	*0.0*
Intestinal nematode infections	*23*	*0.0*	*1 581*	*0.4*	*26*	*0.3*
Respiratory infections	1 263	1.1	44 514	11.4	769	8.0
Maternal conditions	577	0.5	15 365	3.9	320	3.3
Perinatal conditions	1 521	1.3	39 239	10.0	1 022	10.6
Nutritional deficiencies	704	0.6	12 125	3.1	354	3.7
II. Non-communicable conditions	**100 843**	**85.6**	**81 448**	**20.8**	**1 953**	**20.2**
Malignant neoplasms	17 618	15.0	6 179	1.6	142	1.5

Cause	High income countries		Sub-Saharan Africa		Mozambique	
Population (000)	*949 818*		*749 269*		*20 078*	
	(000)	***(%)***	***(000)***	***(%)***	***(000)***	***(%)***
Other neoplasms	358	0.3	339	0.1	7	0.1
Diabetes mellitus	3 496	3.0	2 165	0.6	47	0.5
Nutritional/endocrine disorders	1 815	1.5	3 134	0.8	72	0.7
Neuropsychiatric disorders	30 796	26.1	19 736	5.1	484	5.0
Sense organ disorders	8 916	7.6	9 475	2.4	262	2.7
Cardiovascular diseases	17 307	14.7	14 971	3.8	341	3.5
Respiratory diseases	7 138	6.1	7 308	1.9	180	1.9
Digestive diseases	4 605	3.9	5 751	1.5	120	1.2
Diseases of the genitourinary system	1 198	1.0	2 272	0.6	49	0.5
Skin diseases	212	0.2	939	0.2	23	0.2
Musculoskeletal diseases	5 129	4.4	2 483	0.6	65	0.7
Congenital abnormalities	1 473	1.2	6 049	1.5	142	1.5
Oral diseases	784	0.7	649	0.2	17	0.2
III. Injuries	**10 420**	**8.8**	**32 913**	**8.4**	**650**	**6.8**
Unintentional injuries	6 926	5.9	21 647	5.5	480	5.0
Intentional injuries	3 494	3.0	11 265	2.9	170	1.8

Major cause of death in children under-5 years in Mozambique is malaria, accounting for 23% of all deaths in this age group (Figure 5-1). This is followed by pneumonia (16%) and diarrhoeal diseases (11%).

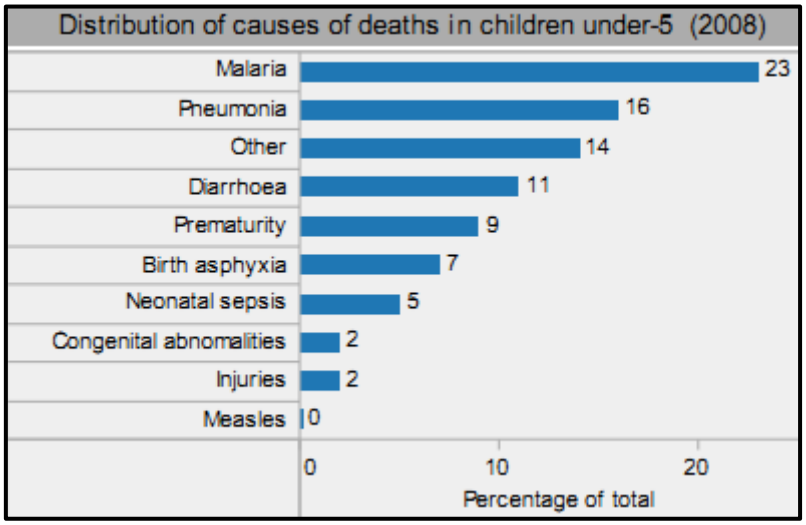


Figure 5-1: Ten major causes of death in children under 5 years, 2008

The mortality indicators for 2002 for the whole population of Mozambique are described in Table 5-2 (WHO, 2006b). Communicable diseases account for two thirds of deaths, whereas HIV/AIDS is by far the major cause of death, responsible for almost a third of all deaths in Mozambique (28%).

Table 5-2: Estimated total death ('000) by cause Mozambique

Cause of death	Total deaths ('000)	Percentage
HIV/AIDS	108	28
Malaria	34	9
Diarrhoeal diseases	30	8
Lower respiratory infections	28	7
Perinatal conditions	20	5
Measles	13	3
Tuberculosis	11	3
Cerebrovascular disease	8	2
Ischaemic heart disease	7	2
Protein-energy malnutrition	3	1

5.2 General Health Profile of Project Region

About 1.65 million people live in Cabo Delgado Province. Pemba is the capital of the province. Cabo Delgado faces a more challenging health situation than other provinces in Mozambique. Health indicators in the province are usually below the national average and morbidity and mortality are higher. The under 5 mortality rate in 2003 was 241 in 1,000 children compare to the national average of 178 (World Bank, 2003b). Infant mortality was 178 in 1,000 children compare to the national average of 124.

Malnutrition rates were higher in this region than elsewhere highlighting a precarious food security situation. The province had a chronic malnutrition rate of 56% in children under 5 years compared to 41% in the national average. However, acute malnutrition is within national average of around 4%. HIV/AIDS prevalence is lower (7.5%) than country average (13.6%).

Balama District is a district of Cabo Delgado Province in northern Mozambique. It covers 5,629km^2 with about 126,000 inhabitants. The main diseases of importance in Balama district are malaria, diarrhoea, HIV/AIDS and Sexually Transmitted Infections (STIs) that together account for almost all cases of diseases reported in the district. Social action in the district has been coordinated by Non-Governmental Organizations (NGOs) and the civil society, promoting the creation of equal opportunities and rights between men and women in all aspects of social and economic life, as well as integration in the labour market, income generation processes and school life.

Balama District has one level I health centre, and five level II & III health centres, with a total of 46 beds and 28 health professionals. The growth of the school and health system since 2000 and improving the care of personnel have allowed an increase in people's access to National Education and Health services which however still remain insufficient. There is one health facility for every 22 thousand people, one bed per 2900 inhabitants and one health professional for every 4800 residents in the district.

5.3 Summary of the Baseline Health Status

A summary of the baseline health status of the PACs is presented in Table 5-3. These have been done according to the EHA framework as outlined in Table 4-2. A comprehensive review of the baseline health status of the community at a national, regional and local level is provided in Section 8.2.

Table 5-3: Summary of baseline health status

Environmental Health Areas (EHAs)
EHA #1 – Communicable Diseases linked to Housing Design
Most households are large and polygamous families are common. Households have several sleeping structures used for sleeping only. Not all household members sleep in the same structure. Tuberculosis is endemic in Mozambique. Poor case detection. Link with HIV is a growing problem and may have a project impact.

Environmental Health Areas (EHAs)
Respiratory tract infections are a major cause of morbidity in the project area especially in children under five. A large majority of children have been fully vaccinated.
EHA #2 – Vector related diseases
Malaria is the biggest public health challenge and the largest cause of mortality. Few national public health interventions. Limited entomology knowledge. Proximity of the dam to the PACs may increase risk of vector proliferation. Migration may increase parasite burden in community and also change environment through makeshift housing. Possession of ITN use is high although actual usage is reportedly inconsistent.
EHA #3 – Sexually-transmitted Infections, including HIV/AIDS
It remains an increasing public health challenge. Good awareness and knowledge of prevention activities amongst communities. HIV prevalence is about 6-8% amongst the general population. Most health facilities able to diagnose HIV but only three care and treatment centres in the district. HIV stigma is low. Commercial sex work is not common in the project area. The prevalence of other STIs is low.
EHA #4 – Soil, Water and Waste-related Diseases
Generally good access to drinking water sources. However, most of the water sources are not improved. Some villages like Ntete and Pirira have boreholes for drinking water, while communities close to the dam get their drinking water from there. Water is available during wet and dry seasons. Both traditional and improved water sources are common. No studies have been done on the microbial content of drinking water either at source or end-user level. Very few improved sanitation facilities within the communities. Most households have their own latrine; however, most of these are not improved. Defecation in bush is common. Diarrhoeal diseases are common in the area. Soil-transmitted helminths are prevalent in area. This is linked to sanitation and waste management. There are regular deworming campaigns conducted in the area. Schistosomiasis prevalence could be high in the project area. No precise data on morbidity and snail populations was available at the local level. Water bodies and accessibility will need to be managed to reduce the impact. There is one major dam in the area.
EHA #5 – Food and Nutrition-related Issues
Malnutrition is a major health concern. Low yields and poor feeding practices are reported as major causes. Access to land and food security are important risk factors.
EHA #6 – Accidents/Injuries
The project may lead to increased traffic loads on Balama-Montepuez road and has thus the potential to increase the number of traffic accidents. There will be use of heavy machinery in the project area.
EHA #7 – Hazardous Materials, Noise and Malodours
Exposures and environmental health determinants as a result of the project will be covered in other specialist reports. There have been no cases of heavy metal pollution or toxicity in the project area. Community expressed concern about possible arsenic pollution of their groundwater sources.
EHA #8 – Social Determinants of Health

Environmental Health Areas (EHAs)
Very good health-seeking behaviour. Very few people rely on traditional healers. However, most communities do not have easy access to a health facility. The capacity of some of these health facilities may also be low. Affordability is an issue as not all services are free. Transport to health care facilities is a major determinant in affordability.
Employment is an existing need that may be impacted as a result of the project. Low skilled workforce. Education is an existing need. Women's literacy as gatekeepers to family unit health needs to be considered. Mixed feelings of hope and despair amongst community members. Community lament lack of many public services. Varied perceptions on the impact of the project.
EHA #10 – Health Systems Issues
Two health facilities are located within the project area. Not all communities have immediate access to a health facility. There is limited NGO activity in project area.
EHA #11 – Non-communicable Diseases
Non-communicable diseases are not well documented due to limited capacity in the local health facilities.

6 IMPACT ASSESSMENT

6.1 Key Issues and Related Health Impacts

This section provides an analysis of the potential impacts associated with the project and has included the analysis of potential negative impacts and their mitigation measures, but also includes potential positive impacts and measures to enhance these. This is based on the evidence presented in the baseline health description, the planned project activities and information obtained from the other available specialist studies.

The key health impacts and needs have been described in the EHA framework to ensure consistency. Project specific determinants and comments will be described so as to inform the impact assessment. While it is recognised that some of these existing health needs will be inherited by the project, and are maybe the responsibility of the government, they may influence the impacts and need to be considered for mitigation/management. It is also true that some of these management measures could overlap into social investment, especially for enhancement of certain impacts. For this reason the mitigation and enhancement will be divided into two different categories:

- **Project impact mitigation:** interventions required to mitigate the impacts of the project on the communities; and
- **Corporate social Investment:** interventions suggested and recommended for the improvement of the existing poor health status of the communities.

6.2 Impact rating methodology

The **environmental significance** scale evaluates the importance of a particular impact. This evaluation needs to be undertaken in the relevant context, as an impact can either be ecological or social, or both. The evaluation of the significance of an impact relies heavily on the values of the assessor/s making the judgement. Four factors need to be considered when assessing the significance of impacts, namely:

1. Relationship of the impact to **temporal** scales - the temporal scale defines the significance of the impact at various time scales, as an indication of the duration of the impact.
2. Relationship of the impact to **spatial** scales - the spatial scale defines the physical extent of the impact.
3. The severity of the impact - the **severity/beneficial** scale is used in order to scientifically evaluate how severe negative impacts would be, or how beneficial positive impacts would be on a particular affected system (for ecological impacts) or a particular affected party. The severity of impacts can be evaluated with and without mitigation in order to demonstrate how serious the impact is when nothing is done about it. The word ‘mitigation’ means not just ‘compensation’, but also the ideas of containment and remedy. For beneficial impacts, optimization means anything that can enhance the benefits. However, mitigation or optimization must be practical, technically feasible and economically viable.

4. The **likelihood** of the impact occurring - the likelihood of impacts taking place as a result of project actions differs between potential impacts. There is no doubt that some impacts would occur (e.g. loss or clearance of vegetation), but other impacts are not as likely to occur (e.g. vehicle accidents), and may or may not result from the project operations. Although some impacts may have a severe effect, the likelihood of them occurring may affect their overall significance.

Table 3.2 below summarises the above described factors' categorical limits and criteria.

Table 3.2: Impact Significance Rating Criteria

Effect	**Temporal scale**		
	Short term	Less than 5 years	
	Medium term	Between 5 and 20 years	
	Long term	Between 20 and 40 years (a generation) and from a human perspective almost permanent.	
	Permanent	Over 40 years and resulting in a permanent and lasting change that will always be there	
	Spatial Scale		
	Localised	At localised scale and a few hectares in extent	
	Study area	The proposed site and its immediate environs	
	Regional	District and provincial level	
	National	Country	
	International	Internationally	
	Severity		**Benefit**
	Slight / Slightly Beneficial	Slight impacts on the affected system(s) or party(ies)	Slightly beneficial to the affected system(s) or party(ies)
	Moderate / Moderately Beneficial	Moderate impacts on the affected system(s) or party(ies)	An impact of real benefit to the affected system(s) or party(ies)
	Severe / Beneficial	Severe impacts on the affected system(s) or party(ies)	A substantial benefit to the affected system(s) or party(ies)
	Very Severe / Very Beneficial	Very severe change to the affected system(s) or party(ies)	A very substantial benefit to the affected system(s) or party(ies)

Likelihood	**Temporal scale**	
	Unlikely	The likelihood of these impacts occurring is slight
	May Occur	The likelihood of these impacts occurring is possible
	Probable	The likelihood of these impacts occurring is probable
	Definite	The likelihood is that this impact will definitely occur

A four-point impact significance scale is then applied to the project impacts (Table 3.3 below).

Table 3.3: Environmental Significance Rating Scale

Significance rating	Description
Very High	VERY HIGH impacts would constitute a major and usually permanent change to the (natural and/or social) environment, and usually result in severe or very severe effects, or beneficial or very beneficial effects.
High	These impacts will usually result in long term effects on the social and/or natural environment. Impacts rated as HIGH will need to be considered by the project decision makers as constituting an important and usually long term change to the (natural and/or social) environment. These would have to be viewed in a serious light.
Moderate	These impacts will usually result in medium to long term effects on the social and/or natural environment. Impacts rated as MODERATE will need to be considered by the project decision makers as constituting a fairly important and usually medium term change to the (natural and/or social) environment. These impacts are real but not substantial.
Low	These impacts will usually result in medium to short term effects on the social and/or natural environment. Impacts rated as LOW are generally fairly unimportant and usually constitute a short term change to the (natural and/or social) environment. These impacts are not substantial and are likely to have little real effect.

6.3 Impact Analysis, Mitigation and Enhancement

This HIA has focused on understanding what potential health impacts the project may have on the nearby communities. To support this it was important to define the existing baseline health status in the project area so that the potential for and direction of health impacts could be analysed.

Based on the findings summarised in Section 5.3 and described in Section 8.2, potential high level health impacts are described below. These will consider options for stakeholder communication and development of short term management plans.

It is important to understand that assessing health impacts is often based on a broad range of factors. These can be influenced from a national or regional policy/program decision/intervention and thus may be extremely dynamic. The impact analysis considers the present state of health based on the community profile, and impacts related to the existing plans and designs of the project (Winkler et al., 2010).

6.3.1 EHA #1 – Communicable Diseases linked to Housing Design

6.3.1.1 Impact 1.1: Transmission of communicable diseases due to overcrowding

The existing environmental health needs related to housing is based on observation and reports from the SIA. During the rainy season, cooking occurs indoors with wood which can increase the incidence of respiratory infections, especially in children.

Influx/In-migration to the area has been mentioned as a potential impact in the SIA. The project has the potential to attract outsiders and returning families. These factors need to be addressed in a migration plan as monitoring of overcrowding will be important.

TB is endemic in Mozambique. The capacity of the health care services to manage TB is limited, especially in case detection. Moreover, the link with HIV is a growing problem and might have a project impact. This increases the challenge in monitoring for any negative impact related to increased transmission from the disease. The project will inherit this as well as the poor socioeconomic and housing conditions as described above.

Respiratory tract infections, from a viral and bacterial origin are important to consider. This can include seasonal influenza and pandemic strains that the local communities may be naïve to due to their isolation. Vulnerable groups in these communities, especially the elderly and those with underlying disease, are particularly susceptible as their immune systems are often weakened. Any management plans for respiratory diseases by the Project must consider community health as this may affect business continuity and reputation, where the project runs the risk for being blamed for disease outbreaks especially with movements of people in and out of area.

Impact Evaluation and management measures:

EHA #1	Increased disease related to overcrowding and close contact
Construction and into operations and closure	
Management Measures	

Project impact mitigation

The following mitigation measures are proposed:

- Support community based information campaigns related to TB symptoms and the need to seek care. The campaign will aim to address the risk of co-infection between HIV and TB. This can be managed through community-based peer health educators;
- Labour policies will aim to encourage hiring of local staff to avoid job seeking migrants. The project will not hire at the front gate but consider a recruitment office at an off-site location;
- Influx management and advice with regards to town planning to prevent overcrowding;
- Develop partnerships to support the community based TB control programs in conjunction with the authorities and any agencies/NGO. These partnerships aim to include case detection, management and surveillance activities under the national TB program policy and strategy;
- Support the health management information system and collect longitudinal data on key TB indicators. This will require health systems strengthening to get this essential data;
- Support improvements in the capacity of local TB case management. This will include training of health care staff, appropriate diagnostics for case detection and a referral system for effective treatment. This can be through support of a local NGO and/or the national program. This will assist in addressing case surveillance and in ensuring that the TB situation does not deteriorate in the area.

Corporate Social Investment

Support improvements in the capacity of local TB case management. This should include training of health care staff, appropriate diagnostics for case detection and a referral system for effective treatment. This can be through support of a local NGO and/or the national program. This will assist in addressing case surveillance and in ensuring that the TB situation does not deteriorate in the area.

Impact	Effect						Risk or Likelihood		Total Score	Overall Significance
	Temporal Scale		Spatial Scale		Severity of Impact					
Without Mitigation	Long term	3	Study Area	2	Severe	4	Probable	3	12	High
With Mitigation	Long term	3	Study Area	2	Moderately beneficial	2	Probable	3	10	Moderately Beneficial

6.3.2 EHA #2 – Vector-related diseases

6.3.2.1 Impact 2.1: Malaria burden

Malaria is the most significant public health threat and cause of mortality in the Project area. Malaria was mentioned as the most important disease in the focus group discussions at the local community level. However, there is good knowledge and understanding of malaria transmission and prevention. Ownership of ITNs is good, although it is difficult to assess proper utilisation. There are also good diagnostic and treatment mechanisms in the area, with consistent use of RDTs to diagnose malaria as well as adequate stock of ACT which is standard treatment. This is also coupled with good health seeking behaviour amongst community members.

Very little is described on the entomology in the area. This includes the vector complexes, their breeding preferences and behaviour (resting and feeding), as well as susceptibility patterns to different classes of insecticide. This is vitally important for the project to describe as it will influence the type of mitigation measures required from a source reduction and control perspective.

While the malaria burden is high in the communities, and there is obviously a suitable environment for mosquito breeding and disease transmission to occur, the project does have the potential to impact malaria transmission. This will require mitigation; interventions may differ based on seasonal and land use practices. Modification of the environment frequently changes the habitat for mosquitoes to breed in. The presence of a dam in the project area strongly increases the malaria risk during the rainy season.

Influx of individuals may also play a role in increased disease transmission. More people from outside the area may increase the naturally occurring parasite pool and changes in land use may also alter the environment. This is challenging for the project to manage as their responsibility, as it is already part of the baseline conditions.

The health of the workforce also needs to be considered, especially as some of the workforce may come from the local community. The risk of the disease could have significant health and economic impacts to the project if not mitigated properly. Malaria can have the following impacts at the workplace level:

- **Absenteeism** through repeated infections: This will have a significant impact on productivity and increased costs. It is estimated that an expatriate non-immune employee will take 5-7 days to reach optimal productivity after an uncomplicated case of malaria and a semi-immune local employee 2-3 days.

- **Health and safety risks**: Patients with malaria who still work may pose a risk to fellow employees and themselves. The effects of the disease and the treatment drugs may decrease alertness. The medications may also reduce hearing sensitivity.

- **Increase cost of overall health care**: The cost of malaria management through large case-loads can become significant even if managed at the local site medical service. An uncomplicated case of malaria may cost about $15 to manage, without considering

human resource and capital expenses (Asante and Asenso-Okyere, 2003). The impact of a complicated case of malaria, that may require medical evacuation and extended hospitalisation in an intensive care unit (ICU), can be very costly, and may run into hundreds or thousands of dollars.

- **Increased burden on the medical service**: High case loads of malaria will take a significant amount of time in the medical service and limit the effectiveness of other health programs, such as occupational health.
- **Employee turnover and attractiveness**: Exposure to risk may decrease the ability to attract skilled staff to work in the area. Repeat infections and decreased morale from the risks related to the disease may also increase employee turnover.
- **Employer liability**: The risk exists for an employer to be held liable for complications that may arise from an infection, especially if mitigation measures have not been implemented.

In summary, the way malaria transmission will be influenced by the project will depend on determinants such as the epidemiological setting, local vector behaviour and management, change in land use related to vector activity, socio-economic conditions and health seeking behaviours. The highly endemic nature of the disease means that the project is unlikely to significantly add to the already high disease burden of the community during the wet season. However, during the dry season, the increased potential for breeding sites will play a major role and change the normal epidemiology of the disease vectors. The behaviour of the vector is not known and may need to be described and understood to determine if the dam and land use will alter the behaviour and lifecycles of the vectors. In spite of these potential unknown factors, mitigation measures are warranted and are likely to play a significant beneficial role to the community if well planned and executed.

Impact Evaluation and management measures:

EHA #2	Vector related diseases: Malaria burden
Pre-construction and into operations and closure	
Management Measures	

Project impact mitigation:
• Collect baseline data that will inform planning related to the integrated programs. Develop monitoring and evaluation programs based on this data. The following data should be collected:
  ○ Entomology survey including the most common mosquito species complex, their feeding and resting habits as well as their susceptibility to the different classes of insecticides;
  ○ Baseline malaria indicator survey in the communities (children aged 6-59 months) to determine the burden of malaria in the community, and also serve as an indicator to monitor the impact of the disease and interventions; and
  ○ A knowledge, attitude and practice (KAP) study in the community to support the design and implementation of information, education and communication programs to promote behaviour change and monitor interventions.
• Ensure project designs reduce the potential for sources of vector breeding;
• Develop community based programs in partnership with the local authorities and based on the strategy of the national	

malaria control program e.g. ITN distribution; and • Any workplace malaria and vector control program should include measures for reducing the potential for increasing vector densities and thus decrease disease transmission in the communities.
Corporate Social Investment: • Extend the workplace program into the community program to ensure maximal positive benefits and reduction in workplace risk. The sustainability of these interventions will need to be closely considered given the duration of the project; and • Encourage source reduction in communities through environmental control mechanisms based on community work groups. These activities can assist with the reduction in other vector related diseases.

Impact	Effect						Risk or Likelihood		Total Score	Overall Significance
	Temporal Scale		Spatial Scale		Severity of Impact					
Without Mitigation	Long Term	3	Study Area	2	Severe	4	Probable	3	12	High
With Mitigation	Long Term	3	Regional	3	Very Beneficial	8	Probable	3	17	Very Beneficial

6.3.3 EHA #3 – Sexually Transmitted Infections, including HIV/AIDS

6.3.3.1 Impact 3.1: Transmission of STIs and HIV/AIDS

HIV/AIDS and STI are significant existing public health challenges nationally and within the immediate project area. Although, the HIV prevalence in the project area is low, it is still of public health concern. STIs, if present and untreated, have been found to increase the risk of transmission of HIV, if one partner is infected. HIV's link with TB and its importance has been discussed above.

Influx or/and movement of labour into the area will pose an increased risk for STIs. There will be more disposable income either as a direct or indirect consequence of the project. Commercial sex workers are more likely to establish in Montepuez, but may also be attracted to the immediate project area, where local community may be vulnerable to opportunistic sexual liaisons. The likely effect of the project employing a number of relatively well-paid employees may also increase the risk for transactional sex, especially if they are away from their normal family unit. Economic upliftment and settlement in the project area may also lead to the adoption of "urban" values and lifestyle changes, which may also play a role in casual sexual engagement.

Women and young girls are extremely vulnerable and have limited negotiating power for safe practices and family planning. Gender based sexual violence is common and while there NGO's are active in the area there is very little support for victims. It is important to recognize the role gender plays in sexuality and its effects on HIV transmission and prevention especially when considering the higher burden of disease in women compared to men in Mozambique.

HIV/AIDS should be considered a major risk for the project and the community and interventions should be implemented on a broad base in the workforce and the community. It may also be influenced by considering the **4M's** detailed below (International Food Policy Research Institute (IFPRI), 2005):

6.3.3.1.1 Mobility

The transport corridors which will be improved with the development of the project will increase traffic to the area. Transport drivers are well known to engage in casual sexual practices as they are often away from family units. This can not only result in high risk sexual activity along the whole transport route but also in Balama as an end destination. The migration of people into the project area in search of work may cause similar consequences.

The contract workforce also needs to be considered. This workforce may come from areas where the HIV prevalence rates are significantly higher and also carry different viral strains. They may have also worked in remote settings away from their normal partners for extended periods and thus causal sexual relations become the norm.

6.3.3.1.2 Money

There will be adequate amounts of disposable income in the area which will increase during the duration of the project. People who benefit directly and indirectly from the project may have more money available to partake in forms of transactional sex. These include both local hires as well especially semi-skilled contract workers and even senior expatriates.

6.3.3.1.3 Men

Men play a predominant role in the local society and will form the bulk of the workforce due to the physical demands from mining. Transport worker and the construction work-force are also generally men.

6.3.3.1.4 Mixing

This is strongly linked into mobility. In-migration of outsiders, returning migrants, the construction workforce and the transport workers are all different population groups that may mix with the present indigenous population. This may result in mixing of people with high prevalence with those with low prevalence of disease, and also introduce different virus strains.

There was no confirmed accurate data on HIV prevalence and very little in the way of data to understand practices and behaviour linked to HIV. The cumulative impacts of HIV, STIs and TB need to be considered.

Impact Evaluation and management measures:

EHA# 3	Sexually transmitted infections including HIV/AIDS

Construction and into operations and closure
Management Measures
Project impact mitigation: • Develop a HIV/AIDS policy that incorporates both the workplace and community considerations; • Develop an integrated HIV management program that considers both the workplace and the community but with different levels of intervention. The workplace should include a comprehensive program while the community program should have a focus on awareness and prevention activities. TB and STI must be integrated into this; • Conduct a KAP study to understand levels of awareness and knowledge in both the workplace and community. This needs to have an emphasis on practices so that appropriate behaviour change programs are developed; • Conduct a sero-prevalence study in the area in partnership with the local health authorities; • Support the local health authorities in extending care and treatment programs in the area. Support the local health authorities with the establishment of VCT centres in the area; • Support information campaigns and community based peer educator programs in both the workforce and community. These need to use locally acceptable tools and based on the finding of the KAP study. These must serve as indicators to monitor the impact of the behaviour change and must have a gender focus. Community based peer health educators will play a key role; • Develop an Influx Management Plan that also considers HIV; • Support equal employment opportunities for women and support livelihood programs to reduce risk for opportunistic sexual encounters; • Support NGO groups active in area on gender-based sexual violence; and • Prevent fraternization of external contractors with the community through codes of conduct and reduce the number of external people sleeping in the community at night.
Corporate Social Investment: • Support the development and extension of prevention of mother to child transmission programs; • Support community based condom distribution centres; and • Support health services in area with improved infection control and medical waste management.

Impact	Effect						Risk or Likelihood		Total Score	Overall Significance
	Temporal Scale		Spatial Scale		Severity of Impact					
Without Mitigation	Permanent	4	Regional	3	Very Severe	8	Definite	4	19	Very High
With Mitigation	Long term	3	Regional	3	Moderately Beneficial	2	Probable	3	11	Moderately Beneficial

6.3.4 EHA #4 – Soil-, Water- and Waste-related Diseases

6.3.4.1 Impact 4.1: Soil-, water- and waste-related diseases

The communities in the project area have limited access to clean/improved water supplies. There is a heavy reliance on non-protected wells as a primary source of drinking water. Water quality has not yet been assessed.

Influx may also play a role in availability of water due to increased demand, which may ultimately negatively affect water quality. Water-borne diseases such as diarrhoea are common and are linked to contaminated water and poor sanitary conditions. Water-washed diseases such as eye and skin infections are common. These are linked to poor hygiene.

Sanitation services in the area are limited and the prevalence of indicators for sanitation such as soil-transmitted diseases and schistosomiasis may suggest a high-level burden of disease. Chipembe Dam may also have the potential to increase the prevalence of schistosomiasis in the area. A study conducted in Mozambique by the International Water Management Institute (IWMI) found that the transmission of urinary schistosomiasis increased after the construction of dams, especially in the semi-arid northern areas of the country. This is because reservoirs provide perennial water bodies in the area for the intermediate snail host. The prevalence of urinary schistosomiasis in villages with and without dams was found to be statistically significant (Boelee et al., 2009). There is also no formal waste disposal system.

The project may influence water and waste related diseases in the following ways:

6.3.4.1.1 Development of water storage facilities

The project will develop water storage dams for water use in the plant and to store excess water pumped from Chipembe dam or underground sources. The community will not have access to these.

6.3.4.1.2 Access to water

Other than resettlement or restriction of movement the project should not reduce access to community water supplies.

6.3.4.1.3 Quantity of water

The project will require water for the plant operations. The planned abstraction of water from Chipembe Dam means that there may not be any significant impact on the quantity of water available.

6.3.4.1.4 Quality of water

The project may have an impact on community water quality through domestic use on site and from plant operations. There might also be potential pollution of surface water from the discharge of water from the sewerage treatment plant that will need to be developed to support the working camps.

6.3.4.1.5 In-migration and unplanned settlements

Pressure on existing limited services in terms of water supply and sanitation could dramatically increase the risk of water related diseases.

There is little data on basic water and sanitation practices or burden of disease linked to specific water and sanitation indicators. There is the potential for the project to be accused of

polluting the water bodies in the surrounding communities from plant or domestic water and thus it is important to establish firm baselines for mitigation. Water and sanitation are significant existing needs in the community and if BGM supports any initiatives they should be linked to specific indicators to measure impact.

Due to influx into the area and the indirect pressure it will cause on available sanitation services, the project is likely to have an impact on the sanitation situation in the area. However, improving the sanitation situation is likely to have major beneficial impacts in the communities and improve their overall quality of life.

Impact Evaluation and management measures:

EHA# 4	**Soil, water and waste related diseases**
Pre-construction and into operations and closure	
Management Measures	
Project impact mitigation • The quality of groundwater and surface water will be monitored to ensure that the project does not have any detrimental effects on community water sources; • Influx management of migrant workers; • Restrict access to project created water bodies; • Conduct baseline water and sanitation studies on practices based on accepted health indicators; • Perform end user analysis of water quality. This serves as an indicator for monitoring water quality where it is consumed and determines the level of general sanitation and hygiene even if water is collected from clean sources; • Conduct baseline soil transmitted helminths and schistosomiasis studies to provide an indicator for monitoring sanitation in the communities. This will be used to inform a proper baseline in the communities so the potential impact of increasing the disease burden from schistosomiasis can be monitored. STH are a good indicator for the baseline status of sanitation in the area and an important cause for co-morbidity; • Ensure proper disposal of human waste that is generated from the project. There must be proper waste water treatment plants with the capacity to manage the expected throughput with required contingencies. The design should be such that if there is a failure that the risk of direct exposure to communities and their water sources is minimised; and • Ensure proper waste management from project generated waste according to waste management principles.	
Corporate Social Investment • Support the local authorities and other partners in supporting and improving water and sanitation services; • Establish water and sanitation committees in the communities to manage their own water and sanitation services. This will improve sustainability of any outreach support; • Promote and support local authorities in improved collection and disposal of waste in communities; • Support information campaigns in the community on water use, hygiene and general sanitation; • Depending on the results of the baseline support the government's school deworming programme in partnership with local authorities. Schools should be supported with VIP latrines.	

Impact	**Effect**						**Risk or Likelihood**		**Total Score**	**Overall Significance**
	Temporal Scale		Spatial Scale		Severity of Impact					
Without Mitigation	Long term	3	Localised	1	Severe	4	Definite	4	12	High

With Mitigation	Long Term	3	Regional	3	Very Beneficial	8	Probable	3	15	Very Beneficial

6.3.5 EHA #5 – Food- and Nutrition-related Issues

6.3.5.1 Impact 5.1: Malnutrition

Malnutrition is extremely common in Mozambique and a big problem in the project area. More than a half of the children in Cabo Delgado Province were found to be stunted in 2010 (Institut National de la Statistique et de la Démographie (INSD) et al., 2011).

Reasons for malnutrition include a lack of food due to poor yields on crops, challenging farming techniques with lack of mechanisation, limited variety in diet, expense of food and also poor feeding practices.

Food security in Mozambique is currently a national challenge. Feeding practices and general diet is not that well understood, although reports suggest that women are poorly educated on proper feeding practices. Feeding practices are extremely important to address as these are problematic and simply having adequate supply of food will not ensure adequate nutrition.

Influx of people into the area will put a strain on existing land and yields may reduce. Inflation could reduce food security in a situation of already high food prices that communities cannot afford.

Changes in practices also need to be considered over the medium term. The community may start buying more food in the form of refined products as a result of economic upliftment. A reduction in physical exertion may also result as a result of changing livelihoods. Ironically, the final result could be an increased incidence of obesity.

Impact Evaluation and management measures:

EHA #5	**Food and Nutrition related issues**
Operations and closure	
Management Measures	
Project impact mitigation: • Perform a baseline nutritional assessment through anthropometric measures in children under 5 and also micronutrient deficiencies (anaemia as an indicator). Perform surveillance on nutritional status through this data set as means to track well-being; • Reduce project related communicable diseases that may impact nutrition; • Minimise agricultural land loss through resettlement programmes; • Inflation management as part of social program; and • Favour local procurement of food items in combination with incentives to increase local production.	
Corporate Social Investment: • Support mitigation measures for communicable diseases such as malaria, diarrhoea and respiratory infection to reduce	

the co-morbidity created by malnutrition;

- Support sustainable livelihood programs through increased use of agriculture. The financial benefit of farming over other practices will be essential to support;
- Promote access to education and schooling for women;
- Health systems strengthening for recognition and management of nutritional disorders;
- IEC programs that promote proper feeding practices at relevant age groups including improved complementary feeding;
- Support maternal and child health programs. This can include supporting the promotion of antenatal care, breastfeeding practices, food preparation/hygiene, and family planning; and
- Support any nutritional activities in partnership with the government or NGO in the project area.

Impact	Effect						Risk or Likelihood		Total Score	Overall Significance
	Temporal Scale		Spatial Scale		Severity of Impact					
Without Mitigation	Long term	3	Localised	1	Moderate	2	Probable	3	9	Moderate
With Mitigation	Long term	3	Localised	1	Moderately Beneficial	2	May occur	2	8	Moderately beneficial

6.3.6 EHA #6 – Accidents/Injuries

6.3.6.1 Impact 6.1: Road traffic accidents and other accidental injuries

RTA are the most common form of accidental injury. These are common on the road between Balama and Montepuez. Other injuries are reported from farming activities. This could change with the further development of the project as the area is likely to see a massive increase in the number and size of vehicles passing in and around the Project area (transport of goods and personnel). The conditions of the roads are also likely to improve which will allow people to drive faster. The roadworthiness of the vehicles, the lack of driving skills and traffic regulation enforcement will mean that RTA will be a major hazard moving forward. At present domestic transport is mainly pedestrian or with bicycles and neither of these groups is aware of the risk of road accidents and road users are unlikely to respect the safety of these groups.

Some community members may be relatively naïve to risks from road traffic accidents and the larger volumes of traffic may increase their exposure risk. This is especially relevant for small children. Community members have expressed concerns that their children and animals are most vulnerable to the construction of the haul road.

The health facilities along the haul road have very limited capacity to respond and manage any form of complex trauma or multiple casualty situations. In addition, there are limited emergency services so delays to care can be significant and inappropriate movement has the potential to exacerbate injuries.

Impact Evaluation and management measures:

EHA #6	Accidents and Injuries
Construction and into operations and closure	
Management Measures	
Project impact mitigation: • Develop community security and safety management plans for the project related to the different activities. This should include emergency response plans for both community related accidents and also for the workplace. This must include a fire, rescue and chemical spill response capability, as well as medical emergency response strategies; • Conduct a traffic impact assessment to assess the impact of increased traffic within the project area; • Develop a clear policy for the management of emergencies or accidents in the community as a direct result of the projects activities; • Support with local safety and security as addressed in these specialist studies.	
Corporate Social Investment: • Support the refurbishment of the local health facilities to support any injuries or trauma. This should be limited to first aid and stabilisation prior to transport. This can also include emergency care training of the local health care practitioners; and • In partnership with the local authorities and police coordinate information campaigns about responsible driving including speed management and vehicle safety. Educational efforts on road safety should also be supported through the school system.	

Impact	Effect						Risk or Likelihood		Total Score	Overall Significance
	Temporal Scale		Spatial Scale		Severity of Impact					
Without Mitigation	Long Term	3	Localised	1	Severe	4	Probable	3	11	Moderate
With Mitigation	Long Term	3	Localised	1	Moderately Beneficial	2	Probable	3	9	Moderately benefit

6.3.7 EHA #7 – Hazardous Materials, Noise and Malodours

6.3.7.1 Impact 7.1: Air pollution, noise and mal-odours

Exposures and environmental health determinants as a result of the project will be covered in a number of specialist reports. These include air quality, water, noise and soil studies. There was no large industrial activity in the area.

Noise is also a factor to consider and the health impacts of noise are well described at both a physical and psychosocial level. The noise related to transport and use of equipment will also need to be assessed. Noise at the plant site will need to be managed with worker health and safety requirements and also based on IFC guidelines to reduce ambient noise that may affect surrounding communities. These will be addressed in the relevant specialist report and the HIA will need to be updated when the study is completed.

Air quality and odours have been addressed in detail in the Air quality report. Dust generation was highlighted as a potential impact especially in operations linked to crushing

and drying of the ore. This will be addressed in the relevant specialist report and the HIA will need to be updated when the study is completed

To manage naturally occurring radioactive material (NORM) it is recommended that Syrah adopt the NORM guidelines as published by the Government of Western Australia, Department of Mines and Petroleum. As stated in the guideline NORM 1 the purpose of this set of guidelines is to summarise the system of radiation protection as recommended by the International Commission on Radiological Protection (ICRP), International Atomic Energy Agency (IAEA) and the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA). Calculations based on the field measurements indicate the dosage level encountered by personnel working in these areas will be less than 5mSv per year. The NORM guidelines provide classifications of work conditions and at dosage levels less than 5mSv the work area would be classified as a supervised area. The ARPANSA definition of a supervised area is “an area in which working conditions are kept under review but in which special procedures to control exposure to radiation are not normally necessary”. As the project progresses to production, on-going monitoring will be conducted and any actions and mitigation measures required will be determined by the NORM guidelines.

Impact Evaluation and management measures:

EHA #7	**Environmental health determinants: Air, water, noise pollution and malodours**
Construction and into operations and closure	
Management Measures	
Project impact mitigation: • Evaluate and manage air, water and noise issues as part of the environmental impact assessment and environmental management plan requirements. Human health considerations should be considered based on results of the surveillance activity; • Collect data on a longitudinal basis from the local health centres on incidence of increased respiratory disease- especially upper respiratory tract infections that could be ascribed to dust. While these may not be specifically ascribed to the project the prevailing trends are useful to monitor so that any concerns could be addressed. This may require health systems strengthening to support recording ; • Develop transport management plans to minimise dust exposure.	

Impact	**Effect**						**Risk or Likelihood**		**Total Score**	**Overall Significance**
	Temporal Scale		Spatial Scale		Severity of Impact					
Without Mitigation	Long Term	3	Localised	1	Moderate	4	Probable	3	11	Moderate
With Mitigation	Long Term	3	Localised	1	Moderately Beneficial	1	May occur	2	7	Low benefit

6.3.7.2 Impact 7.2: Chemicals, pesticides and heavy metals

No obvious dangerous chemicals or agents are likely to be used in the construction phase of the Project. Cement will be used but should not pose any community health threats. Hydrocarbon fuels pose a risk to water bodies and need to be controlled.

Pesticides are likely to be used in general camp management and possibly for vector control programs. These will need to be managed under the guidance of *IFC Performance Standard 3 for pesticide use and management* to ensure that they do not have a negative impact on human health and the environment. The project will need to adopt a pest management approach so that minimal pesticides are utilised at the project. The Food and Agricultural Organisation (FAO) has developed an International Code of Conduct on the Distribution and Use of Pesticides that focuses on risk reduction, protection of human health and the environmental, and support for sustainable agricultural development by using pesticides in an effective manner and applying integrated pest management strategies (WHO and FAO, 2010).

The potential for acid rock drainage from waste rock with more heavy metals being available for leaching will need to be considered. Heavy metal exposure may also be one of the major potential impacts of the project. These will be addressed in the relevant specialist report and the HIA will need to be updated when this study is completed. There is no adequate biological baseline data on heavy metal exposures in the area and key informants in the health services reported that they would not be able to accurately diagnose any heavy metal exposures.

The operations phase will involve flocculants, of which some may be flammable and hazardous in high concentrations. International best practice will be needed in managing these hazardous substances.

Impact Evaluation and management measures:

EHA #7	**Environmental health determinants: Chemicals, pesticides and heavy metals**
Operations and closure	
Management Measures	
Project impact mitigation: • Hazardous chemical substance management is required as part of the environmental management plan requirements; • Determine baseline values of arsenic and mercury in PACs. These will be sampled in communities across similar exposure groups to determine background community exposures. Hair samples are preferred but otherwise urine is considered to be adequate; • Water monitoring as proposed in the environmental management plan will include surveillance for heavy metals; • Background naturally occurring radiation levels (NORM) will be measured; and • Ensure the project complies to IFC Performance Standard 3: Pollution prevention and abatement. These standards will apply to the planned integrated vector control programs. The least hazardous product is to be chosen for control and selected based on the World Health Organization Recommended Classification of Pesticides by Hazard Class. The guidelines of the FAO will be followed for procurement, storage, application	

and disposal of insecticides for malaria control.

Impact	Effect						Risk or Likelihood		Total Score	Overall Significance
	Temporal Scale		Spatial Scale		Severity of Impact					
Without Mitigation	Long Term	3	Localised	1	Very Severe	8	Probable	3	15	High
With Mitigation	Long Term	3	Localised	1	Slightly Beneficial	1	Probable	3	8	Moderate benefit

6.3.8 EHA #8 – Social Determinants of Health

6.3.8.1 Impact 8.1: Gender-based violence, alcohol and drugs

Gender-based violence occurs commonly and is often related to substance abuse. Women and young girls are often the most vulnerable.

While drug and alcohol abuse are currently not a major problem, these have the potential to increase during the lifespan of the project.

Influx and development of make-shift structure and settlements may be important to consider, although these may not alter the baseline significantly.

Impact Evaluation and management measures:

EHA #8	Social determinants of health: Gender-based violence, alcohol and drugs
Construction and into operations and closure	
Management Measures	
Project impact mitigation: • Social management plans and recommendations as part of the social impact assessment; and • Gender empowerment must be considered through these programs.	
Corporate Social Investment: • Support information programs in the community on domestic violence, role of men and support of women, alcoholism and drug abuse; and • Support local authorities with improved policing and criminal justice system for gender-based violence.	

Impact	Effect						Risk or Likelihood		Total Score	Overall Significance
	Temporal Scale		Spatial Scale		Severity of Impact					
Without	Long	3	Localised	1	Very	8	May	2	14	High

Mitigation	Term				Severe		occur			
With Mitigation	Medium Term	2	Localised	1	Very beneficial	8	Probable	3	14	High benefit

6.3.8.2 Impact 8.2: Social Cohesion and Well-being

Influx into the project area will play a major role in lifestyle and perceptions of wellbeing.

Employment is a major need in the project area. The SIA will highlight the potential benefits that the project may bring for employment opportunities. There are distinct direct and indirect health benefits related to this, which will be addressed in detail under the job creation and stimulation of economic growth impact analysis in the SIA.

Education is also a major existing need in the community. The level of education in the project area is described as low. It was cited as a priority developmental need in the community. Women's literacy is extremely important to enhance health needs in the family unit as they are the gatekeepers to health.

It remains unlikely that individuals from the local population will be employed and trained in time for construction or operation of the graphite mine, due to the level of skills required not being available locally. The developer may be left with no other alternative but to make use of skilled migrant workers, as training required may be too complex. Once the mine becomes operational, several permanent jobs will be created, constituting of skilled, semi-skilled and unskilled labourers. Many of the highly-skilled workers may come from outside of the Project area which may lead to community tension.

Resettlement is likely to be limited to moving households within the same community. The households will be moved to areas within their own host communities thus reducing social challenges in their own or new host communities. The effects of economic resettlement are addressed in separate specialist reports.

It is not the intention of the HIA to address social issues in detail as this will be covered in more detail in the social impact assessment. However, it is important to recognise the well-being and perceptions on quality of life have both a social and health basis.

Impact Evaluation and management measures:

EHA #8	Social determinants of health: Social cohesion and well-being
Pre-construction and into operations and closure	
Management Measures	
Project impact mitigation • Many elements will be addressed in the social management plan including influx management and resettlement management. It is essential that where possible health is integrated into social programs; • Gender empowerment and equity. This should include programs as well as employment opportunities; and • Extensive communication and management of expectations will need to be conducted with stakeholders. Community expectations will need to be managed carefully.	
Corporate Social Investment • Supporting education programs with a gender equity focus; • Support cultural activities and sports especially in schools; • Support vulnerable groups; and • Support graduate training programs for the youth in the community.	

Impact	Effect						Risk or Likelihood		Total Score	Overall Significance
	Temporal Scale		Spatial Scale		Severity of Impact					
Without Mitigation	Long Term	3	Localised	1	Very Severe	8	May occur	2	14	High
With Mitigation	Long Term	3	Localised	1	Very beneficial	8	May occur	2	14	High benefit

6.3.9 EHA #10 – Health Systems Issues

6.3.9.1 Impact 10.1: Health system strengthening

There are two health facilities within the project area with one of these being the district hospital in Balama. However, there remain challenges in the accessibility to the health facilities, as well as the capacity of these facilities.

There are also a few NGOs which support health infrastructure and health system strengthening programs. *Medicus Mundi International* have been providing consumable for health facilities in the local community while *Medecins Sans Frontieres* assist in transportation of sick people to Montepuez or Pemba.

In terms of project impacts, influx may create increased demand for what is already a scarce resource. This has the potential to create tension.

Health information management is generally good in the health facilities that surround the project. This data is limited by the fact that diagnostics and human resource capacity is basic. However, it serves as the best form of health surveillance for the monitoring of health impacts if supported and managed well. Strategic investment in local health facilities can support this.

Impact Evaluation and management measures:

EHA #10	Health systems issues
Pre-construction and into operations and closure	
Management Measures	
Project impact mitigation: • Influx management and supporting already limited health facilities to cope with the increased population if related to project; • Support community volunteer programs through expansion of the community based peer health educator group; and • Support the health information management system at the local health facilities as a means to support the monitoring of specific health impacts. This will provide a longitudinal tool to track specific health conditions and through the partnership provide access to information. The project should set up a basic monitoring tool with support of the local health facilities.	
Corporate Social Investment: • Develop a plan to support health infrastructure in the Project area. This strategic investment should consider the existing health needs of the community and be designed in such a way to evolve with the likely future health needs. Even minimal support with the local health infrastructure will result in significant positive impacts. • The needs and the location of the facilities need to be discusses and agreed with the communities so that the projects are community owned and supported. This must be done cautiously so that expectations are managed and disparities are not created; • Develop a memorandum of understanding (MoU) with the government for the mutual support of the health facilities in the project area. The project must not become the de-facto government as this will create an unsustainable situation. It is recommended that the project support upgrading of facilities and eventually with the development of new ones (e.g. a mobile clinic) to a level that supports the needs of the community and supports the planned mitigation and enhancement activities. The community leaders must be part of this MoU; • The following model is recommended in case a new health facility is developed: o The communities provide land and labour to construct facilities. This must be based on government standards; o The project will provide materials and construction supervisory support; o The project should equip the facility through an NGO agreement; and o The government must provide staff and supply of essential drugs and consumables. • The local health authorities meets with all health oriented NGOs working in the project area regularly. This serves as an ideal opportunity for the Project to seek to engage NGO partners, and to do so in collaboration with the local health authorities; • Support outreach services to local communities through support or partnership with programs- e.g. vaccination and logistics support; and • Support the health information management system through the following mechanisms: o Improve information technology through education of staff and providing computers; o Ensure adequate diagnostic equipment; o Support training on the national system to ensure accurate reporting; and o Develop a basic site based monitoring program to track key health trends.	

Impact	Effect						Risk or Likelihood		Total Score	Overall Significance
	Temporal Scale		Spatial Scale		Severity of Impact					
Without Mitigation	Long Term	3	Study Area	2	Very Severe	8	Definite	4	17	Very High
With Mitigation	Long Term	3	Study Area	2	Very beneficial	8	Probable	3	16	Very High Benefit

6.3.10 EHA #11 – Non-Communicable Diseases

6.3.10.1 Impact 11.1: Non-communicable diseases

These diseases are poorly described in the country and district. This is due to the high burden of communicable diseases in the country that have focussed the human and economic resources to this sector.

NCD may play a major role in the economics of the country as it is well recognised that poor adult health negatively effects economic well-being at an individual and household level, but also at a macro level. Labour productivity will fall, and the social and medical costs of managing chronic diseases as well as an ageing population, will increase.

The project will in all likelihood enhance the socio-economic conditions in the area either from direct or cumulative benefits. As the project starts to uplift health programs in the area through direct or indirect means, it will hopefully increase the life expectancy in the area and also the productive time of breadwinners. The short term effects may be an increased spending ability and adoption of more western sedentary lifestyle and diet. With prosperity and organised settlement may come a degree of urbanism with associated changes in values and behaviour, which predisposes the community to an increase in lifestyle related diseases such as obesity, hypertension, diabetes, dental caries and some forms of cancers. This may place an additional burden on the local health care facilities that may not have an ability to diagnose and appropriately manage these conditions.

The project will employ a number of permanent and temporary workers. Diet and lifestyle will need to be monitored in this sector as they will have access to increased incomes and potentially free meals on the project site. This is a workplace health as well as a community health concern.

In terms of the significance of the project on the communities the following can be considered:

- Reduction in traditional lifestyle and values;
- Social and environmental factors that increase stress and unhealthy behaviours; and

- Increase pressure on existing health care facilities that only practice limited preventive health care.

These conditions are chronic in nature and difficult to predict at the local level. The cumulative impacts of the economic upliftment of the country will need to be considered and such the impacts cannot solely be ascribed to the project. Mitigation and management at the local level is however important.

Impact Evaluation and management measures:

EHA #11	Non-communicable diseases
Operations and closure	
Management Measures	
Project impact mitigation: • Collect indicator data on NCD in area. Focus on hypertension and diabetes as most common conditions; and • Support health education programs as part of a community based peer health educator program. These should focus on lifestyle risk factors such as diet, exercise, smoking and alcohol consumption.	
Corporate Social Investment: • Support the district health authorities implement a local integrated non-communicable disease intervention program based on the WHO Stepwise program. This seeks to reduce risk factors in the community, enhancing the preventive practices of the health care personnel and ensuring provision of correct diagnostics and treatment. This may need to be a strategy that develops over time due to local policy priorities; • Support the local health care personnel with training on disease management programs and the recognition of NCD symptoms and associated management. This should include integrated management to include proper management strategies for hypertension and high cholesterol; and • Support with diagnostic medical hardware.	

Impact	Effect						Risk or Likelihood		Total Score	Overall Significance
	Temporal Scale		Spatial Scale		Severity of Impact					
Without Mitigation	Long Term	3	Study Area	2	Severe	4	Probable	3	12	High
With Mitigation	Long Term	3	Study Area	2	Moderate benefit	2	Probable	3	10	Moderate benefit

7 COMMUNITY HEALTH MONITORING PLAN

Monitoring and evaluation (M&E) plans should be based on appropriate, applicable, and relevant KPIs and therefore it is important to have a robust baseline with areas that can be measured based on impact management and interventions.

Numerous KPIs have been established for monitoring health performance indicators which can be divided into three types [139]:

- **Structural-** buildings, equipment, drugs, medical supplies, and vehicles; personnel; money; and organizational arrangements.
- **Process-** asses the effectiveness of the actions, and identify who is involved and whether the various programs are working.
- **Outcome-** measures the long-term effects of a program. The five Ds (death, disease, disability, discomfort, and dissatisfaction) are typically considered outcome measures. The morbidity and mortality outcome indicators are calculated as rates.

Table 7-1 outlines the planned community health monitoring program for the project.

It is important that a robust baseline is used to support these KPIs. There was a limitation in some of the data collected in this phase of the HIA which makes it very challenging to measure outcome data. It is thus recommended to collect new quantitative data to support this surveillance requirement as well as to better inform the baseline.

Based on the impact assessment there are a number of key data gaps that should be addressed in order to support a robust baseline and inform a surveillance program based on outcome indicators. It is recommended that quantitative data is collected from different potentially affected communities to inform this monitoring program. However, it is essential that a snap shot of the baseline is completed with the following considerations:

- The data collection methodology still needs to be defined but at this initial stage it is recommended to conduct a sentinel site sampling methodology. Seven sentinel sites can be selected from a broad geographical and project affected area with preliminary sites being Ntete, Pirira, Mualia, Nquide, Sikadi, Bairu and one control village site outside the project affected area. Households will be randomly selected from the sentinel sites or from schools and health centres;
- The sentinel site methodology will not work for all parameters such as HIV testing and school sampling. For the former the health centres located closest to the selected sentinel sites should be chosen as sampling areas. For the latter schools (with children aged 9-14 years old) closest to the planned sentinel sites and to a water course should be selected;
- Any data collection will need to be done in conjunction with the local health authorities and permissions and approvals on study designs obtained;

- It is recommended that the following data should be collected:
  - Knowledge, attitude, behaviour and perception questionnaires in the community based on the demographic and health system questionnaires. This will include aspects such as water and sanitation, HIV/AIDS, TB, malaria, as well as health seeking behaviours;
  - Malaria studies;
  - Nutritional studies;
  - HIV sero-prevalence studies from ANC;
  - School surveys for schistosomiasis and soil transmitted helminths;
  - End-user water analysis;
  - Key indicators in hospitals and health centres prior to interventions; and
  - Hypertension.

Thus data collection will occur at an individual, community and environmental level.

Table 7-1: Community Health Monitoring Plan

Community Health Monitoring Program			
Health Impact	**Structural indicators**	**Process indicators**	**Outcome indicators**
Transmission of communicable disease due to overcrowding	• Household size and no. of rooms/people; • House inflation; and • Effective project waste disposal services.	• Influx management; • Local recruitment; • Health education campaigns; • TB policy and program; and • Support of national TB management programs.	• Key TB indicators from health services; • ARI indicators; and • Any epidemics outbreak in community (e.g. meningitis).
Malaria	• Health service activity- human resource, sufficient stock and diagnostic ability; • Vector control activities. Coverage of program, human resources, equipment and partnership agreements; and • Community based peer health educator activities.	• Clear malaria management plan and program with set targets and measures; • Entomology analysis; • Vector control activities at project level; • Number of ITN distributed; • Number of ITN in use; • Coverage of IPTp; • Cleanliness of sectors of communities; • Influx management; and • Health education programs.	• Health facility statistics; • Malaria parasite prevalence rates; • Malaria-related anaemia rates; and • Behaviour change.
Transmission of STIs and HIV/AIDS	• Health facility capacity on key HIV care and treatment principles; • Effective management of STI and sexual partner follow up; • Community based peer health educator activities; and • Medical waste management.	• HIV policy implemented; • HIV management program implemented with metrics; • Health education programs; • Commercial sex work activity; • Reproductive health services for CSW; and • Distribution of condoms.	• Health facility and district statistics; • KAP survey and behaviour change measures; and • HIV sero-prevalence studies.

Community Health Monitoring Program			
Health Impact	**Structural indicators**	**Process indicators**	**Outcome indicators**
Access to safe drinking water	• Proportion of households with access to improved water sources; and • Equality of improved water supply.	• Health education programs; • Influx management; and • Water quality results.	• Diarrhoea, skin and eye disease rates from health facility; and • End-user water quality results.
Sanitation and waste management	• Proportion of households with access to improved sanitation services; • Equality of sanitation services; and • Effectiveness of project sanitation services.	• Health education programs; • Influx management; • Support school-based deworming programs; and • Agreements with local authorities.	• Schistosomiasis and soil transmitted prevalence rates; and • Health facility statistics for schistosomiasis, intestinal parasites and diarrhoea, skin and eye disease.
Malnutrition and food security	• Health facility capacity and reporting; and • NGO agreements on nutritional programs.	• Access to land; • Effectiveness of nutritional support programs; • Health education programs; and • Food inflation.	• Malnutrition statistics from health facility; • Anthropometric measurements; and • Anaemia prevalence.
Accidents and injuries	• Health service support with improved trauma capability; • Emergency response ability; and • Emergency equipment and trained staff at site.	• Health and safety plans; • Emergency response plans and updates; • Drug and alcohol programs; • Transport management plan; • Health education programs; • First aid training; and • Community grievances related to project activities.	• Police and health facility statistics; and • Workplace health and safety statistics.

Community Health Monitoring Program			
Health Impact	**Structural indicators**	**Process indicators**	**Outcome indicators**
Environmental health determinants	• Environmental and occupational hygiene monitoring- human resource, equipment; and • Change houses to prevent cross contamination from soiled clothing.	• Dust suppression activity; • Air quality monitoring; • Transport management plan; • Community grievances; and • Compliance to IFC performance standard 3.	• Heavy metal testing at baseline; • Health facility statistics on respiratory infections; and • Water quality testing.
Social Determinants of health	• Equipment to screen for substance abuse.	• Health education programs; • Workplace substance abuse policy and program; • NGO support programs; • External stakeholder communication; and • Grievance register linked to health.	• Reported cases of domestic violence; and • Reports on alcoholism and substance abuse.
Health systems	• Health service capacity at workplace. Minimum standards adhered to in terms of stock, staff and equipment; and • Community based peer health educator activities.	• Influx management; • Support of local health facilities and monthly reports; • NGO agreements; and • Define dependent health care benefits and sign off from labour organisation.	• Utilization and capacity of health facilities.
Non communicable diseases	• Improved diagnostic services in health facilities; and • Health management information system supports surveillance of NCD.	• Health education programs; • NCD disease ; and • Training of health care personnel.	• Diabetes and hypertension statistics from health facility; • Baseline health profile and risk mapping of different sectors of workforce; • Cancer registry; and • Spontaneous abortion registry.

8 BASELINE HEALTH STATUS

8.1 General Socio-economic Context

8.1.1 National Level

Mozambique is located in south-eastern Africa, bordered by the Indian Ocean to the east, Tanzania to the north, Malawi and Zambia to the northwest, Zimbabwe to the west and Swaziland and South Africa to the southwest. After the post- independence civil war lasting from 1977-1992, the country approved the first democratic constitution in 1992 and joined the Commonwealth in 1995. In 1995 Mozambique supported the establishment of the Comunidade dos Países de Língua Portuguesa (CPLP). The low criminal rate and political stability helped the economic growth of the country in the last years. Mozambique adopted an open market policy and encouraged foreign investment in the mining sector and agriculture. Nowadays, Mozambique ranks 184th of 187 countries on Human Development Index (HDI) and is classified as a 'low development' country. In fact this data is below the regional average for sub-Saharan Africa (UNDP, 2011).

In the 1990s Mozambique has been subjected to extreme climate conditions in the last decade with severe droughts, flooding and cyclones which affected the agricultural production and food security.

The country has improved the Gross Domestic Product (GDP) in the last years. The GDP amounted to 333 US$ per capita per year in 2006 but raised to 410 US$ in 2010 (World Bank, 2011). Mozambique ranks 120 (out of 182) in the 2011 Transparency International Corruption Index (Transparency International, 2011).

Mozambican soil is rich in natural resources such as coal, hydro, natural gas, precious stones and mineral sands. Oil has been recently explored in reserves off shore and on shore. Mozambican resources are currently under-exploited and are almost exclusively for export. It has been calculated that Mozambican export will grow by 10% yearly until 2020 (Bucuane and Mulder, 2007).

Average inflation in Mozambique was reported at 3.25% change in 2009, according to the International Monetary Fund (IMF). In 2015, Mozambique's average inflation is expected to be 5.59% change (IMF, 2011). Despite the strong export, in 2008 about 54.7% of the population was living under the national poverty line. The percentage has improved since 1996 when 69.4% were under the poverty line (World Bank, 2011).

The main productive activities occur in the sectors of agriculture, fisheries, minerals and in the mega projects related with natural resources. The construction sector has picked up in recent years because of the cumulative effects of the investment policies on the infrastructure and foreign investment. The main exports products are sugar cane, cotton, tobacco, cashew, prawns, minerals such as aluminium and coal and hydroelectric power generated by the Cahora Bassa Dam in the central part of the country. The country imports mainly fuel, consumer goods and manufactured products. The dependence rate of the economically active population is 89%. Most of the population in the productive age brackets

is in activities related to the primary sector, which is mostly informal (Instituto Nacional de Estatística (INE) et al., 2005).

Mozambique has 55% of the adult population which is literate with a steady improvement from 1980 when only 27% of the adult population was literate. Huge efforts have been put in ensuring access to education but discrepancies remain in access to education especially for girls in the poorest regions. School completion rates remain extremely low throughout the country and drop out in primary school is set to 13% (World Bank, 2003a).

Mozambique has a population of nearly 23 million inhabitants and middle population annual growth (2.8%). Similarly to other countries in sub-Saharan Africa fertility rate is high (5 children per woman). Most of the population in Mozambique lives in rural settings (61.6%) but the rural population is slowly decreasing as it steadily moves from rural areas to urban settings. Mozambicans have relatively short life expectancy (48 years) which has improved from 1970 when it was 39 years (World Bank, 2011).

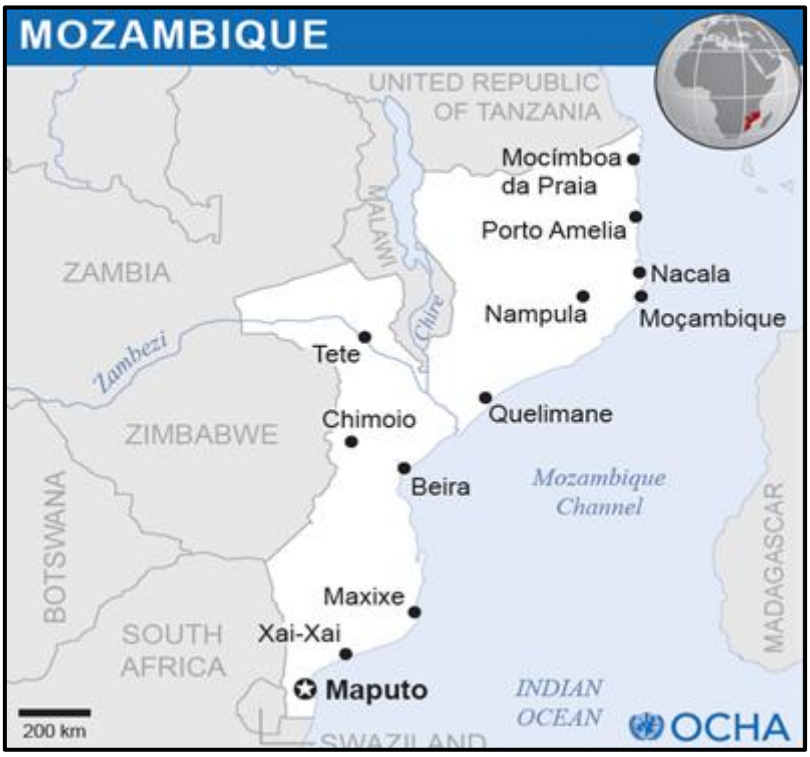


Figure 8-1: Map of Mozambique, 2011 (UN CERF, 2013)

8.1.2 Regional Level

Balama District is located south of Cabo Delgado Province, confined by the Northern District of Montepuez and the Niassa Province, across the river Ruassa, with the east and west Namuno district with the district Montepuez.

The Balama District Municipality has been carrying out rehabilitation and maintenance of feeder roads and maintenance of access roads linking district headquarters and

administrative posts. The Work maintenance of access roads was done in close collaboration with leaders and community-based structures. The district faces major problems of drinking water, especially in Balama town mainly due to few sources of water supply. Of the 99 existing water sources, only 64 are operational.

According to the Census of 1997, the total electricity coverage in the population was almost 0%. The district has 61 schools (of which 57 are primary schools) and is served by 6 health facilities.

Despite these efforts, it is important to note that the most of the infrastructure is in a poor state due to poor maintenance. Most of the water pumps are in need of maintenance, as well as the road network. Most of the bridges in the district are known to collapse during the rainy season.

Agriculture is the dominant activity and involves almost all households. Agriculture is mainly practiced on small family farms manually using intercropping systems based on local crop varieties. Agricultural production is done predominantly rain-fed, which is not always successful, since the risk of crop loss is high due to the low capacity storage of moisture in the soil during crop growth.

8.2 Environmental Health Areas (EHAs)

The following section will describe the baseline health status in the project area with reference to the EHAs. This is based on the national and regional baseline health data that was identified during the desktop review and during the site visit from 11-15th March 2013. Data at the local level is based on the FGD and KII that were carried out during the field visit.

8.2.1 EHA #1 – Communicable Diseases Linked to Overcrowding and Poor Environmental/Social Conditions

8.2.1.1 General Housing and Environmental/Social Conditions in Communities

8.2.1.1.1 National and Regional

- According to the Mozambican Demographic and Health Survey 2003 (MDHS), households in Mozambique consist of 4.9 persons on average (5.6 in urban settings; 4.5 in rural settings);
- In Cabo Delgado, average household size is 4.3 persons (Instituto Nacional de Estatística et al., 2005);
- The AIDS Indicator Survey 2009 (INSIDA), thus six years later, found a household composition of 4.3 persons per household on average (4.5 urban; 4.2 rural) (Instituto Nacional de Estatística et al., 2010); and

- Less than a half (43.1%) of urban households and 3.8% of rural were found to have electricity in 2009 (Instituto Nacional de Estatística et al., 2010).

Figure 8-2: Type of housing in Balama

8.2.1.1.2 Local Level

Balama District has an area of 5455km^2 and a population of 123,000 inhabitants in 2005. It is estimated that the district would have reached 133 thousand inhabitants by 2010.

- Respondents in Ntete village stated that there was severe overcrowding in their village, with households being no less than 8 individuals per household. Respondents in Maputu, Sicadi, and Bairu villages reported that there was enough housing and that overcrowding was not a matter of concern.

- During the KII with district health officials they said that there is little overcrowding in the community. However, housing conditions are generally not very good.

- The typical type of housing in the district is a mud hut, with grass or thatched roof and walls of mud, reeds or sticks, as illustrated in Figure 8-2 above.

8.2.1.2 Tuberculosis

Tuberculosis (TB) is caused by bacteria (*Mycobacterium tuberculosis*) that most often affects the lungs. TB is curable and preventable. It is spread from person to person through the air. When people with lung TB cough, sneeze or spit, they propel the TB germs into the ari. A person needs to only inhale a few of these germs to become infected (WHO, 2013q).

About one-third of the world's population has latent TB, which means people have been infected by TB bacteria but are not (yet) ill with disease and cannot transmit the disease. However, people with compromised immune systems, e.g. people living with HIV, malnutrition or diabetes, have a much higher risk of falling ill (WHO, 2013q).

It has been estimated that in 2009 TB affected 9.4 million people (range, 8.9 million–9.9 million) which is equivalent to 137 cases per 100,000 population with the majority of cases concentrated in sub-Saharan Africa (WHO, 2010b).

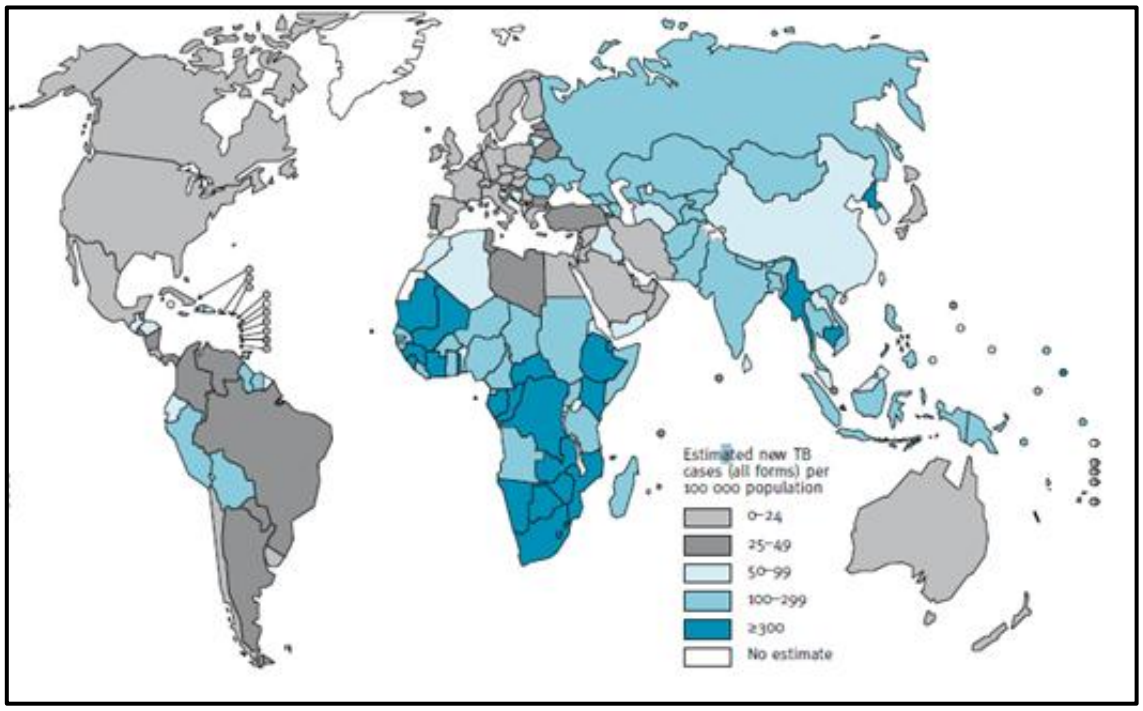


Figure 8-3: Estimated world TB incidence, WHO, 2009

TB can be cured using a long course of drugs. When these drugs are misused or mismanaged, a different form of TB can occur which takes longer to treat and only reacts to second-line drugs, usually more expensive and with severe side effects. This form of TB is called MDR-TB, or multidrug-resistant TB. The MDR-TB bacteria are resistant to at least first-line anti-TB drugs and are therefore treated with second-line anti-TB drugs. When TB bacteria become unreactive to these drugs as well, it is defined as XDR-TB or extensively multi-drug resistant TB. This is a form of TB that is resistant to second-line drugs (WHO, 2010a).

Cost often represents a challenge in receiving adequate treatment: while a course of standard TB drugs cost approximately 20 US$, MDR-TB drugs can cost up to 5,000 US$, and XDR-TB treatment is far more expensive than that (WHO, 2010a). Furthermore MDR-TB patients have low recovery rate since control programmes have shown that cure is possible only for up to 50–60% of cases (Pardini et al., 2009). Patients with XDR-TB have

low life expectancy since 70% of them die within a month of diagnosis (Donald and van Helden, 2009).

It is estimated that 3.3% of all world new TB cases had MDR-TB in 2009. Each year, around 440,000 MDR-TB cases are estimated to emerge, and 150,000 persons with MDR-TB die. Additionally there are an estimated 25,000 cases of XDR-TB emerging every year (WHO, 2011g).

8.2.1.2.1 National level

- TB is one of the leading causes for morbidity and mortality in Mozambique, particularly affecting young adults, children and people living with HIV/AIDS. Mozambique ranked 17th on the list 22 high-burden TB countries in the world in 2008 (WHO, 2012b).
- According to the WHO, Mozambique had an estimated incidence rate of 544 cases per 100,000 population (WHO, 2012f).
- An estimated 3.5% of new TB cases are MDR-TB cases (WHO, 2012f).
- Due to the high HIV/AIDS burden in Mozambique, the number of TB cases is likely to increase further over the next few years (USAID, 2009). The TB-HIV co-infection rate is high, with 61% of TB patients testing HIV positive (WHO, 2012f).
- Due to the lack of infrastructure and a shortage of human resources, health services for TB control and prevention in Mozambique are inadequate. All districts are implementing Directly Observed Treatment Short Course (DOTS), while only 40% of the population has access to DOTS (USAID, 2009). This results in low case detection rates and high death rates among patients with treatment. Furthermore Mozambique has only one laboratory which performs specific testing for TB drug resistant cases, therefore, suspected MDR-TB cases have limited access to the diagnosis.
- In 2008, the new National Strategic Plan for TB 2008-2012 was adopted by the government. It focuses on the recommendations from the Stop TB Initiative and aims at reducing the global burden of TB in line with the Millennium Development goals and the Stop TB partnership targets. Its budget is limited to 1.1 US$ per patient.
- The last national survey found BCG (the recommended TB vaccine) vaccination coverage of 88% in Mozambique. In 2010, WHO/UNICEF estimated BCG coverage in Mozambique at 90% (Instituto Nacional de Estatistica and UNICEF, 2009, WHO/UNICEF, 2010c).

8.2.1.2.2 Regional level

- Figure 10 shows the TB notification rates for Mozambique in 2007 with a notification rate of 53-109 per 100,000 people in Cabo Delgado (WHO, 2009c).

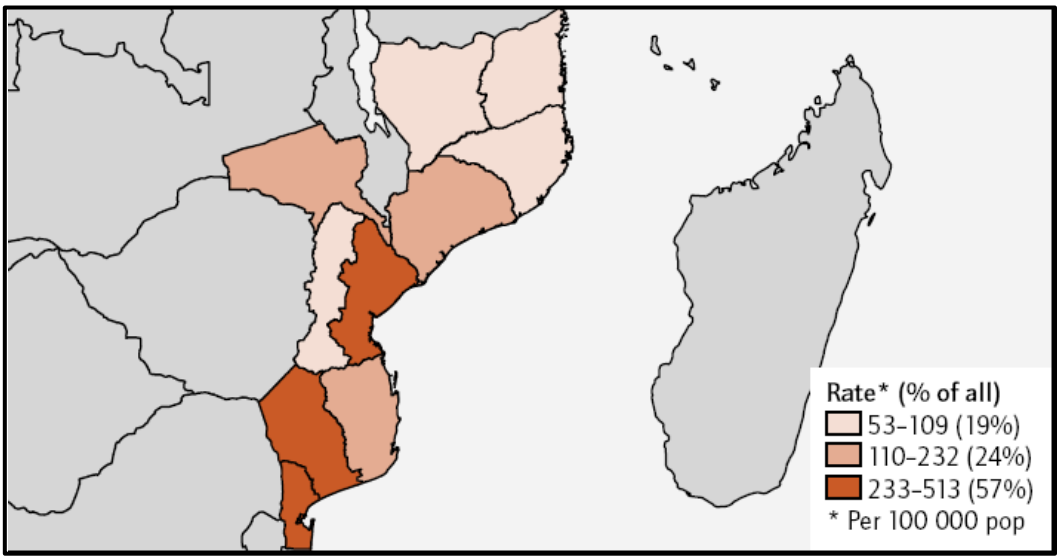


Figure 8-4: TB notification rate (new and relapse), WHO, 2007

- According to the 2008 Multiple Indicators Cluster Survey (MICS), in the Cabo Delgado 93.2% of children aged 12-23 months have been vaccinated against TB (Instituto Nacional de Estatistica and UNICEF, 2009).
- The prevalence of TB in Balama District is about 3.7%.

8.2.1.2.3 Local Level

- During the KII with the district health officials they reported that TB is common within the community.
- Although it was reported that the prevalence of TB in Balama District was about 3.7%, staff at Ntete said that they see very few cases of TB. They have only had two cases within the last 3 years.
- There are 3 health facilities within the district that have the ability to diagnose and treat TB. Ntete Health Centre is one of these.
- The district health officials reported that 3 out of 10 TB patients were HIV positive.

8.2.1.3 Acute Respiratory-tract Infections

Respiratory tract diseases are diseases that affect the air passages, including the nasal passages, the bronchi and the lungs. They range from acute infections such as pneumonia and bronchitis, to chronic conditions such as asthma and chronic obstructive pulmonary disease.

Pneumonia is a form of acute respiratory infection (ARI) that affects the lungs. It is the single largest cause of death in children worldwide. Every year, it kills an estimated 1.2 million children under the age of five years, accounting for 18% of all deaths of children under-five years worldwide. Children can be protected from pneumonia; it can be prevented with simple interventions, and treated with low-cost, low-tech medication and care. Risk factors that can increase a child's susceptibility to pneumonia are: (i) indoor pollution caused by cooking and heating with biomass fuels (such as wood); (ii) living in crowded homes; and (iii) parental smoking (WHO, 2013n).

8.2.1.3.1 National level

- During the 2011 MDHS little more than half the cases (52%) of the children had symptoms of ARI were reported to have had symptoms of an ARI in the two weeks preceding the survey (Instituto Nacional de Estatística (INE) et al., 2012).
- Lower Respiratory Infections accounted for 7% of deaths in 2004 as show in Table 5-1.

8.2.1.3.2 Regional Level

- According to the 2008 MICS, in the two weeks preceding the survey, 6.4% of the children in Cabo Delgado showed signs of acute respiratory infections (Instituto Nacional de Estatistica and UNICEF, 2009).

8.2.1.3.3 Local Level

- Local health facility officials said that pneumonia is one of the most common diseases affecting children under the age of five. Staff at Ntete said that they think respiratory diseases are common because people don't dress up their children warmly whenever necessary. Influenza is frequent during the months between August and November.

8.2.1.4 Measles

Measles is a highly contagious, serious disease caused by a virus. It remains one of the leading causes of death among young children globally, despite the availability of a safe and effective vaccine. Approximately 158,000 people died from measles in 2011, mostly under the age of five. Unvaccinated young children are at highest risk of measles and its complications, including death. Unvaccinated pregnant women are also at risk. Measles outbreaks can be particularly deadly in countries experiencing or recovering from a natural disaster or conflict. Damage to health infrastructure and health services interrupts routine immunisation, and overcrowding in residential camps greatly increases the risk of infection (WHO, 2013k).

8.2.1.4.1 National level

- The last representative survey found a MCV (measles containing vaccine) coverage of 64% of children under 1 year in 2008 and 74% for children aged 12-23 months (Instituto Nacional de Estatistica and UNICEF, 2009). WHO/UNICEF estimated the coverage of MCV for 12-23 months olds at 70% in 2010 (WHO/UNICEF, 2010c).

- In Mozambique, measles was in 2004 found to be the most frequent cause of vaccine-preventable childhood death (Jani et al., 2006) and the disease accounted for 18,000 DALYs (all age) in 2004 (WHO, 2004a).

- 2,321 measles cases were reported in Mozambique in 2010 (WHO/UNICEF, 2010c). This is considerably higher than the 60 cases reported in 2009.

- National data on measles have included clinical cases which have to be confirmed in the laboratory. In 2008, 475 cases of clinical measles were notified as against 272 and one death in the previous year, representing a rise of 74.6%. However, of these clinical cases, 79.8% were further investigated and only 4 were found to be confirmed as Measles IgM sero-positive.

- In June 2010 a measles outbreak has hit Mozambique affecting 434 patients but causing no deaths. The outbreak which affected other countries in Southern and East Africa was caused by the poor vaccination coverage in the region, WHO reported. Only 20% of children under 5 in the region were vaccinated against measles (UNICEF, 2010b).

- A follow-up measles campaign was organized by the MoH in May 2011. It was aimed at reaching 3.6 million children from 6 to 59 months of age and providing measles immunization, vitamin A supplementation, and Mebendazole for de-worming (UNICEF, 2011c).

8.2.1.4.2 Regional Level

- According to the Ministry of Health (MoH), in 2009/2010 in Cabo Delgado 44 cases of measles have been reported (Ministério da Saúde, 2011).

- In Cabo Delgado province, 80.2% of children between 12 and 23 months have received the measles vaccination 2003 (Instituto Nacional de Estatística et al., 2005). The vaccination coverage was slightly improved by 2008 reaching 83.8% (Instituto Nacional de Estatistica and UNICEF, 2009).

8.2.1.4.3 Local Level

- During the KII district health officials said that measles is not common in the district. The vaccination coverage is almost at 100%.

8.2.1.5 Leprosy

Leprosy is caused by the slow-growing bacillus *Mycobacterium leprae*. It is transmitted via droplets from the nose and mouth of untreated patients with severe disease, but it is not highly infectious. If left untreated, the disease can cause nerve damage, leading to muscle weakness and atrophy and permanent disabilities (WHO, 2011e, ILEP, 2011). Leprosy is a disease of poverty and overcrowding. The WHO is targeting leprosy elimination and defined a goal of registered prevalence rate of less than 1 case of leprosy per 10,000 population (WHO, 2011e). In 2003, Tanzania, Brazil, India, Madagascar, Mozambique and Nepal accounted for 83% of the leprosy cases in the world (WHO, 2005a).

8.2.1.5.1 National level

- Mozambique has an estimated prevalence of leprosy of less than 1 case per 10,000 population.
- 1,313 new leprosy cases were reported in 2008 of which 69 (5.3%) were among children (WHO, 2011d). 1,191 cases were reported in 2009 by WHO (WHO, 2012g).

8.2.1.5.2 Regional Level

- Cabo Delgado Province was in 2012 reported to have one of the highest number of leprosy cases in Africa (Leprosy Voice, 2011).

8.2.1.5.3 Local Level

- During the KII district health officials stated that there are only nine leprosy cases within the whole district.

8.2.1.6 Meningitis

8.2.1.6.1 National level

- Last reported outbreaks of meningitis in Mozambique date back to 1996 and 1998.
- A study conducted in Manhiça Province showed that *S. pneumoniae* and *H. influenzae* are the main aetiologies responsible for the high burden of morbidity and mortality associated with acute bacterial meningitis in rural Mozambique (Sigaúque et al., 2008).
- Hib3 vaccination coverage was estimated at 74% in 2009 and 2010 (WHO/UNICEF, 2010c).

8.2.2 EHA #2 – Vector-related Diseases

8.2.2.1 Malaria

Malaria is a life-threatening disease caused by a parasite called *Plasmodium*, which is transmitted via the bites of infected *Anopheles* mosquitoes, which bite mainly between dusk and dawn. About 219 million cases of malaria were estimated to have occurred in 2010. Malaria mortality rates have fallen by more than 25% globally since 2000, and by 33% in the Africa (WHO, 2013i).

Malaria continues to be a major public health problem in Africa. It is estimated that 960,000 deaths from malaria occurs annually in Africa, which represents 90% of the malaria deaths reported worldwide. A large proportion of victims are children under the age of five years. The burden of this disease translates into a significant demand for health care services, particularly in the resource poor settings of most African countries (WHO Afro, 2013).

Transmission depends on climatic conditions that may affect the number and survival of mosquitoes, such as rainfall patterns, temperature and humidity. In many places, transmission is seasonal, with the peak during and just after the rainy season. Malaria epidemics can also occur when people with low immunity move into areas with intense malaria transmission, for instance to find work. Human immunity is also another important factor, especially among adults in areas of moderate or intense transmission conditions. Partial immunity is developed over years of exposure, and while it never provides complete protection, it reduces the risk of severe disease from malarial infection. This is why most malaria deaths in Africa occur in young children, whereas in areas with less transmission and low immunity, all age groups are at risk (WHO, 2013i).

Vector control is the main way to reduce malaria transmission at the community level. It is the only intervention that can reduce malaria transmission from very high levels to close to zero. For individuals, personal protection represents the first line of defence for malaria prevention. Two forms of vector control are effective in a wide range of circumstances (WHO, 2013i):

- **Insecticide-treated mosquito nets (ITNs):** Long-lasting insecticidal nets (LLINs) are the preferred form of ITNs for public health distribution programmes. The WHO recommends that people in high risk areas sleep under a LLIN every night.

- **Indoor spraying with residual insecticides:** Indoor residual spraying (IRS) with insecticides is a powerful way to rapidly reduce malaria transmission. Its full potential is realized when at least 80% of houses in targeted areas are sprayed.

Early diagnosis and treatment of malaria reduces diseases and prevents deaths. The best available treatment for, particularly for malaria is Artemisinin-based combination therapy (ACT). WHO recommends that all cases of suspected malaria be confirmed by parasite-based diagnostic testing (either microscopy or rapid diagnostic test) before administering treatment (WHO, 2013i).

Malaria infection during pregnancy can have adverse effects on both mother and foetus, including maternal anaemia, foetal loss, etc. It is a particular problem for women in their first or second pregnancies or for those with HIV. Interventions for pregnant women other than use of ITNs include intermittent preventive treatment (IPTp) which entails administration of a curative dose of an effective antimalarial drug (currently sulfadoxine-pyrimetamine [SP]) to all pregnant women whether or not they are infected with the malaria parasite (CDC, 2012).

8.2.2.1.1 National level

Prevalence

- In 2009, Mozambique had an estimated 5.3 million malaria cases (WHO, 2012g).
- The whole of the country's surface and thus its population is exposed to high transmission (≥1 case per 1,000 population).
- Transmission shows a seasonal pattern with a peak season between November and July. The country is also prone to natural disasters such has floods, cyclones and tropical storms which increase the availability of mosquito breeding sites.
- Through national surveillance system, eleven years (1999-2009) of weekly malaria data have been processed and data analysis led to the conclusion that malaria prevalence in Mozambique has been declining since 2007. Control measurements have included the implementation of the malaria rapid diagnostic tests (RDT) to confirm suspected cases even in community settings. This factor may have also significantly contributed to the reduction of reported malaria cases.
- The major malaria vectors in Mozambique are *Anopheles (An.) gambiae, An. arabiensis* and *An. funestus. Plasmodium falciparum* accounts for more than 90% of all malaria infections, with *P. malariae* (9%) and *P. ovale (1%)* responsible for the remainder (DFID, 2011).
- Malaria is a severe problem for pregnant women too, especially those residing in the rural zones of the country, where approximately 20% of pregnant women are infected with the parasite (MISAU, 2009). The burden of disease was highest in the northern regions and in the coastal stratum.
- During the 2007 Mozambique Malaria Indicator Survey, 38.5% of children aged 6-59 months were found to be carrying malaria parasites (National Malaria Control Programme et al., 2009).
- During the 2011 MDHS 13% of children reported having fever (a main symptom of malaria) during the two weeks preceding the survey. 15% of these children received ACT on the same day or days after the fever began (Instituto Nacional de Estatística (INE) et al., 2012).

- About 19% of households countrywide were found to have IRS during the 2011 MDHS. This was also higher in urban areas (30%) than in rural areas (13%) (Instituto Nacional de Estatística (INE) et al., 2012).

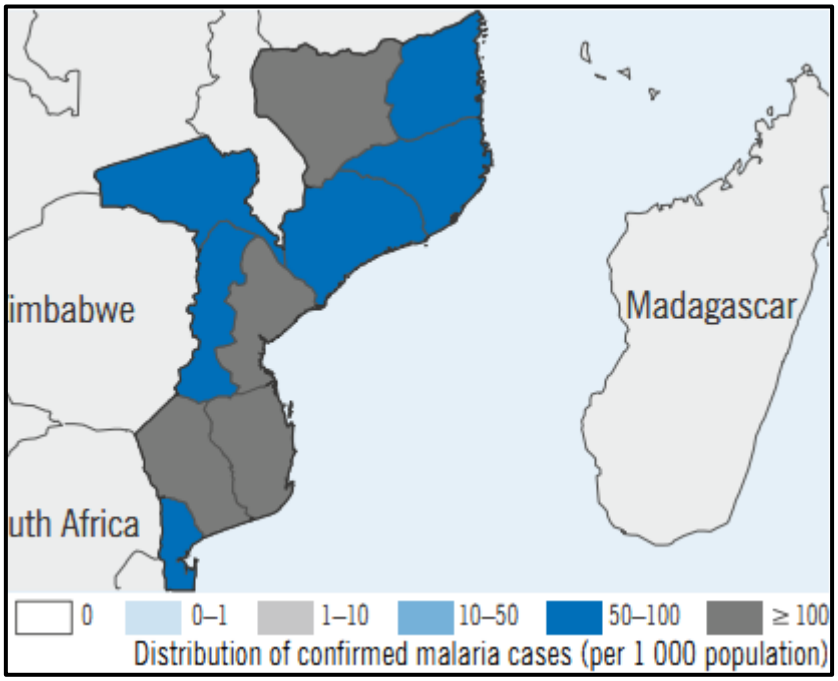


Figure 8-5: Malaria cases, Mozambique 2010

Knowledge

- Knowledge on transmission of the disease and on prevention among women was measured during the 2007 Mozambican Malaria Indicator Survey (MIS). Knowledge on symptoms was high; 70.0% of interviewed women knew that fever is the main symptom of malaria but yet only 12.4% knew that anaemia is an important symptom of malaria (National Malaria Control Programme et al., 2009).

- With regard to malaria transmission, only 35.3% of the interviewees related malaria transmission to mosquitoes (National Malaria Control Programme et al., 2009).

- Only 28.6% of the women interviewed knew that mosquito nets are protective against malaria but almost 60% of them knew that pregnant women and children under 5 constitute a high-risk group (National Malaria Control Programme et al., 2009).

- Health seeking behaviour related to malaria has proven to be poor especially in the countryside where access to health care can be challenging. In the MMIS only 60% of children with fever were taken to a health facility and only 36% of children were given anti-malarial drugs within 24 hours from onset of symptoms (National Malaria Control Programme et al., 2009).

Treatment

- Malaria represents an enormous public health burden for the Mozambique health systems and overstretches its medical resources. It is responsible for about 44% of all outpatient consultations, 57% of admissions to health facilities and 23% of all in-hospital deaths (National Malaria Control Programme et al., 2009).

- Lack of proper diagnostic tools in remote health centers results often in over-diagnosing children and adults with malaria. In a study conducted in 2007 in Mozambique, malaria was over-diagnosed in 23% of children and 31% of adults (National Malaria Control Programme et al., 2009).

- During the 2011 MDHS less than a half of women (42%) who had been pregnant at least two years before the survey were found to have taken anti-malarial drugs during their pregnancy. This was higher in urban areas (54%) than in rural areas (37%) (Instituto Nacional de Estatística (INE) et al., 2012).

Insecticide Treated Nets (ITNs) and Indoor Residual Spraying (IRS)

- During the 2011 MDHS 57% of the households were found to have at least one ITN, treated, and 28% of households have at least one ITN. Ownership of mosquito nets was slightly higher in urban areas than in rural areas (Instituto Nacional de Estatística (INE) et al., 2012).

- In total, 39% of children slept under a mosquito net of any type and 18% slept under an ITN during the night before the survey. Similarly, mosquito net use was slightly higher in urban areas, where 21% of children slept under an ITN, compared to 16% of children in rural areas (Instituto Nacional de Estatística (INE) et al., 2012).

8.2.2.1.2 Regional Level

Prevalence

- Cabo Delago is considered as highly endemic and shows a seasonal transmission pattern with transmission occurring during up to 12 months as depicted in Figure 8-6.

- 70.8% of children 6-59 months were tested RDT-positive and 36.8% were blood slide positive in the MMIS 2007 (National Malaria Control Programme et al., 2009). See Figure 8-7.

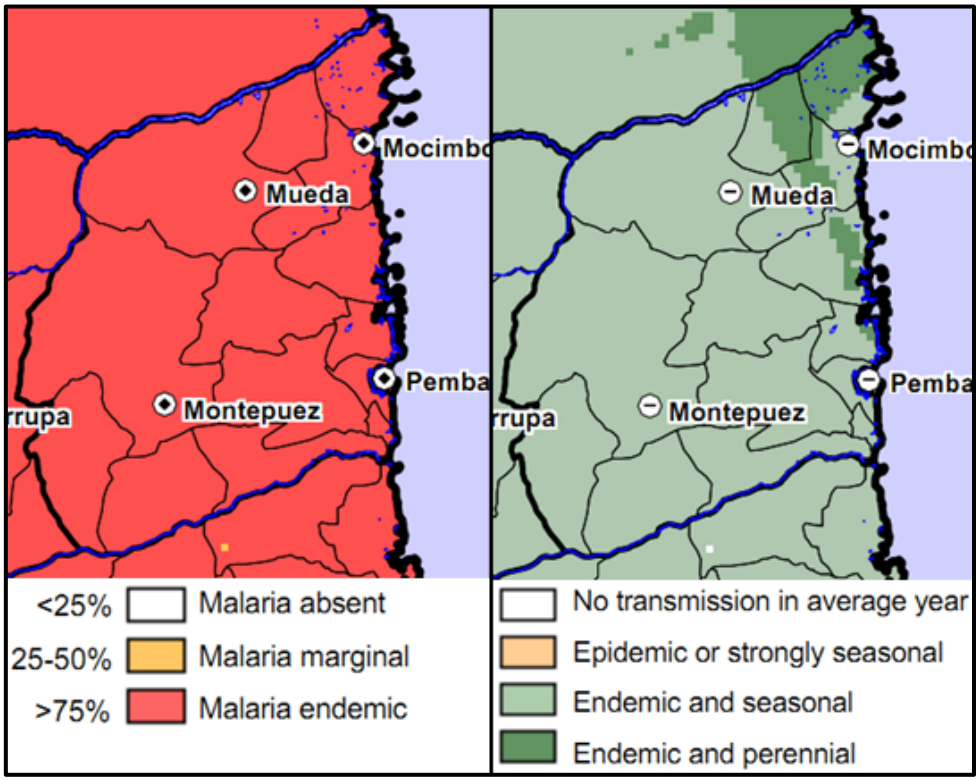


Figure 8-6: Malaria endemicity and duration of transmission season, Cabo Delgado Province

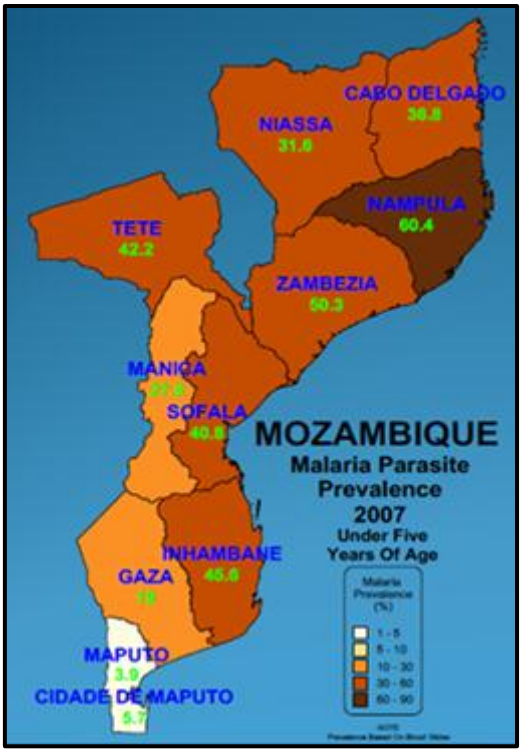


Figure 8-7: Malaria parasite prevalence

Knowledge

- In Cabo Delgado province, 61.5% of interviewed women knew that fever is the main symptom of malaria and only 32.0% knew that malaria is transmitted by mosquitoes and only 20.2% knew that mosquito nets can protect from malaria (National Malaria Control Programme et al., 2009).

Insecticide Treated Nets (ITNs) and Indoor Residual Spraying (IRS)

- The 2007 MMIS reported 19.6% of households are in possession of at least one ITN in Cabo Delgado province (National Malaria Control Programme et al., 2009). 9.5% have a LLIN in their household.

- In the following year in 2008, the MICS reported that 43.4% of households with children under five years had at least one ITN (Instituto Nacional de Estatistica and UNICEF, 2009).

- Only 33.0% of children 0-59 months slept under an ITN in the night previous to the MICS survey (Instituto Nacional de Estatistica and UNICEF, 2009).

Treatment

- According to the MMIS, only 1.8% of women giving birth in the previous year in Cabo Delgado received the recommended 3 doses of IPTp, 3.4% received 2 doses and 10.1% received 1 dose (National Malaria Control Programme et al., 2009).

8.2.2.1.3 Local Level

- District health officials indicated during a KII that the prevalence of malaria in the community is about 9%. They also reported that malaria normally peaks between January and June each year.

- Figure 8-8 shows the number of malaria cases in children aged 0-4 years in Ntete in the first nine weeks of 2013.

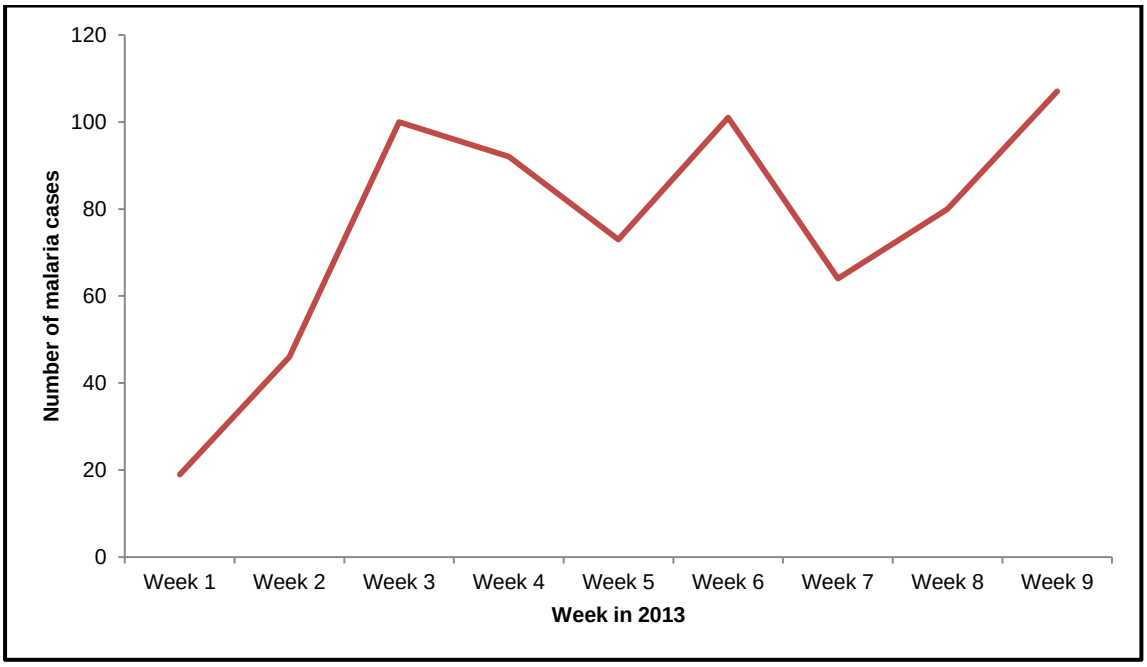


Figure 8-8: Number of malaria cases in children aged 0-4 years at Ntete Health Centre in 2013

- The health authorities said that they think malaria is prevalent in the region due to the dam that breeds mosquitoes. Moreover, most of the community members do not use their ITNs, despite owning them. The district health authorities reported that each household received ITNs in 2012. They estimated ITN usage at 10%.
- During the FGDs, respondents were questioned about the use of ITNs. A number of respondents in various villages reported that children and pregnant women usually got preferential treatment in households with regards to the distribution of ITNs.
- There are few misconceptions on malaria transmission and prevention within the community. Most community members know that being bitten by mosquitoes are the only form of malaria transmission.
- Diagnosis of malaria is purely by use of RDTs. Treatment is by use of Artemether-Lumefantrine (ARTs) drugs, which is recommended by the WHO. Fansidar and Quinine are used for complicated malaria cases. IPT_p is offered to all pregnant women. There is a good supply of RDTs as well as treatment.
- There have been no organized vector control programmes in the district. IRS took place in other districts within the province but not in Balama. Moreover, there are no NGOs that support malaria control initiatives within the district.

8.2.2.2 Human African Trypanosomiasis

Human African Trypanosomiasis (HAT), also known as *sleeping sickness* is a parasitic disease transmitted by the bite of the *Glossina* insect, commonly known as the tsetse fly. The disease affects mostly poor populations living in remote rural areas of Africa. Untreated, it is usually fatal. Travellers also risk becoming infected if they venture through regions where the insect is common (WHO, 2012b).

8.2.2.2.1 National level

- There is no data available for HAT (*T.b. rhodesiense*) in Mozambique, but it is listed as an endemic country by WHO (WHO, 2011j).

8.2.2.2.2 Local Level

- There has been no case of HAT in the project area in recent times.

8.2.2.3 Filariasis

The filarial diseases result from infections with vector borne tissue dwelling nematodes called *filariae*. The parasites are transmitted to humans through the bite of an infected mosquito and develop into adults worms in the lymphatic vessels, causing severe damage and swelling (lymphoedema). The infection can be treated with drugs. Annual treatment of all individuals at risk with anti-filarial treatment such as diethyl-carbamazine citrate (DEC) and albendazole (or ivermectin and albendazole) can prevent occurent of new infection and disease (WHO, 2013g). Lymphatic filariasis (LF) and Onchocerciasis as the most important infections from a project impact and public health point of view will be discussed below.

Lymphatic filariasis, commonly known as *elephantiasis*, is a neglected tropical disease. Infection is usually acquired in childhood, but the painful and profoundly disfiguring manifestations of the disease occur later in life. It may lead to permanent disability. More than 1.4 billion people in 73 countries, including Mozambique are at risk (WHO, 2013g).

Onchocerciasis, commonly called r*iver blindness*, is a parasitic disease caused by the filarial worm *Onchocerca volvulus*. It is transmitted through the bites of infected blackflies of the *Simulium* species which carry the parasite from human to human. The disease can lead to a variety of diseases like blindness, skin rashes, lesions, intense itching and skin depigmentation (WHO, 2013m).

8.2.2.3.1 National level

- LF is partially endemic in the Mozambique as shown in Figure 8-9. There is, by now, no formal elimination program in place (The global alliance to eliminate lymphatic filariasis, 2008).

- Early mapping of onchocerciasis in Mozambique showed that the disease is present at a hypo-endemic level. Mozambique is therefore not considered a priority area for mass ivermectin treatment (WHO, 2011a).

8.2.2.3.2 Local Level

- There are no cases of LF in the project area.
- There are no cases of onchocerciasis in the project area.

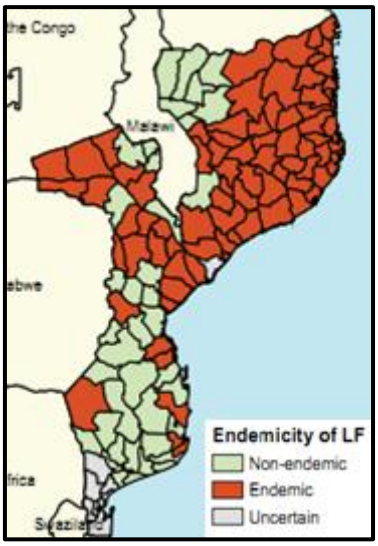


Figure 8-9: Lymphatic Filariasis in Mozambique, 2010

8.2.3 EHA #3 – Sexually-transmitted Infections, including HIV/AIDS

Mining and related extractive projects in developing countries have a well described legacy of increasing transmission of these diseases through social and economic changes. In-migration is also a major concern for mining projects as this places pressure on the social structures in communities.

8.2.3.1 HIV/AIDS

There are an estimated 33.3 million people living with HIV globally, with Sub-Saharan Africa accounting for 67% (22.5 million) of all cases (UNAIDS, 2010). In 2009, the southern African region accounted for almost 70% of all new HIV infections with an estimated 1.8 million [1.6 – 2.0 million] new infections (UNAIDS, 2010). AIDS-related deaths globally were estimated at 1.8 million whereas African countries alone registered 1.3 million deaths (72.2%).

Countries in Southern Africa were the most affected by the HIV and AIDS epidemic in 2009 as depicted in Figure 8-10, where prevalence exceeded 15% (UNAIDS, 2010). Nevertheless, HIV and AIDS prevention efforts have shown positive effects in recent years; 33 countries decreased their HIV incidence by more than 25% between 2001 and 2009, and among these, 22 were sub-Saharan African countries (UNAIDS, 2010).

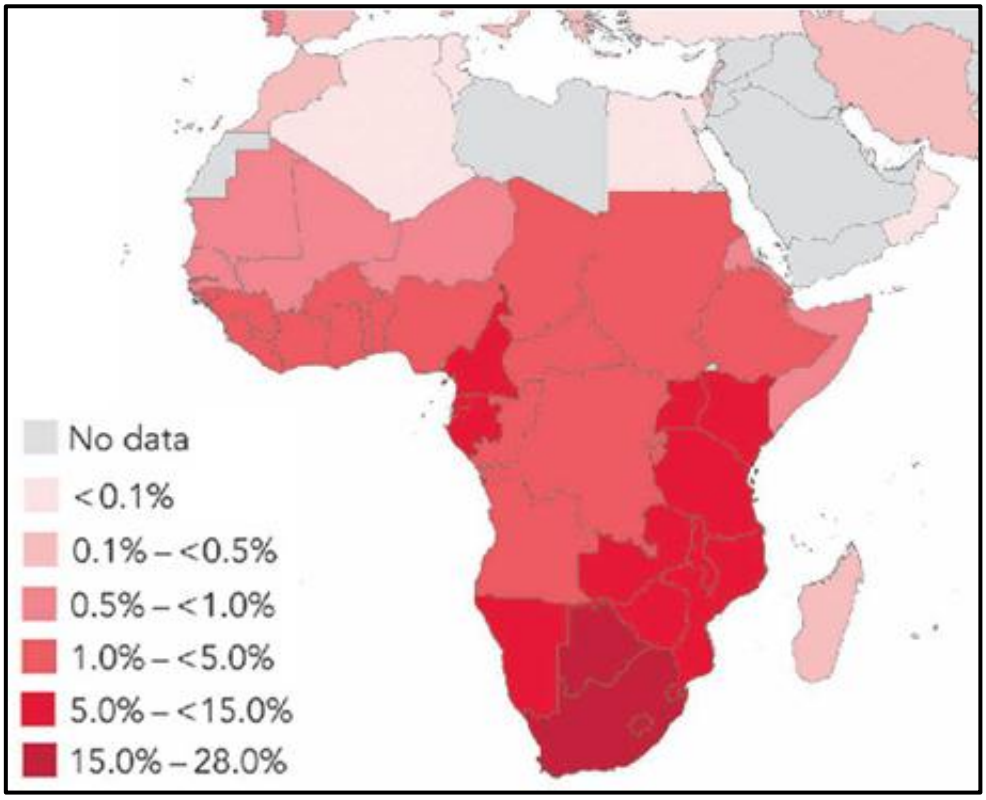


Figure 8-10: HIV prevalence 2009

8.2.3.1.1 National level

Prevalence

- The 2009 Mozambique HIV/AIDS Survey (INSIDA) found the prevalence of HIV in Mozambique to be 11.5%. The prevalence of HIV found in Mozambique in 2009 for men and women aged 15-49 years is shown in Figure 8-11. HIV prevalence was found to be higher in urban areas (15.9%) compared to rural areas (9.2%) (Instituto Nacional de Estatística et al., 2010).
- Nearly 100,000 young people aged 15-19 years are currently infected with HIV (UNGASS et al., 2010).
- HIV prevalence in the country is highest among the 20-24 year-old age group (18.3% in 2008) (USAID, 2010).
- Gender disparity in terms of HIV prevalence is high. HIV prevalence in women (13.1%) was found to be higher than in men (9.2%). Moreover, when stratified by age, HIV prevalence amongst young people (aged 15-24 years) showed large disparities, with the prevalence in young women (11.1%) almost four times that in young men (3.7%) (Instituto Nacional de Estatística et al., 2010).
- HIV infection rates are increasing with educational level and wealth status (Instituto Nacional de Estatística et al., 2010).

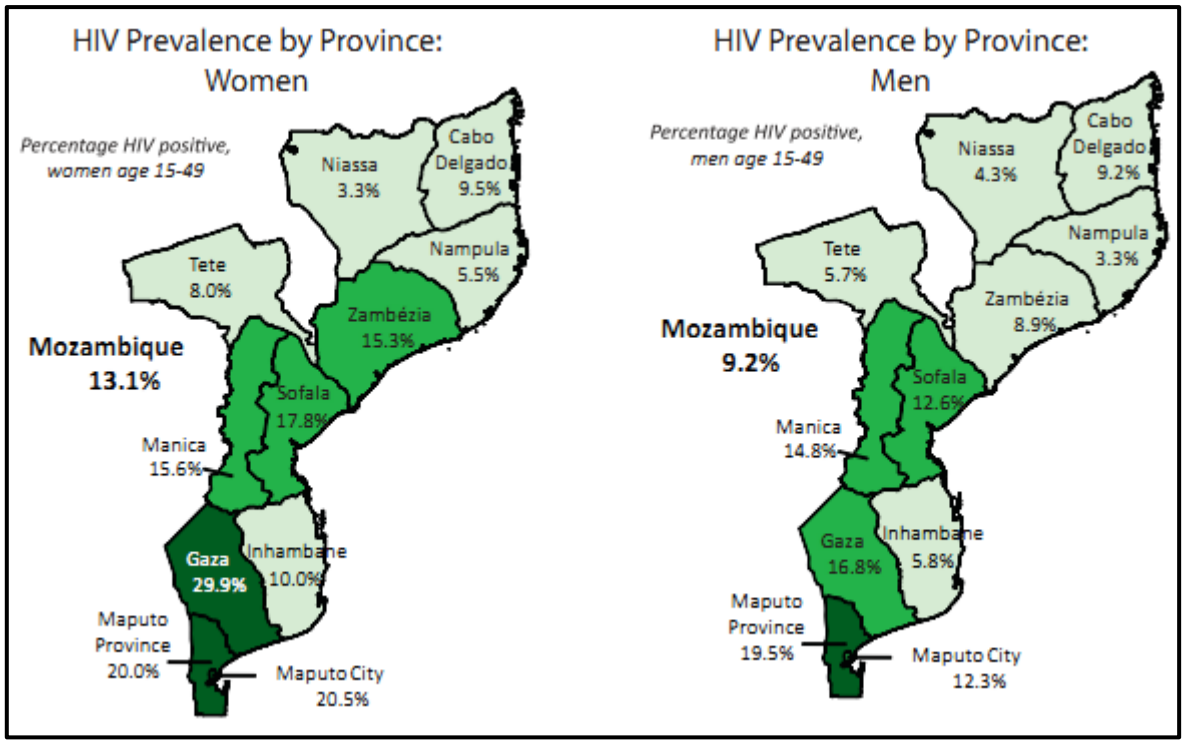


Figure 8-11: HIV prevalence in Mozambique by sex and province, 2009

- A quarter of youth (25%) aged 15-24 years had had sex before the age of 15. Many high-risk behaviours are particularly common in low-prevalence northern provinces but high prevalence of circumcision in the same areas may provide some protection against transmission (USAID, 2010).

Table 8-1: Prevalence Estimates for HIV/AIDS in Mozambique

Year	Source	Category	Prevalence
2009	INSIDA (Instituto Nacional de Estatística et al., 2010)	Men and women 15-24 years	Men: 3.7% Women: 11.1% Overall: 7.9%
2009	INSIDA (Instituto Nacional de Estatística et al., 2010)	Men and women 15-49 years	Men: 8.0% Women: 9.0% Overall: 8.5%
2009	INSIDA (Instituto Nacional de Estatística et al., 2010)	Urban / Rural	Urban: 15.9% Rural: 9.2%
2009	USAID (USAID, 2010)	Estimations for the whole population and high risk groups	Overall: 11.5% Urban: 15.9% Women: 13.1% Along transport corridors: - Pregnant women: 15%
2009	Projecto 100% Viva	Sex workers attending VCT (limited sample)	Sex workers: 28%
2010	UNGASS (UNGASS et al., 2010)	Women attending ANC	South: 21% Center: 18% North: 9%

- Kaposi's sarcoma (KS) is a tumor caused by the Herpesvirus 8. It is widely known to be one of the AIDS defining illnesses. In Mozambique, KS is the leading type of cancer in terms of incidence and mortality in men (2008 estimates) and 3rd leading type of cancer in women (Globocan, 2008b).

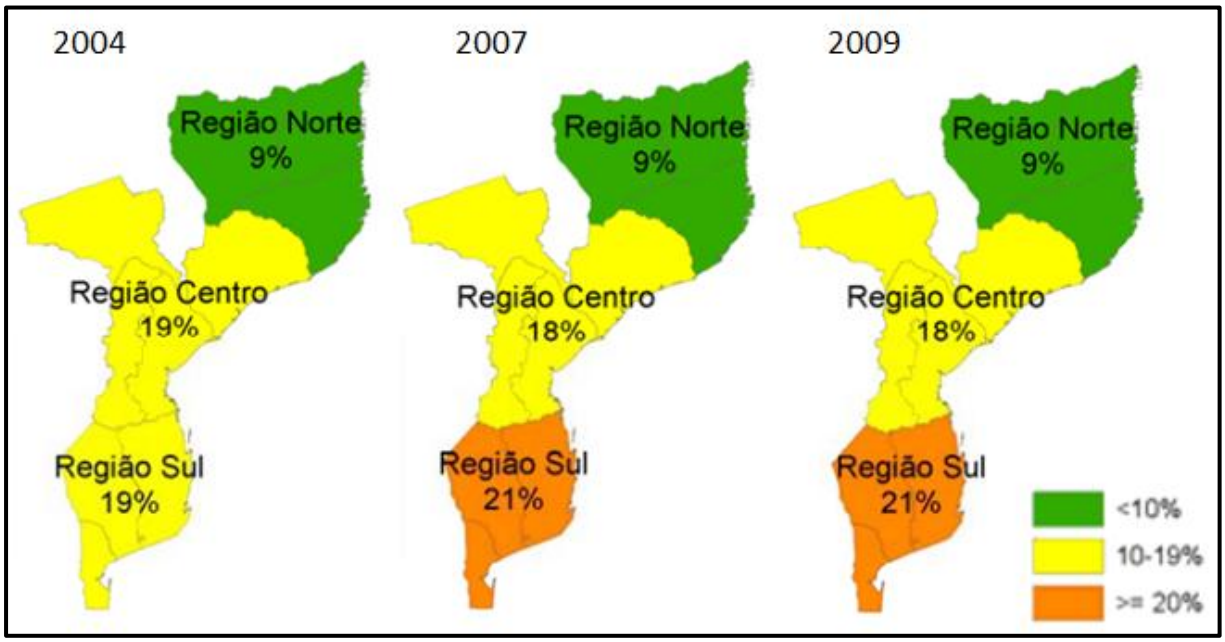


Figure 8-12: HIV infection levels found in women attending antenatal care

Knowledge, Attitude, Behaviour

- The 2011 MDHS found that virtually all Mozambicans have heard of HIV/AIDS. During the survey 98% of women and 100% of men reported that they had heard of the disease, even those with no schooling (Instituto Nacional de Estatística (INE) et al., 2012).

- During the 2011 MDHS, knowledge of HIV preventions methods was assessed by assessing how many people knew that consistent condoms use and only having one uninfected sexual partner can prevent HIV infection. About three-quarters (74%) of men and just over a half (52%) of women knew that both of these can prevent HIV infection. However, it was found that knowledge about HIV infection increases with education level (Instituto Nacional de Estatística (INE) et al., 2012).

- The United Nations General Assembly Special Session on HIV/AIDS (UNGASS) 2010 Progress Report for Mozambique provides an interesting overview on how knowledge and attitude towards HIV has changed in Mozambique in the last decade. Most young people (15-19 years) in Mozambique now know about HIV (90%) but importance to take action against an infection by using a condom remain relatively low especially in young women (UNGASS, 2010).

- In the 15-19 years age group only 66.7% and 67.9% in the 20-24 years age group were aware that condoms can prevent an HIV infection. This data show an improvement from a decade ago when in 2003 only 25% of young women in the age group 15-24 knew that the use of condoms can prevent HIV transmission (UNGASS, 2010).

- However, translation of knowledge into behavior remains erratic. Condom use among young people has greatly improved but it remains unsatisfactory. In 2008, about 44.7% of young women aged 15-24 years reported that they had used a condom the last time they had sex with an irregular partner compared to 24% in 2003 (UNGASS, 2010).

- The 2011 MDHS found that multiple partners women with multiple sexual partners were more common amongst those residing in urban areas compared to rural areas (4% and 2%, respectively). The proportion of women who reported having multiple partners was 3%. However, about a thirds of all males (30%) reported having had two or more sexual partners in the 12 months preceding the survey (Instituto Nacional de Estatística (INE) et al., 2012).

Diagnosis and Treatment

- HIV rapid tests are very frequently out of stock all over the country (UNGASS et al., 2010).

- The government began providing Anti-Retro Viral Treatment (ART) in 2003, but the lack of human resources and infrastructure for health care provision has limited coverage: in 2009, it was estimated that only around one third (30%) of people in need of ART have received treatment (UNGASS, 2010), whereas only around half of the population have access to an acceptable level of health care (WHO, 2008a).

- Voluntary counselling and testing (VCT) has shown to be crucial in adapting a less risky behaviour and thus prevent transmission of the disease (Mola et al., 2006). Therefore, the accessibility of VCT services to the general population, especially in areas where HIV prevalence is high or where the population is particularly vulnerable, is crucial to manage the growing HIV/AIDS epidemic in Mozambique (Hagopian et al., 2008).

8.2.3.1.2 Regional level

- HIV prevalence in Cabo Delgado was found to be 9.4% during the 2009 INSIDA. HIV prevalence was found to be slightly higher in women compared to men (9.5% compared to 9.2%, respectively) (Figure 8-11) (Instituto Nacional de Estatística et al., 2010).

- Almost one in ten women (9%) in Cabo Delgado Province reported having had two or more sexual partners in the 12 previous months. However, 71% of men in this province reported having had more than one sexual partner in the preceding 12 months. The average number of sexual partners in this province was reported to be 3 in women and 9 in men. The level of education or type of residence did not appear to influence the behaviour of men as to the number of sexual partners (Instituto Nacional de Estatística (INE) et al., 2012).

- 100% of health facilities in Cabo Delgado province offered antenatal care services and PMTCT (prevention of mother-to-child transmission) services in 2009 (UNGASS et al., 2010).

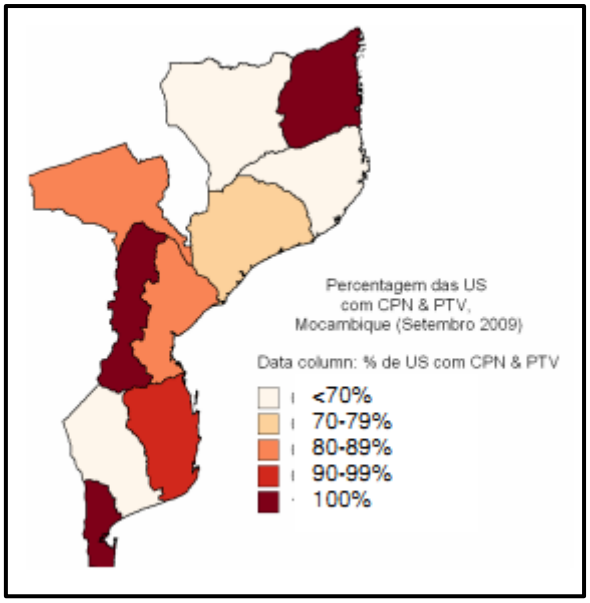


Figure 8-13: ANC and PMTCT services in health facilities, Mozambique 2009

8.2.3.1.3 Local Level

- District health authorities estimated that HIV prevalence in the district to be about 6-8%. They also said that they thought the prevalence was reducing.
- Most health facilities have the ability to diagnose HIV. However, there are only three health facilities in the district that have care and treatment centres.
- Condoms are readily available within the community. They are available for free at health facilities and they are also available in the shops. There is little stigma associated with buying condoms, although the health authorities reported that few women prefer to use the female condom.
- There are regular HIV awareness campaigns within the community. One American based NGO in Pemba, Fundação Ariel Glaser contra o SIDA Pediátrico (ARIEL), which is an affiliate of the Elizabeth Glaser Pediatric AIDS Foundation (EGPAF) conducts regular campaigns within the district. The district health authorities reported that there is good knowledge of HIV transmission and prevention measures.
- The communities also have a good attitude towards people with HIV.
- The district health authorities said that commercial sex work is not very frequent in Balama.
- Information collected during focus group discussions shows that a large proportion of respondents know the two main ways to prevent HIV, namely condom use and having one uninfected sexual partner. One of the respondents in Ntete village noted that

although the knowledge of prevention methods is higher among men this knowledge is seldom translated into practice by men.

8.2.3.2 Sexually Transmitted Infections

8.2.3.2.1 National level

- STIs are also increasing the risk of attraction of HIV. In couples where the women has had an STI within the past 12 months previous to the INSIDA, couples were found to be three times more likely to be HIV positive (both partners) (Instituto Nacional de Saúde (INS) et al., 2010).
- In the 2009 INSIDA, 6.3% of women and 6.4% of men reported that they had symptoms of STIs or confirmed STIs within the past 12 months previous to the survey (Instituto Nacional de Estatística et al., 2010).

8.2.3.2.2 Regional level

- In the 2009 INSIDA, 3.8% of women and 5.6% of men reported that they had symptoms of STIs or confirmed STIs within the past 12 months previous to the survey (Instituto Nacional de Estatística et al., 2010).

8.2.3.2.3 Local Level

- STIs are not very frequent within the community. The district health authorities reported that STIs are usually diagnosed during ante-natal care in women. Otherwise most community members do not come to the hospital when they have symptoms of STIs.
- The district health authorities estimated the prevalence of syphilis to be 2-3% at antenatal care.

8.2.3.3 Hepatitis B

In the world, Hepatitis B virus (HBV) infection is the largest cause of acute and chronic liver disease. Approximately 30% of the world's population - almost 2 billion people - have been infected with Hepatitis B and more than 350 million are chronic carriers of the virus (WHO, 2009b). These chronic carriers are at a high risk of death from cirrhosis of the liver and hepatocellular carcinoma (HCC). These cause an estimated 660,000 deaths per year. Moreover, HCC was the second most common cancer in men in sub-Saharan Africa in 2008 after prostate cancer, with a male incidence of 100 new cases per 100,000 population in Mozambique (Globocan, 2008a) (Eddleston et al., 2008).

8.2.3.3.1 National level

- In Mozambique the Hepatitis B vaccine was introduced in 2001 by the EPI. This represented an important advance for public health because it was estimated that annually around 10,000-15,000 thousand Mozambicans died from HBV infection. In

2004 Hepatitis B vaccine coverage was 72%, compared to the average of 35% in sub-Saharan Africa (WHO, 2006b).

8.2.3.3.2 Local level

- There were no reported cases of Hepatitis B at the local level.

8.2.4 EHA #4 – Soil-, Water- and Waste-related Diseases

The prevalence of soil-, water- and waste-related diseases highly depend on sanitation facilities and access to safe drinking water, factors which often show strong variations on continental and regional level. According to WHO/UNICEF report from 2008 (WHO/UNICEF, 2010), it was estimated that the percentage of the population in Mozambique using an improved drinking water source and those using an improved sanitation facility (i.e. one that hygienically separates human excreta from human contact) were both lower than 50% (Figure 8-14).

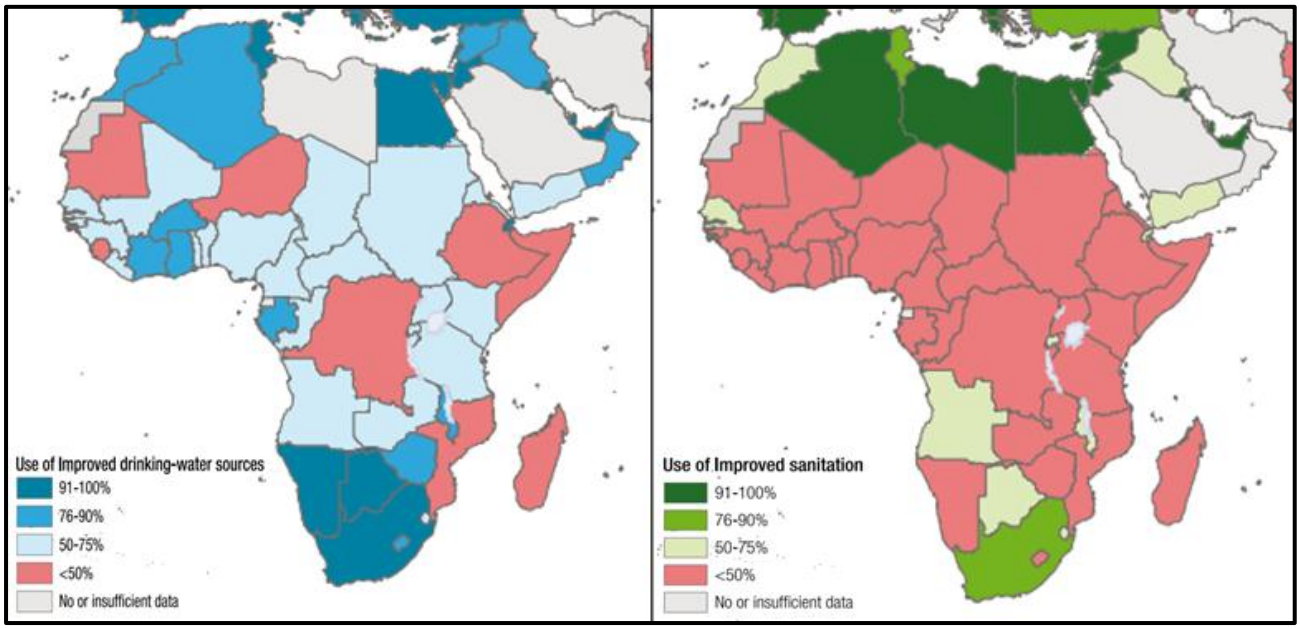


Figure 8-14: Coverage with improved drinking water sources / improved sanitation facilities, Africa, 2008

8.2.4.1 Water and Sanitation

WHO/UNICEF have developed definitions and a set of indicators for evaluating human excreta disposal. The following definitions and indicators are widely used to monitor the progress towards supporting the provision of sanitation services (WHO/UNICEF, 2007):

- Improved sanitation facilities:
  - flush or pour – flush to piped sewer system, or septic tank or pit latrine;
  - ventilated improved pit latrine (VIP);
  - pit-latrine with slab; and
  - composting toilet.
- Non-improved sanitation facilities:

- flush or pour – flush to elsewhere;
- pit-latrine without slab or open pit;
- bucket; and
- no facilities or bush or field.

Furthermore, only facilities which are not shared or are not for public use are considered improved.

8.2.4.1.1 National and Regional Level

- During the 2007 Malaria Indicator Survey about three-quarters of households (73%) reported that they have safe drinking water[1] sources. However, only two-thirds of households (68%) reported that they had their own latrine (whether improved or not) (National Malaria Control Programme et al., 2009).
- During the same survey 62% of households in Cabo Delgado Province reported to having safe drinking water sources while 67% of households reported to having their own latrine (National Malaria Control Programme et al., 2009).

Figure 8-15: Tubewell in Ntete

[1] Any tap water, borehole, or protected well

8.2.4.1.2 Local Level

- Most people in the local communities have their own non-improved well. Households in Ntete and Pirira collect drinking water from central boreholes in their village. Communities that live near Chipembe Dam reported that they get their water from there.
- Most people in the community also said that they have their own latrine, although these are not improved latrines. The district health authorities estimated that 80% of households had their own latrines. The rest of the households either shared latrines or said that they go to the bush.
- The district health authorities reported that there are many diseases linked to poor water and sanitation in the district.

8.2.4.2 Diarrhoeal Diseases

Diarrhoea is the passage of 3 or more loose stools per day, or more frequently than is normal for the individual. It is usually a symptom of gastrointestinal infection, which can be caused by a variety of bacterial, viral and parasitic organisms. Infection is usually through spread through contaminated food or drinking water, or from person to person as a result of poor hygiene. Severe diarrhoea leads to fluid loss, and may be life-threatening, particularly in young children and people who are malnourished (WHO, 2013f).

8.2.4.2.1 National level

- 11% of total deaths in children under 5 years of age in Mozambique were attributed to diarrhoeal diseases in 2008.
- During the 2011 MDHS, 59% of children whose mothers reported them to have had diarrhoea (within the two weeks preceding the survey) were taken to hospital for treatment (National Malaria Control Programme et al., 2009).

8.2.4.2.2 Regional level

- In Cabo Delgado 18.3% of children showed signs of diarrhoea in the two weeks preceding the MDHS 2003 (Instituto Nacional de Estatística et al., 2005).

8.2.4.2.3 Local Level

- Diarrhoea was identified as one of the diseases with a significant burden within the community, especially amongst children under five years of age.
- Figure 8-16 shows the frequency of diarrhoea in children aged 0-4years at Ntete Health centre during the first nine weeks of 2013.

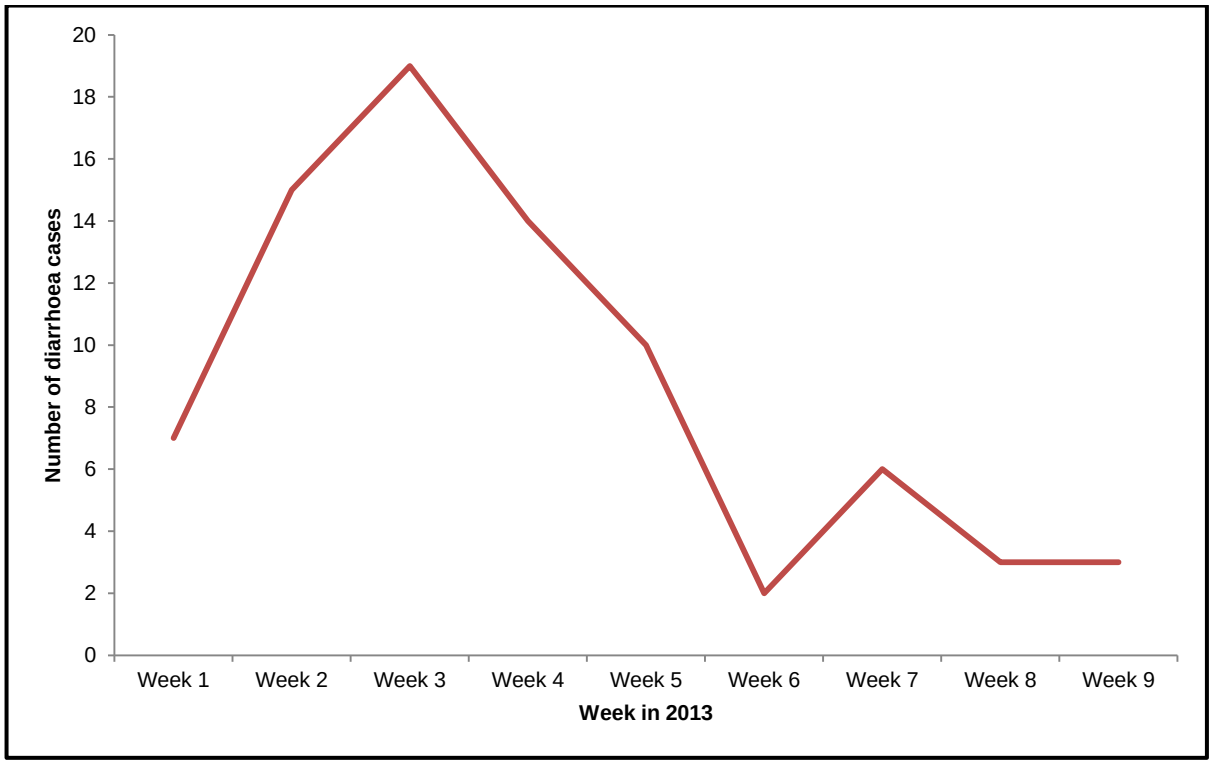


Figure 8-16: Frequency of diarrhoea in children aged 0-4 years at Ntete Health Centre

8.2.4.3 Cholera

Cholera is an acute diarrhoeal disease caused by ingestion of food or water contaminated with the bacterium *Vibrio cholerae*. It is an extremely virulent disease affecting both adults and children that can kill within hours. There are an estimated 3-5 million cholera cases and 100,000-120,000 deaths due to cholera every year. Up to 80% of cases can be successfully treated with oral rehydration salts. Effective control measures rely on prevention, preparedness and response. Provision of safe water and sanitation is critical in reducing the impact of cholera and other waterborne diseases (WHO, 2012a).

8.2.4.3.1 National level

- Cholera outbreaks are common in Mozambique and the disease has been frequently reported since 1973. In 1992, 1993, 1998, 1999 and 2004 cholera cases from Mozambique represented one fifth to one third of all registered cases in Africa. Cholera epidemics mainly occur during the period from December to May/June, therefore coinciding with the rainy season.

- Figure 8-17 depicts number of notified cholera cases in the past 30 years and the Case Fatality Rate (CFR) (WHO, 2006a).

- A cholera outbreak was reported in 2003/4 with 15,237 cases and 85 deaths. Cabo Delgado province was not affected by this outbreak.

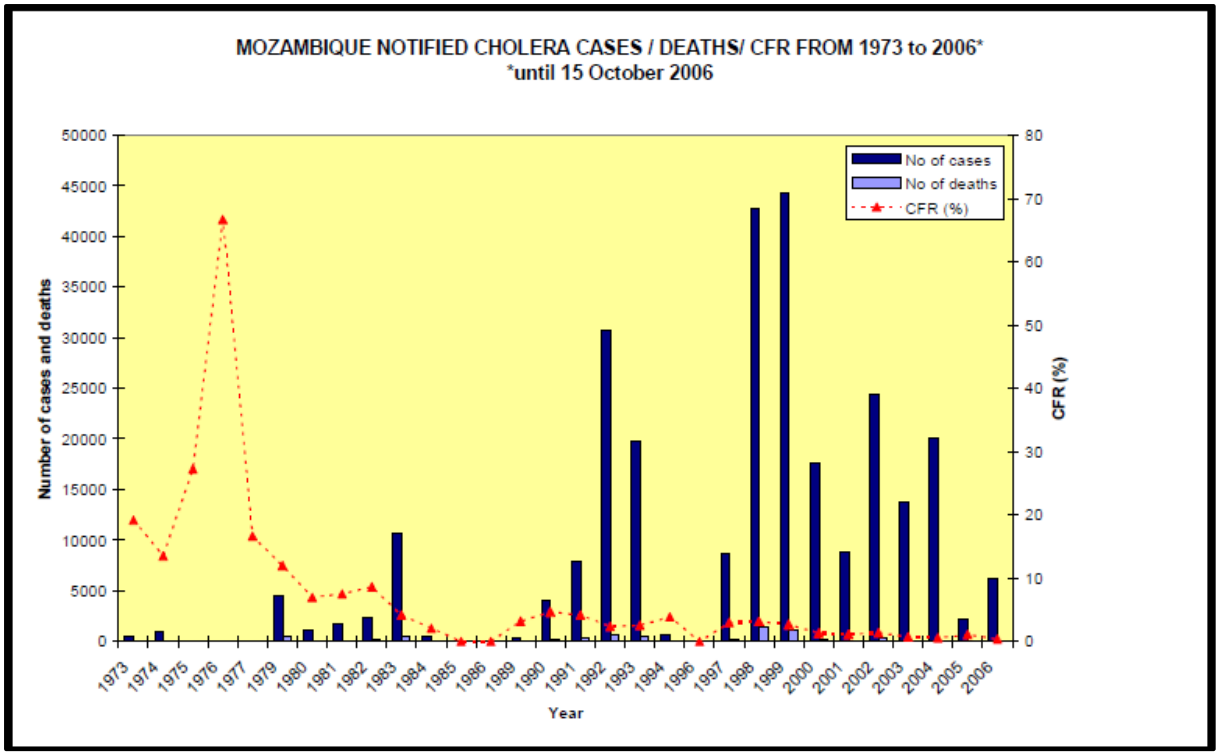


Figure 8-17: Mozambique cholera cases 1973-2006

8.2.4.3.2 Regional level

- A cholera outbreak was reported in February 2010 with totally 2,130 cases and 38 deaths (CFR was 1.8%) affecting, Cabo Delgado, Niassa, Zambezia and Sofala provinces (WHO, 2010x).

8.2.4.4 Soil Transmitted Helminthiases

Soil Transmitted Helminthiasis (STH) or intestinal worm infections are among the most common parasitic infections worldwide often affecting deprived communities. Infection with STHs is strongly associated with unimproved sanitation facilities and poor hygiene (WHO, 2011b). Studies assessing risk factors for STH infection have revealed that the odds of STH infection reduce by half if a household has improved sanitation facilities (Ziegelbauer et al., 2012).

The common helminths are roundworm *(Ascaris lumbricoides)*, whipworm *(Trichuris trichiura)* and hookworm *(Necator americanus)*. Estimates suggest that *A. lumbricoides* infects 1.2 billion people globally and *T. trichiura* and hookworms amount to ~700–800 million infections each (de Silva et al., 2003). *Giardia intestinalis* is the most common human protozoan intestinal pathogen, having a worldwide distribution, with infection being highest in infants and children. Infection is caused by ingestion of eggs from contaminated soil (*A.*

lumbricoides and *T. trichiura, Giardia*) or by active penetration of the skin by larvae in the soil (hookworms). STH produce a wide range of symptoms including intestinal manifestations (diarrhoea, abdominal pain), general malaise and weakness, which may affect working and learning capacities and impair physical growth. Hookworms cause chronic anaemia through mal-absorption and blood loss that result in anaemia (WHO, 2011b).

8.2.4.4.1 National level

- STH infections are widely spread in Mozambique (Figure 8-18) (WHO, 2010y).
- WHO estimates that 3,081,879 pre-school aged children (pre-SAC) in Mozambique are in need for preventive chemotherapy (PC) (WHO, 2010d).
- In an epidemiological survey carried out nationwide between 2005 and 2007, schoolchildren were also examined for STH infection. The most prevalent STH species were *Ascaris lumbricoides* (65.8%), *Trichuris trichiura* (54.0%) and hookworm (38.7%). Among protozoan species, the most prevalent were *Entamoeba coli* (47.7%), followed by *Entamoeba histolytica* (31.2%) and *Giardia lamblia* (19.0%) (Augusto et al., 2009).

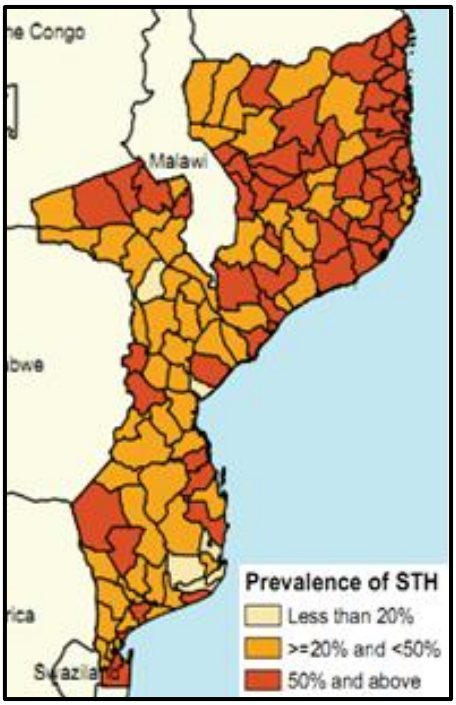


Figure 8-18: Distribution of STH in Mozambique

8.2.4.4.2 Regional level

- As shown in Figure 8-18 prevalence of STH in Cabo Delgado and especially around the project region is ‘high’ with a prevalence higher than 50% (Augusto et al., 2009).

8.2.4.4.3 Local Level

- The district health authorities reported that few STH were not very prevalent in the area. However, staff at Ntete Health Centre reported that STH, especially *Ascaris*, are very common in school children.

- The district health authorities have deworming programmes every six months at school level. The last deworming programme took place in November 2012.

8.2.4.5 Schistosomiasis

Schistosomiasis, also known as Bilharzia, is a disease caused by parasitic trematode schistosome worms. It is regarded as a neglected tropical disease. Worldwide, an estimated 779 million people are at risk of schistosomiasis, of whom 106 million (13·6%) live in irrigation schemes or in close proximity to large dam reservoirs (Steinmann et al., 2006). Of the 230 million people requiring treatment yearly, only 33.5 million (14.6%) people received treatment for schistosomiasis in 2010 (WHO, 2012c).

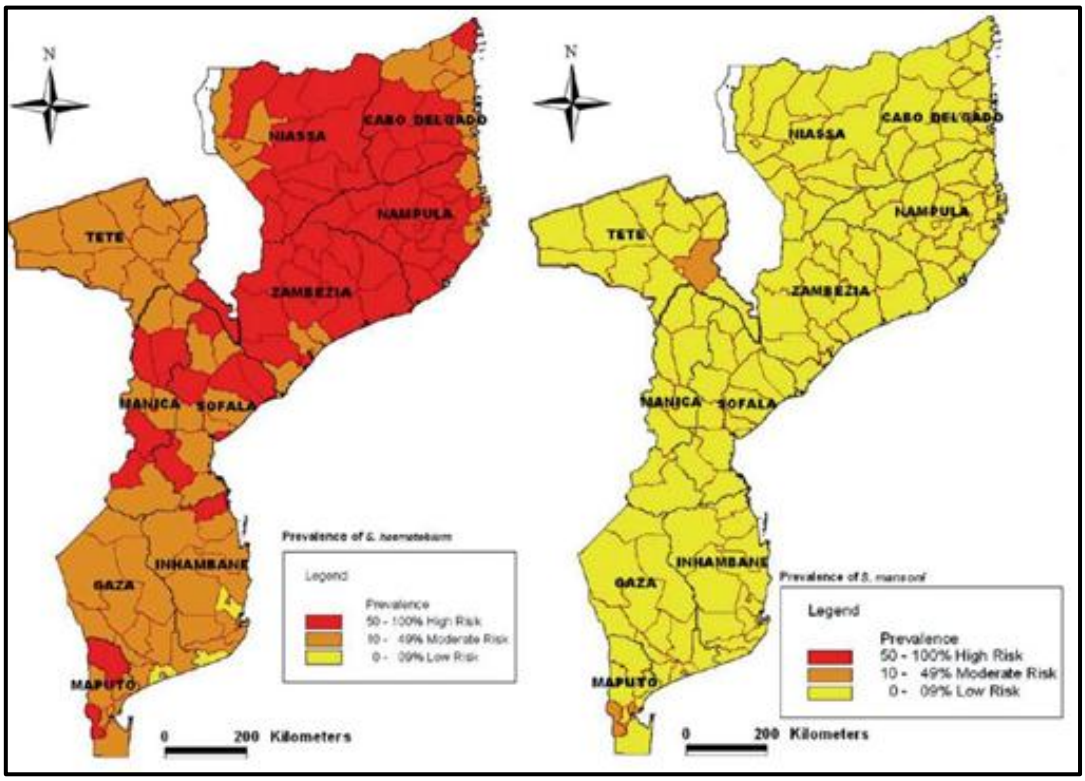


Figure 8-19: Distribution of intestinal *S. haematobium* and *S. mansoni* in Mozambique

8.2.4.5.1 National level

- WHO calculates that in Mozambique 16,326,177 are infected with schistosomiasis and 17,118,460 are in need of PC (WHO, 2010d, WHO, 2010y).

- While most parts of Mozambique are at moderate to high risk for *S. haematobium*, the risk for *S. mansoni* is relatively low (Figure 8-19) (WHO, 2010y).

- During a nationwide epidemiological survey (2005–2007) among schoolchildren (aged 9-14) across Mozambique a total of 83,331 individuals were tested for schistosomiasis and soil-transmitted helminthiases (STH) (Augusto et al., 2009). The overall prevalence rate was 47% for *S. haematobium* infection across Mozambique, with the northern parts of the country reporting higher rates of infection than the south.

8.2.4.5.2 Regional level

- The districts affected by the Project have a prevalence of *S. haematobium* between 10% and 100% and a prevalence <10% of *S. mansoni* (Figure 8-19) (Augusto et al., 2009, WHO, 2010y).

- The districts affected by the Project are targeted by the first MDA round, which consists of DEC + Albendazole as well as Albendazole/Mebendazole + Praziquantel.

8.2.4.5.3 Local Level

- The district health authorities reported that urinary schistosomiasis (*S. haematobium*) is very common in the area. Intestinal schistosomiasis (*S. mansoni*) is not very common.

8.2.5 EHA #5 – Food- and Nutrition-related Issues

In the past decade Mozambique had suffered from natural disasters, including droughts and floods in 2001 and 2007, which has led to the displacement of many thousands of people. Flooded land became unsuitable for cultivation and grazing and many landmines from the civil war in the 1970s are still posing a threat to the farmers.

The food situation is still critical. The latest food security outlook for Mozambique, released by the Famine Early Warning Systems Network in 2011, noted that 456,000 people were in need of food assistance between April 2010 and March 2011. The Ministry of Agriculture estimated that in the centre and south of the country 605,000 hectares of planted land were lost to drought - equivalent to 30% of the total land planted in the affected areas - representing a national loss of 13% maize and 11% of cereal production for 2011. Many Mozambicans had lost their crops twice, moving from drought areas to fields which were afterwards submerged by flooding (IRIN, 2010).

8.2.5.1 Malnutrition

The fourth report on global nutrition showed that the challenge of malnutrition is still very high and that progress to reduce it in most parts of the world is slow. It was estimated that in the year 2000, 182 million preschool-aged children, or one-third of children below the age of 5 years in developing countries were stunted, while about 27% were underweight, which underscored long-term cumulative inadequacies of health and/or nutrition [37].

Malnutrition has been known to not only result from, but also perpetuate poverty and undermines socio-economic growth in the affected communities. It remains one of the greatest concerns in public health and the largest contributing factor to child mortality in developing countries, where the majority of children who are malnourished are concentrated. Malnutrition links into more than half the deaths of children, as a co-morbid factor, as malnourished children are more likely to acquire infections through low levels of inherent resistance. They are more likely to die from common childhood illnesses, such as diarrhoea and respiratory tract infections, and if they survive these initial insults, they often enter a continuous cycle of illness until they do eventually succumb to an infection. It is very important to understand that ¾ of children that die with a link to malnutrition only have moderate levels of under-nourishment thus not making this very visible in general communities.

Three global indicators of malnutrition are usually assessed: stunting (height-for-age), wasting (weight-for-height) and underweight (weight-for-age) among children under the age of five. These are usually calculated against WHO reference standards. Wasting, also referred to as acute malnutrition, is a widely used measure to determine food availability or burden of disease estimation in affected populations. Stunting is also referred to as chronic malnutrition. It reflects a deficit in the consumption of micro- and macro-nutrients and also potential exposure to infections, poor water and sanitary conditions. Underweight reflects both, the poor past (chronic) and/or present (acute) under-nutrition of the (under 5 years of age) population. This has a particular reference to food availability in the community over time.

8.2.5.1.1 National level

- According to Food and Agriculture Organization (FAO), Mozambique is one of the countries with a high prevalence of under-nourishment, with 35 to 50% of the population being undernourished between 2003 and 2005 as shown in Figure 8-20 (FAO, 2006).

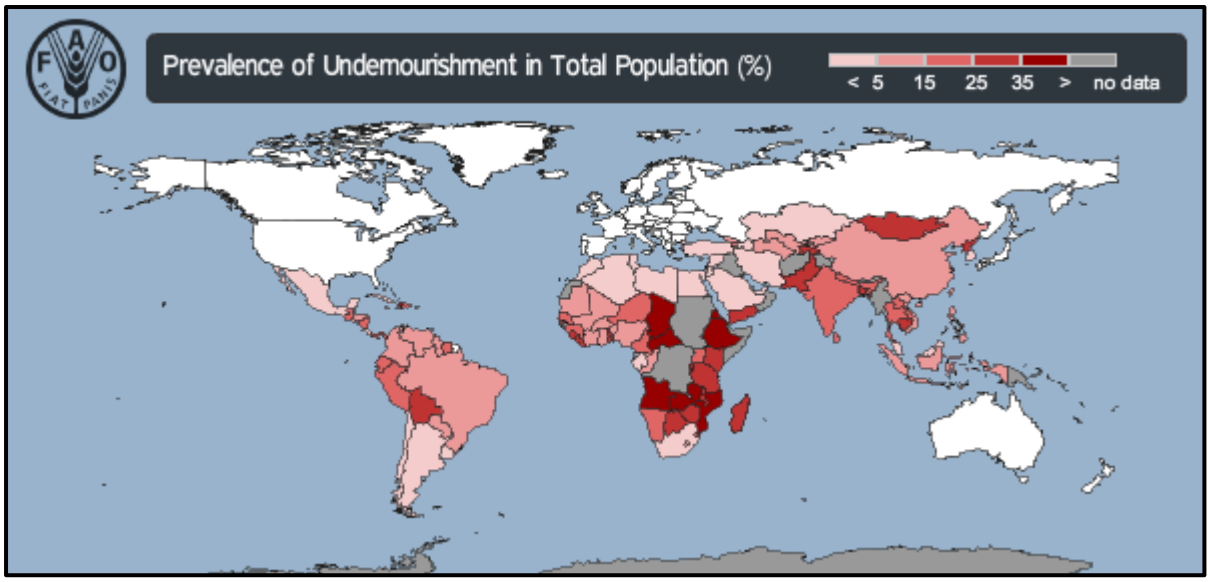


Figure 8-20: Worldwide map of undernourished population

- The 2011 MDHS found that about four in ten (42.6%) Mozambican children under the age of five are stunted, 14.9% are underweight, while 5.9% are wasted (Instituto Nacional de Estatística (INE) et al., 2012).

Table 8-2: Summary of nutritional indicators in Mozambique in 2011

Background characteristic	Severely wasted (<-3 SD)	Wasted (<-2 SD)	Stunted (<-2 SD)	Underweight (<-2 SD)	Total number of children sampled
Male	2.5%	6.4%	44.7%	16.6%	5,140
Female	1.8%	5.4%	40.5%	13.3%	5,173
Total	2.1%	5.9%	42.6%	14.9%	10,313
2011 MDHS – Cabo Delgado	*1.5%*	*5.6%*	*52.7%*	*20.6%*	*879*

8.2.5.1.2 Regional level

- The 2011 MDHS found that more than a half of children (52.7%) in Cabo Delgado Province under the age of five are stunted, 20.6% are underweight, while 5.6% are wasted (Instituto Nacional de Estatística (INE) et al., 2012).

- Cabo Delgado has the second highest rate of children with chronic malnutrition in Mozambique(Instituto Nacional de Estatística (INE) et al., 2012).
- Acute malnutrition (wasting) is observed in 3.5% of children at a moderate level and in 0.7% of children at a severe level.

8.2.5.1.3 Local Level

- The district health authorities estimated the prevalence of malnutrition in the district to be 3% amongst children aged 0-5 years. They linked this mainly to bad feeding practices. However, the district authorities reported that the prevalence of malnutrition within the project area was not very bad.
- The district health authorities also reported that children under-five who were underweight was very common, about 98%.

8.2.5.2 Anaemia and Micro-nutrient Deficiencies

Iron deficiency and anaemia are public health problems in both the developing and developed countries, where it is predicted that more than 2 billion people around the world are anaemic. Anaemia adversely affects health, cognitive development, school achievement and work performance. Young children and pregnant women are the most vulnerable groups, and this holds true for Mozambique (Sahn and Stifel, 2002, Osório et al., 2001).

Anaemia is the world's second leading cause of diability and thus one of the most serious global public health problems. It affects over half of pre-school children and pregnant women in developgin countries and at least 30-40% in industrialised countries. It is also one of the commonest preventable causes of death in children under 5 years and in pregnant women. Anaemia is a common cause of morbidity and mortality in resource-poor settings in the tropics, especially with the high burden of disease from malaria, intestinal parasites (e.g. hookworm infections) and the effects of malnutrition. Although other causes of anaemia, such as haemorrhage, infections, genetic disorders, and chronic diseases play a role, nutritional deficiency (due primarily to a lack of dietary iron) accounts for the majority (half the global burden) of anaemia cases. Iron deficiency, is caused by inadequate dietary intake of bio-available iron, increased iron requirements during rapid growth periods (such as pregnancy and infancy), and increased blood loss/haemolysis due to parasitic infections (WHO, 2013a).

8.2.5.2.1 National level

- The 2011 MDHS found that a little more than two-thirds (68.7%) of Mozambican children aged 6-59 months have anaemia (haemoglobin <11g/dl). Children in rural areas are more likely to have anaemia than children in urban areas (72% to 59.7%, respectively). Four percent of children were found to have severe anaemia (<8g/dl) (Instituto Nacional de Estatística (INE) et al., 2012).

- The same survey found that more than a half (53.9%) of women of reproductive age (15-49 years) had anaemia. Only 1.4% were found to have severe anaemia (Instituto Nacional de Estatística (INE) et al., 2012).

8.2.5.2.2 Regional level

- More than three-quarters (75.9%) of children between 6-59 months old in Cabo Delgado Province were found to have anaemia during the 2011 MDHS. However, only 5.5% had severe anaemia (Instituto Nacional de Estatística (INE) et al., 2012).

- Three in five women (61.1%) women of reproductive age (15-49 years) in Cabo Delgado were found to have anaemia during the same survey. About 2% had severe anaemia (Instituto Nacional de Estatística (INE) et al., 2012).

8.2.5.2.3 Local Level

- The district health authorities reported that micronutrient deficiencies are not very common in the district. However, anaemia is common because of bad feeding practices.

- The district health authorities provide regular education programmes for women on how to feed their children well.

8.2.6 EHA #6 – Accidents/Injuries

Road traffic accidents (RTA) and injuries are a huge and growing problem in the developing world, regardless of whether the setting is rural or urban. In addition, there are often very high rates of household injuries and accidents, such as burns, falls or drowning. Dramatic upsurges in local populations usually outpace the development of effective transportation infrastructure hence; there is a significant risk of road traffic accidents that is superimposed on a fragile medical response system. In many developing country settings, urban area hospitals have an enormous burden of accident victims, and it is not uncommon to find almost 50% of in-patient beds occupies by trauma patients (IFC, 2009).

8.2.6.1 National level

- Estimated road traffic mortality rate in Mozambique is 31.6-38 deaths per 100,000 population.
- In 2007, 1,502 road traffic fatalities were recorded (74% male, 26% female). Additionally, there were 7,065 non-fatal road traffic injuries (WHO, 2011h). These are likely to be underreported.
- Pedestrians are most vulnerable victims in road traffic accidents and account for the majority of deaths (68%). The remaining is divided between drivers (18%) and passengers (14%) of 4-wheelers (WHO, 2011h).

8.2.6.2 Local Level

- Road traffic accidents are not very common in the community. Generally 1-2 every month, which may be as a result of motorbikes or bicycles.
- There are also very few cases of drowning.
- There were three crocodile attacks in the dam in 2012. Two of the incidents were fatal.
- Snake bites are rare, usually about 3-4 every year.

8.2.7 EHA #7 – Exposure to Potentially Hazardous Materials, Noise and Malodours

These may also be listed as environmental health determinants and include items such as pollution of air, soil and water as well as possible exposure to pesticides or other organic or inorganic pollutants, noise and malodours. The pathway of human exposure to pollutants can be complex and may be the result of a variety of sources as is shown in Figure 8-21 (Agency for Toxic Substances & Disease Registry (ATSDR), 2002).

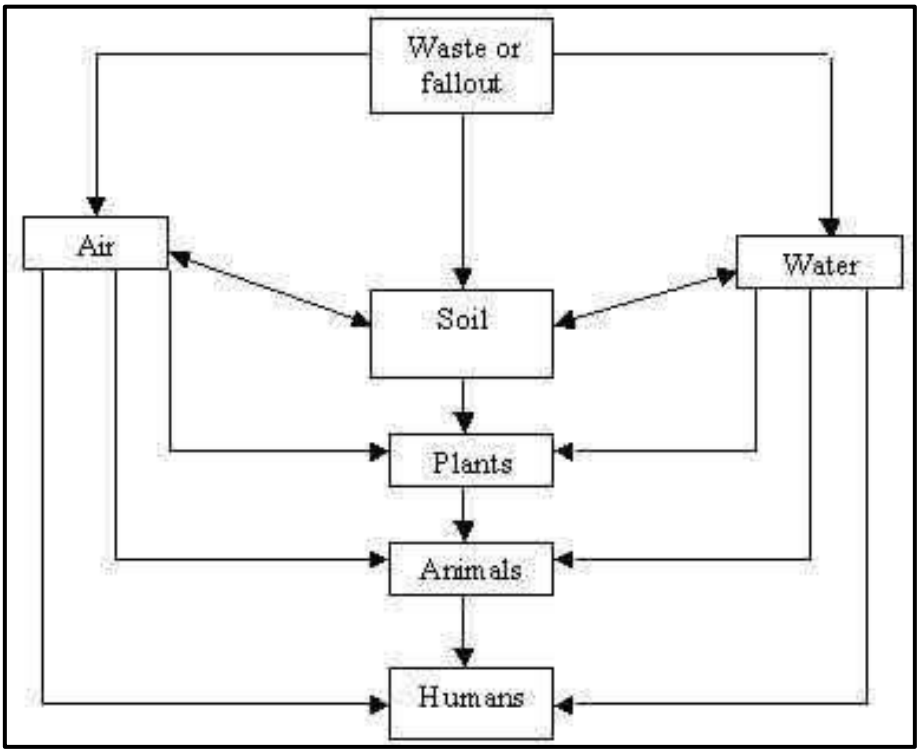


Figure 8-21: Pathway of exposure to pollutants

These environmental health determinants will not be commented on further at this stage as the community in the project area is located in a remote rural setting with no formal industry. Pollution will most likely be from motor vehicles, dust and through poor local environmental practices.

8.2.7.1 Environmental Health Determinants

The following environmental health determinants of the project need to be considered.

8.2.7.1.1 Hazardous chemical substances

The project will utilise different types of hazardous chemical substances (HCS) in the operational process or to support elements of the project. The process will use flocculants in the process (The flocculant to be used in this project is a polymer and is not considered to be hazardous). The HCS will need to be managed in the framework of best practice.

8.2.7.1.2 Noise and Vibration

The IFC and the WHO have recommended maximum limits for noise exposure in communities as a result of an operation of 55dBA and 45dBA during the day and night, respectively (WHO, 1999). No

Noise specialist studies for the Project are still underway and the HIA will need to be updated as soon as these are complete. Vibration is not expected to play a major role due the nature of the operations. No blasting will occur. However, the Australian and New Zealand standards to minimise annoyance from ground vibration will be used as a reference (Australian and New Zealand Environmental Council, 1990). The maximum level of airblast overpressure is 115 dB and the recommended maximum level for ground vibration is 5mm/sec peak particle velocity.

8.2.7.1.3 Air pollution

Graphite milling operations usually have environmental impacts from air pollution. Other than dust emissions there is unlikely to be significant air pollution that will pose a risk to human health. The main sources of dust will be from crushing and drying in the process plant (Metallicon, 2013). Air quality specialist studies are still underway and the HIA will need to be updated as soon as these are complete.

8.2.7.1.4 Water quality

Water quality and potential for pollution or changes in the water quality or quantity is a major concern and potential impact in the area and related to the project. BGM is undertaking a detailed hydro-census and is undertaking extensive inorganic water sampling of both water and ground water sources. Groundwater studies for the Project are still underway and the HIA will need to be updated as soon as these are complete.

8.2.7.1.5 Soil quality

The project is unlikely to influence soil quality to create a potential human health risk, however, graphite mines may have potential to result in soil contamination from the possible presence of naturally occurring radioactive material Measurements taken indicated the levels of radioactivity naturally occurring in radioactive materialswere in the order of 3 to 10 times the background level, and generally across the field locations where measurements were taken. Measurements on core samples at the core shed also followed the same trend, although one specific piece of core from drill hole BMDD0123 at a depth of 18m exhibited a value about 30 times background.

Calculations based on the field measurements indicate the dosage level encountered by personnel working in these areas will be less than 5mSv per year. This is considered to be “an area in which working conditions are kept under review but in which special procedures to control exposure to radiation are not normally necessary”. Potential risks to adjacent communities are therefore considered low.

As the project progresses to production, on-going monitoring will be conducted and any actions and mitigation measures required will be determined by the NORM guidelines.

8.2.7.1.6 Visual

Visual impacts have been recognised as potential impacts by the project and these will be addressed in the project EMP. The HIA will need to be updated as soon as this is complete.

8.2.7.1.7 Naturally Occurring Radioactive Material

Graphite projects have potential risks related to naturally occurring radioactive material, including uraniferous graphite. This risk needs to be assessed.

8.2.7.2 Local Level

- There is no pollution from any industry within the district.
- There have been no cases of heavy metal pollution or toxicity within the district.

8.2.8 EHA #8 – Social Determinants of Health

The social determinants of health are the conditions in which people are born, grow, live, work and age, including the health system. These circumstances are shaped by the distribution of money, power and resources at global, national and local levels. The social determinants of health are mostly responsible for health inequities – the unfair and avoidable differences in health status seen within and between countries (WHO, 2011f).

8.2.8.1 Health Seeking Behaviour

The manner in which people choose a health provider and at which stage of an illness they actually attend for consultation depends on a variety of factors. It is essential to understand these factors in order to gain an understanding of why and how entry is made into the health care system. Culture and spirituality influence health seeking behaviour. People may believe that western medicine may be effective in curing their ailment but their conviction is that mystical causes have also intervened; this obliges them to combine visits to the health care facilities with visits to traditional healers.

Several factors may influence health care use, including supply and demand. On the supply side, there is the availability of health care services, the cost of care, the technology and equipment available, the quality of management and the attitude of staff. On the demand side, there are the individual and household characteristics, perceptions and beliefs in the community, affordability (treatment, transport, and daily income), decision-making responsibility, accessibility and prioritization. All these factors need to be considered as they may become barriers to utilization of formal healthcare services. Without this understanding, any behavioural change efforts may not be effective.

8.2.8.1.1 National level

- In 2011, 91% of women reported that they have received antenatal care (ANC) from a skilled provider. This was an improvement from 85% in 2003 (Instituto Nacional de Estatística (INE) et al., 2012).

8.2.8.1.2 Regional level

- In 2011, 96% of women reported that they have received ANC by a skilled provider, which was an improvement from 89% in 2003 (Instituto Nacional de Estatística (INE) et al., 2005).

8.2.8.1.3 Local Level

- District health authorities reported that all women went to the health facility for ANC.

8.2.8.2 Life Style and Social Ills

Substance misuse such as alcohol, tobacco or other drugs is not only an important health determinant but also closely linked to mental health (Prince et al., 2007). Misuse is associated with crime, prostitution and domestic violence.

8.2.8.2.1 National Level

Tobacco

- A survey conducted in 2003 highlighted smoking patterns in the adult Mozambican population: tobacco consumption was 39.9% in men and 18.0% in women. Women consumed predominantly smokeless tobacco especially in the north. Hand-rolled and manufactured cigarettes were the most frequently consumed among men (Araújo et al., 2011).

Alcohol

- Similar studies estimated consumption of alcohol in 28.9% in women and 57.7% in men. The prevalence of current drinking increased with age and education among women and with income among men (Padrão et al., 2011).

- Figure 8-22 shows the adult per capita alcohol consumption worldwide in 2009. Mozambique was estimated to have an adult per capita consumption of between 0-3 litres of alcohol.

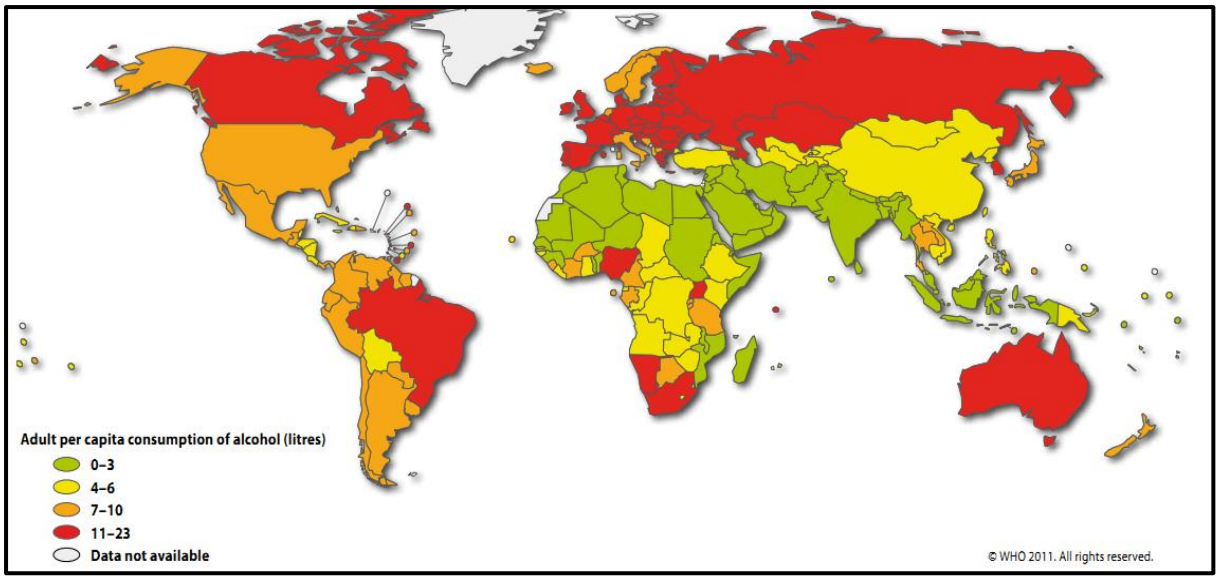


Figure 8-22: Adult per capita alcohol consumption, 2009

Teenage Pregnancy

- About 40% of Mozambican women fall pregnant before the age of 20. The risk of death amongst pregnant teenagers is four times higher than for women above the age of 20.

8.2.8.2.2 Local Level

- Most members of the community drink a lot of alcohol, especially during the harvest period. The district health authorities did not think that alcohol was a major contributor of disease.
- Smoking is also common in the community, though not as much as smoking.
- There is not much drug use within the community.
- Teenage pregnancy is common, usually leading to early marriages.

8.2.8.3 Gender-based Violence

Violence against women has profound implications for health but is often ignored. WHO's World Report on Violence and Health notes that "one of the most common forms of violence against women is that performed by a husband or male partner."

Although the adoption of the law on domestic violence in 2009 represents significant progress, its impact on the Mozambican society has been limited. A "domestic violence" unit has been created within the Ministry of the Interior but its means are too meagre to allow for effective action. Domestic violence enjoys considerable social legitimacy stemming from a widespread view that the man, as the head of family, has the prerogative to use force to solve marital disputes conflicts.

According to research by Africa for Women's Rights, rape accounts for half the reported cases of violence against women in Mozambique. Sexual abuse at school, including harassment of girl students by their teachers or by fellow students, has increased alarmingly. According to the Mozambican law, incest is rape with aggravating circumstances, but there is no specific government policy to control this type of violence. There is no sanction for marital rape.

8.2.8.3.1 National level

- The 2011 MDHS included a module of violence designed to capture experiences of gender-based violence. A greater proportion of women (25.9%) reported having suffered some form of violence in the 12 months preceding the survey compared to 8.3% of men (Instituto Nacional de Estatística (INE) et al., 2012).

8.2.8.3.2 Regional Level

- During the 2011 MDHS, Cabo Delgado had the highest proportion of men (19.9%) who reported having experienced some kind of violence during the past 12 months. About a quarter of women (23.9%) reported having experienced some form of violence during the same period of time (Instituto Nacional de Estatística (INE) et al., 2012).

8.2.8.3.3 Local Level

- Community residents reported the presence of gender-based violence within their households.

8.2.8.4 Education

Education is a key determinant to support and uplift the health status and well-being of an individual in a society and, indeed, communities. Many studies have shown that educational attainment has a strong effect on reproductive behaviour, contraceptive use, fertility, infant and child mortality, morbidity, and attitudes and awareness related to family health and hygiene. Education is related to gender, poverty and social practices since females have less access to education then males (Colclough et al., 2000). Many of the health indicators recorded in the MDHS are linked to levels of education.

8.2.8.4.1 National level

- Figure 8-23 shows the level of education amongst adults aged 15-49 in Mozambique as found during the 2011 MDHS. Almost a third of women (31.2%) were found to have no formal education at all compared to 12.8% in men. Only 2.6% of men and 1.3% of women were found to have more tertiary education (Instituto Nacional de Estatística (INE) et al., 2012).

- Despite increase in enrolment in school of children in past years, number of teacher per pupils remains low. This affects quality of education and drop-out rates in school are high and completion in primary schools remains well below the regional average and hinders progress towards the Millennium Development Goal (MDG) (UNICEF, 2011b).

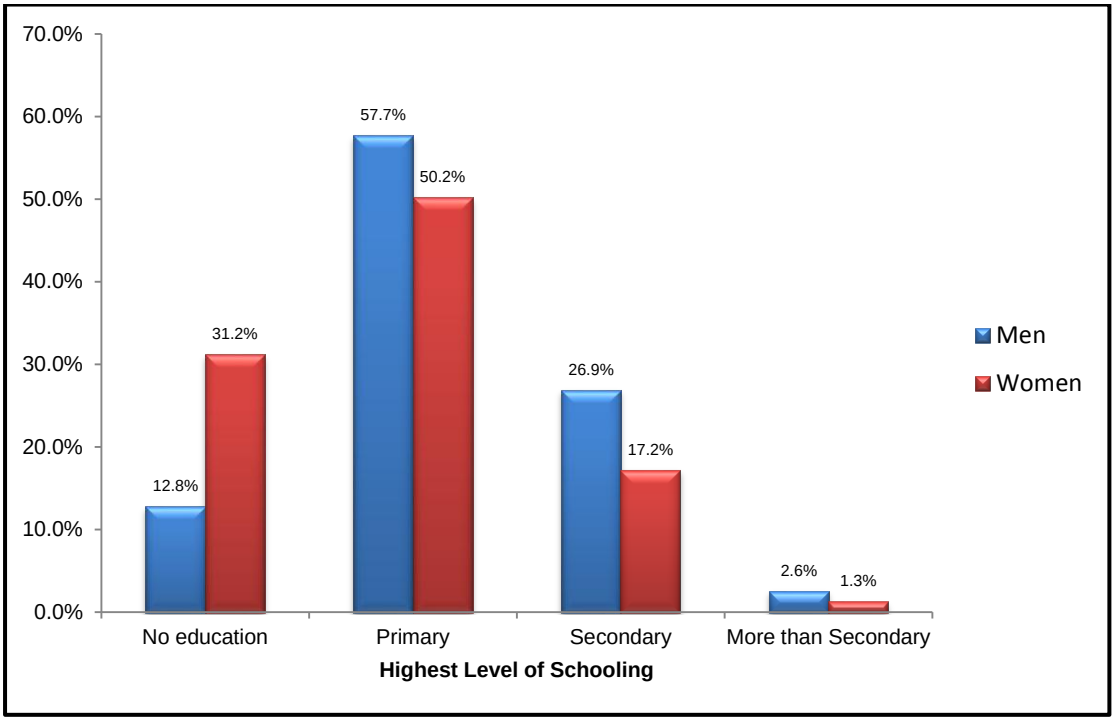


Figure 8-23: Level of education in Mozambique, 2011

8.2.8.4.2 Regional level

- In Cabo Delgado Province school attendance is above national average. 70.2% of women and 71.9% of men have attended primary school (Instituto Nacional de Estatística et al., 2010). 22.0% of women did not attend any school (6.6% men).

8.2.8.4.3 Local Level

- Just over a quarter (27%) of women in Balama District are reported to be well versed in Portuguese. The illiteracy rate in the female population is 96% and 77% for men. Women in the district with more than 5 years, 85% have never attended school and only 2% completed primary school. The highest rate of female enrolment occurs in the age group of 10 to 14 years, in which 17% of girls attend school. This indicator shows the low level of education and late entry into school for most girls, especially in rural areas.

8.2.8.5 Employment

The economy of Balama District is primarily dependent on agriculture. Most of the people conduct multiple livelihood activities that include crop production and livestock keeping and small-scale trading. During FGDs, respondents reported that there are no employment opportunities for the youth in the project area.

8.2.9 EHA #9 – Cultural Health Practices

8.2.9.1 Traditional Medicine

Traditional medicine is the sum total of knowledge, skills and practices based on the theories, beliefs and experiences indigenous to different cultures that are used to maintain health, as well as to prevent, diagnose, improve or treat physical and mental illnesses. Traditional medicine that has been adopted by other populations (outside its indigenous culture) is often termed alternative or complementary medicine. Herbal medicines include herbs, herbal materials, herbal preparations, and finished herbal products that contain parts of plants or other plant materials as active ingredients (WHO, 2008b).

Traditional medicine (TM) plays an important role in many African countries, especially in rural areas. For a number of reasons this is often the primary route of health consultation. The way communities perceive illness has a deep-rooted cultural basis. Where access and cost is a major determinant of access to modern health care this only serves to reinforce the use of TM.

African traditional medicine is part of the culture of African people, and is therefore closely linked to their beliefs. Many people refuse to believe the scientific explanation of an illness or disease (Gessler et al., 1995).

8.2.9.1.1 Local Level

- There are about 60 traditional medical practitioners in the district. The district usually tries to collaborate with them.
- Most of the people who go to traditional healers are those who live far away from a health facility.
- There is one traditional medical practitioner present in Ntete. The health authorities in Ntete were not sure what he usually treats. However, they said that he usually attends meetings at the hospital.

8.2.10 EHA #10 – Health Systems Issues

The WHO highlighted that Africa bears 25% of the world's disease burden with only 3% of the world's health workers (WHO, 2008a).

8.2.10.1 Health Infrastructure

The health system in Mozambique is comprised of the public sector, the private sector, and the private not-for-profit sector. However, the public sector is the main provider of health services nationwide. It plays a main role in defining policies, developing strategic plans, resource mobilization and allocation as well as developing cooperation relations. There are 10 provincial health directorates, 128 district health, women and social welfare directorates that supervise and follow up the implementation health care provision in 1277 health units countrywide (number of health units in 2007).

The national health system is organized into four levels of care:

- Levels I and II, which are the most peripheral ones and which are meant for implementing the Primary Health Care (PHC) strategy and serve as a referral for the clinical conditions that do not have response at Level I; and
- Levels III and IV which are fundamentally meant for more specialised curative care and serve as a referral for the immediately inferior levels.

Despite the efforts endeavoured by the Ministry of Health to overcome the shortage of human resources, the human resources deficit is still notorious in the provinces of Zambézia, Nampula, Cabo Delgado and Tete.

8.2.10.1.1 National level

- The 2003 MDHS found that only 50% of the Mozambican population had access to an acceptable level of health care. Just over a third (36%) of the population had access to health care within a radius of 30 minutes from their houses. There were high disparities between rural (20.9%) and urban areas (68.1%). In the rural areas 4% or more households take at least 2 hours to reach the nearest health unit (Instituto Nacional de Estatística et al., 2005).
- Figure 8-24 shows the gap in density of health personnel between Mozambique and the average for the African Region in the year 2002 (WHO, 2006c).

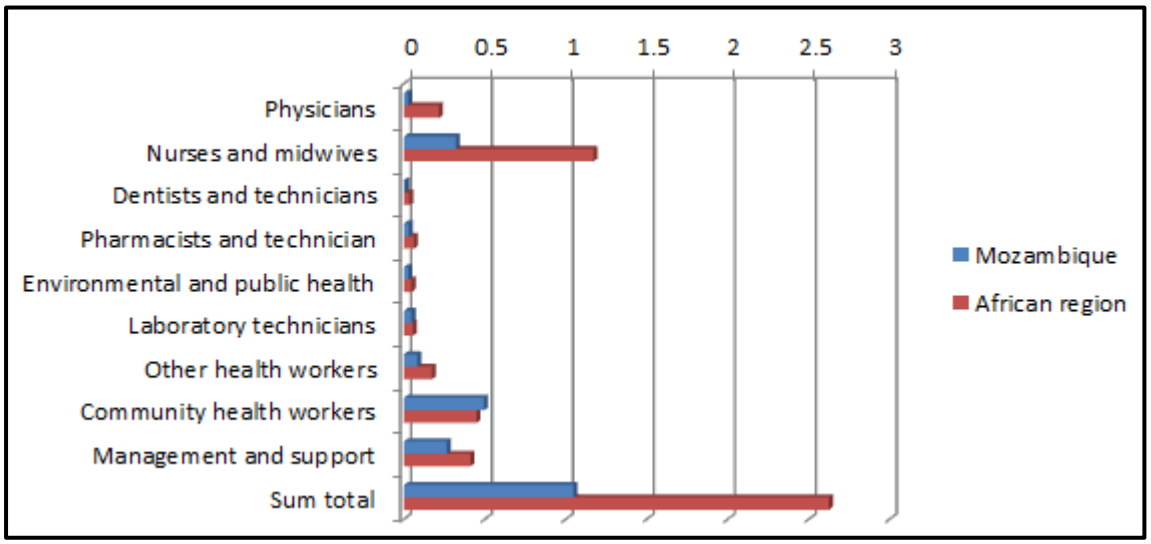


Figure 8-24: Densities of health workers per 1,000 population

8.2.10.1.2 Local Level

- There are only two health facilities within the immediate vicinity of the project. These are Balama Hospital and Ntete Health Centre. These are shown in Plan 3 (Appendix A).
- Complicated cases are usually referred to Montepuez, then Pemba and then Nampula.
- Most people live far away from a health facility and do not have immediate access to one. The costs for consultation are 1 Metical and 5 Metical for medicine.
- Most of the health facilities in the district lack a stable water supply, a maternity ward, electricity and ambulances. These were identified as the critical needs of the health facilities.
- There is only one medical doctor in the whole district. All other health facilities are manned by nurses.
- The district health authorities reported that there is generally a good stock and supply of drugs and consumables.

8.2.10.2 Health Information Management Systems

8.2.10.2.1 Local Level

The health information management system (HMIS) is functioning in the area but does have limitations related to human resource capacity and diagnostic services. There are thus likely to be gaps in diagnosis (thus recognition and reporting) and recording. Most health information that originates from the health centres in the Project area will need to be interpreted with these limitations in mind.

8.2.10.3 Reproductive Health

Reproductive health implies that people are able to have a responsible, satisfying and safe sex life and that they have the capability to reproduce and the freedom to decide if, when and how often to do so. This includes the right of men and women to be informed of and to have access to safe, effective, affordable and acceptable methods of fertility regulation of their choice, and the right of access to appropriate health care services that will enable women to go safely through pregnancy and childbirth. This will provide couples with the best chance of having a healthy infant (WHO, 2013p).

Fertility and its determinants

8.2.10.3.1 National level

- The 2011 MDHS estimated the total fertility rate (TFR) in Mozambique to be 5.9 children per woman. However, this is higher in rural areas than in urban areas (6.6 compared to 4.5 children per woman, respectively) (Instituto Nacional de Estatística (INE) et al., 2012).
- According to WHO, 71% of births happen in rural areas (WHO, 2004b).
- Age at first sexual intercourse is very low in Mozambique (Instituto Nacional de Estatística et al., 2010). A quarter of youth aged 15-24 years has had its first sexual intercourse before the age of 15. Between 64-85% have had their first time before the age of 18 (Figure 8-25).

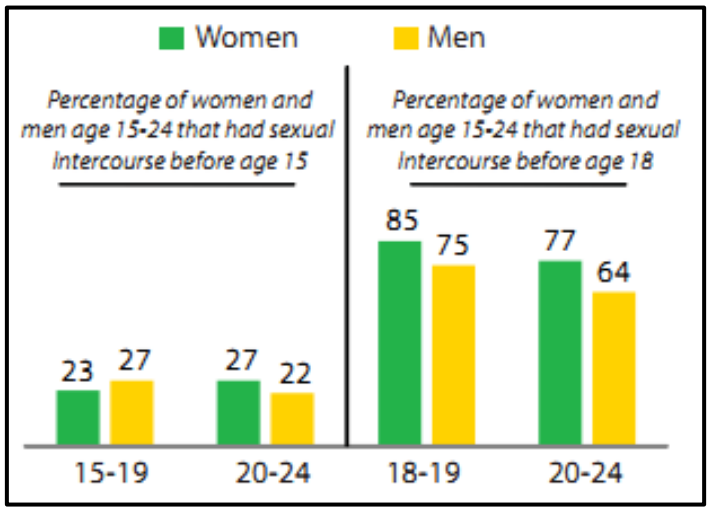


Figure 8-25: Age at First Sexual Intercourse in 15-24 age group, Mozambique 2009

Family Planning

8.2.10.3.2 National level

- According to the 2011 MDHS, only 12% of Mozambican women use contraceptives (of any kind). The use of contraceptive methods is much higher in urban areas than in rural areas. About one in five (21%) of urban women use contraception (of any kind) compared to 7% in rural areas (Instituto Nacional de Estatística (INE) et al., 2012).

8.2.10.3.3 Regional Level

- According to the 2011 MDHS, only 3% of women in Cabo Delgado use contraception of any kind (Instituto Nacional de Estatística (INE) et al., 2012).

8.2.10.3.4 Local Level

- According to the district health authorities, contraceptives are available at all health centres in the project area for free.
- The most commonly used contraceptives are pills and injectibles.

Breastfeeding

Exclusive breastfeeding is very important during early childhood. It not only supports the basic nutritional needs of the child but it also boosts their immunity through transfer of antibodies from mother to child. It also encourages maternal bonding and provides a natural form of contraception which promotes child spacing. The WHO recommends that breastfeeding should be provided exclusively for the first six months of life and then supported by supplemental food up until a minimum of 2 years of age (UNICEF, 2011a).Breastfeeding of infants has a positive impact on child survival reducing ARIs and diarrhoea and other infectious diseases.

8.2.10.3.5 National level

- There has been a remarkable improvement in breastfeeding patterns in Mozambique in the past decade which might be attributed to health education campaigns. As Figure 8-26 shows, percentage of children breastfed in the first 3 months of life increased from 37.6% to 48.4% and for those that breastfed exclusively for 6 months increased from 30% to 36.8% between 1997 and 2008 (UNICEF, 2010a).
- The 2011 MDHS noted that 94% of children under the age of 3 years were breastfed for at least one year. However, less than a half (41%) were exclusively breastfed for at least six months (Instituto Nacional de Estatística (INE) et al., 2012).

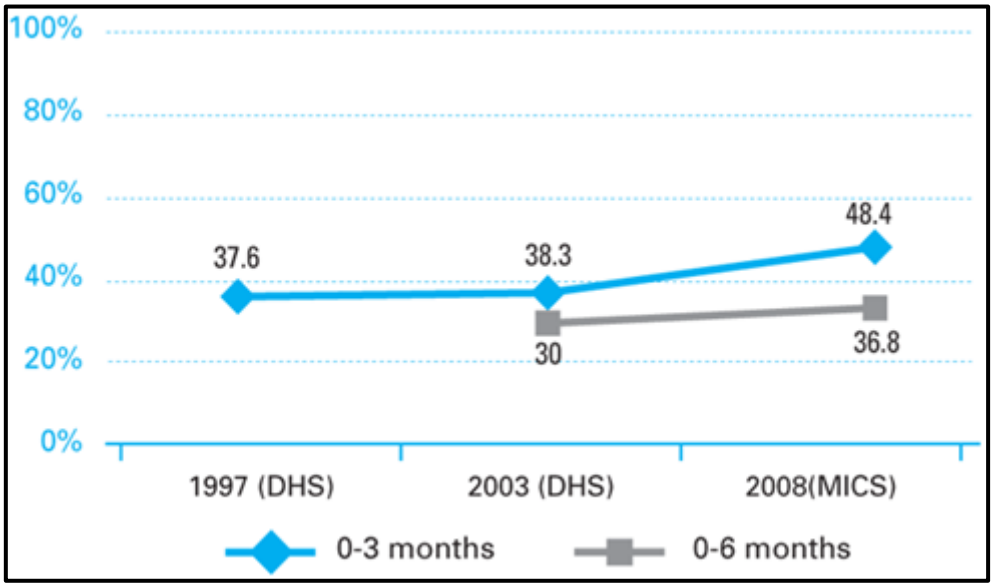


Figure 8-26: Breastfeeding trends in Mozambique, 1997-2008

8.2.10.3.6 Regional level

- The 2008 MICS found that 18.2% of children aged 0-5 months were exclusively breastfed in Cabo Delgado province (Instituto Nacional de Estatistica and UNICEF, 2009).

8.2.10.4 Maternal Health

Maternal health refers to the health of women during pregnancy, childbirth, and the post-partum period. While motherhood is often seen as a positive and fulfilling experience, for many it is associated with suffering, ill-health and even death (WHO, 2013j).

A key element of maternal and child health services is the provision of safe delivery care. The proportion of deliveries in a health care setting, as well as the supervision of the delivery by a trained health provider, are both important determinants to good maternal and foetal outcomes. Accessibility issues may hamper women from accessing a safe delivery site, particularly in remote areas. High delivery fees and lack of trained midwives and health personnel may also discourage women from going to a health centre and force them to deliver at home.

8.2.10.4.1 National level

- The maternal mortality ratio (per 100,000 live births) in Mozambique has decreased from 1,000 deaths in 1990, 780 deaths in 2000 to 550 deaths in 2008. Therefore MMR is still alarmingly high (WHO, 2012g).

Delivery: Place and Assistance

- The 2011 MDHS found that the percentage of births attended by skilled health professionals was 54%. However, there's a large disparity between rural (44%) and urban areas (80%) (Instituto Nacional de Estatística (INE) et al., 2012).

8.2.10.4.2 Regional level

- According to the 2011 MDHS, only 36% of births were attended by a skilled professional. This is much lower than the national average of 54% (Instituto Nacional de Estatística (INE) et al., 2012).

8.2.10.4.3 Local Level

- Most women in the community deliver their children at the health facility. In villages that are far from the health facility, women are assisted by traditional birth attendants, or family and friends.
- District health authorities reported that the percentage of women who delivered in a health facility in the district is about 76%.
- The district health authorities reported that the maternal mortality rate was about 2 per 1,000.

8.2.10.5 Child Health

Ensuring the healthy growth and development of children is a prime concern of all societies. Children, especially newborns, are particularly vulnerable to malnutrition and infectious diseases, many of which can be effectively prevented or treated (WHO, 2013d).

8.2.10.5.1 National level

- Mozambique has high child mortality although a look at surveys conducted in the past decade shows a decreasing trend (Figure 8-27). In the 1997 MDHS under-five mortality was estimated at 159 per 1,000 children. The 2011 MDHS reported that under-five mortality has decreased to 97 per 1,000 children (Instituto Nacional de Estatística (INE) et al., 2012).

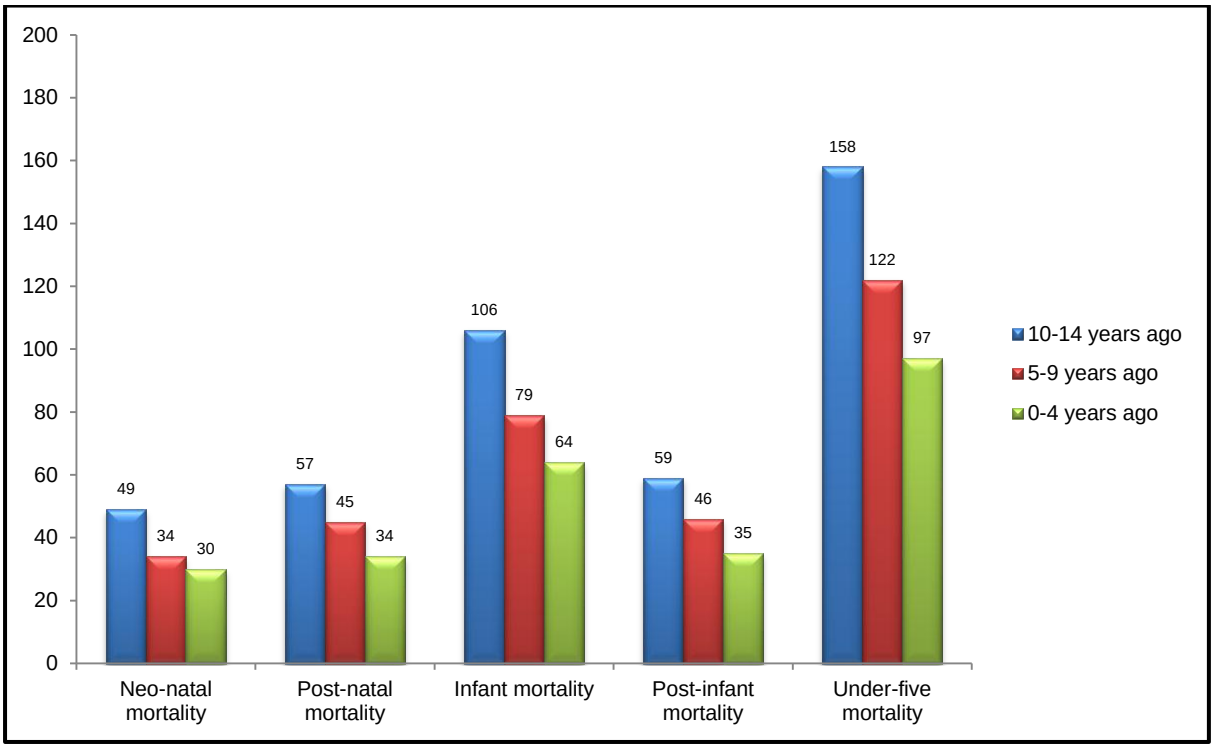


Figure 8-27: Child mortality trends

- Among the causes of child mortality, malaria was the biggest single killer (33% of deaths) in 2009 as depicted in Figure 8-28. Neonatal causes including prematurity and sepsis accounted for 16% of deaths (UNICEF, 2010a).

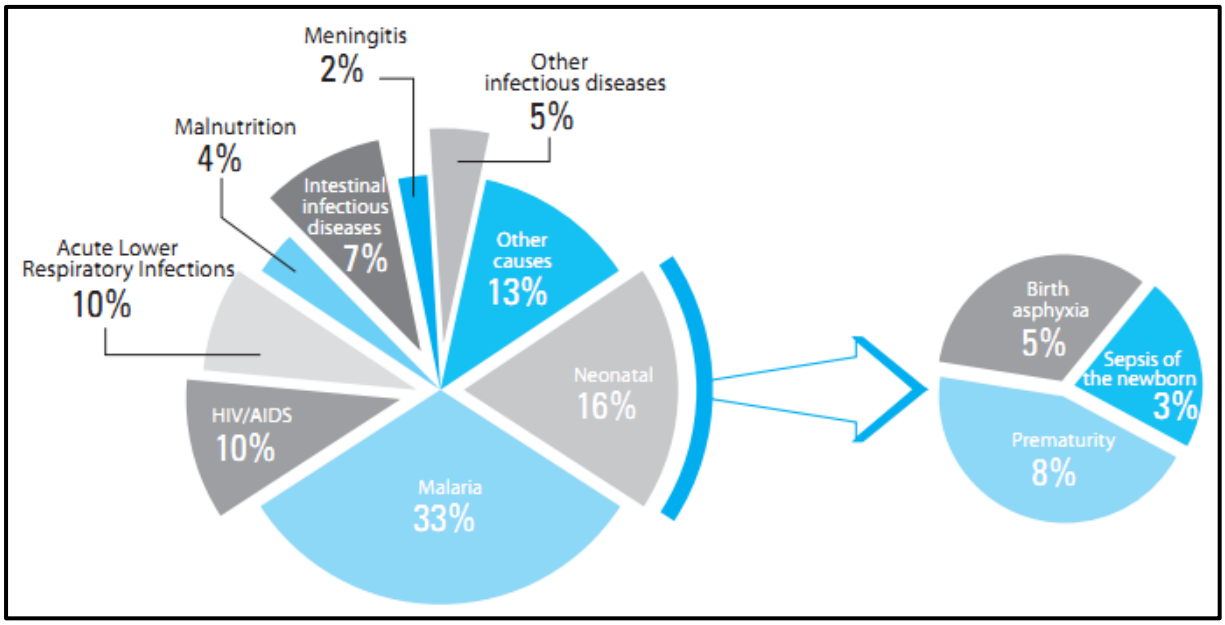


Figure 8-28: Causes of under-five mortality in Mozambique, 2009

8.2.10.5.2 Regional level

- Figure 8-29 shows under 5 mortality average rate in Mozambique by province in the decade 1998-2008 (Instituto Nacional de Estatistica and UNICEF, 2009). Under-5 mortality in Cabo Delgado is second highest in the country with 180 deaths per 1,000 live births.

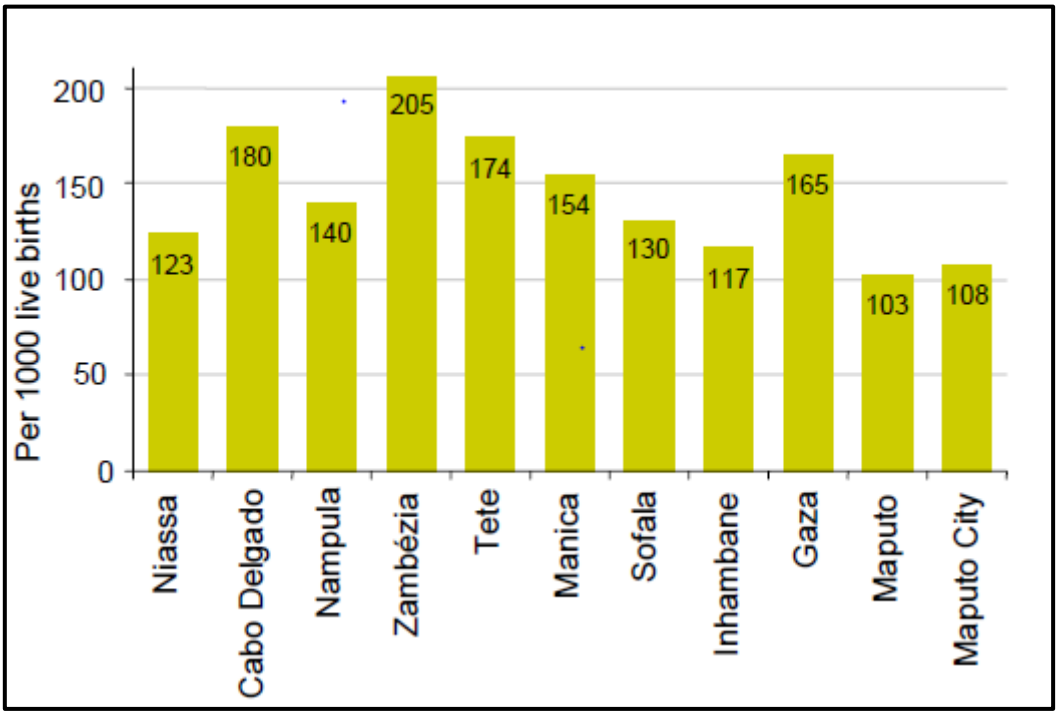


Figure 8-29: Under 5 mortality in Mozambique, 1998-2008

8.2.10.5.3 Local Level

- The district health authorities reported that the leading causes of death in children under five were malaria, malnutrition, diarrhoea and pneumonia. They said that the prevalence of infant mortality was about 4%.

8.2.10.6 Immunization

8.2.10.6.1 National level

- The immunization schedule in Mozambique (Table 8-3) is in line with the international norms for a developing country (Ministry of Health Mozambique, 2009). Immunization services are offered in approximately 1,160 health centres, which represent 91% of all health units in the existing health network. However, less than 50% of the country population is served by the existing health network (Ministry of Health Mozambique, 2009). Despite the progress seen in the last years, the overall vaccination coverage is

still low and is not equally distributed throughout the country, with a considerably lower coverage in rural areas.

Table 8-3: Immunization schedule in Mozambique

Vaccination for Infants			Women of child bearing age (15-49 years)		
Age	**Visit**	**Antigen**	**Visit**	**Interval**	**Antigen**
Birth	1	BCG, OPV0	1	0 (as early as possible)	TT1
6 weeks	2	DTP-HepB1, OPV1	2	4 weeks	TT2
10 weeks	3	DTP-HepB2, OPV2	3	6 weeks	TT3
14 weeks	4	DTP-HebB3, OPV3	4	1 year or subsequent pregnancy	TT4
9 months	5	Measles	5		TT5
6-59 months		Vitamin A supplement		All post-natal mothers	Vitamin A supplement

- Figure 8-30 shows the proportion of immunized children in children aged less than 12 months by dose and type of vaccine in Mozambique and Cabo Delgado in 2008. Overall, 60.3% of children aged 12-23 had all their vaccinations (Instituto Nacional de Estatistica and UNICEF, 2009). Moreover, 85% of mothers were in possession of a vaccination card for their child during the 2008 MICS.

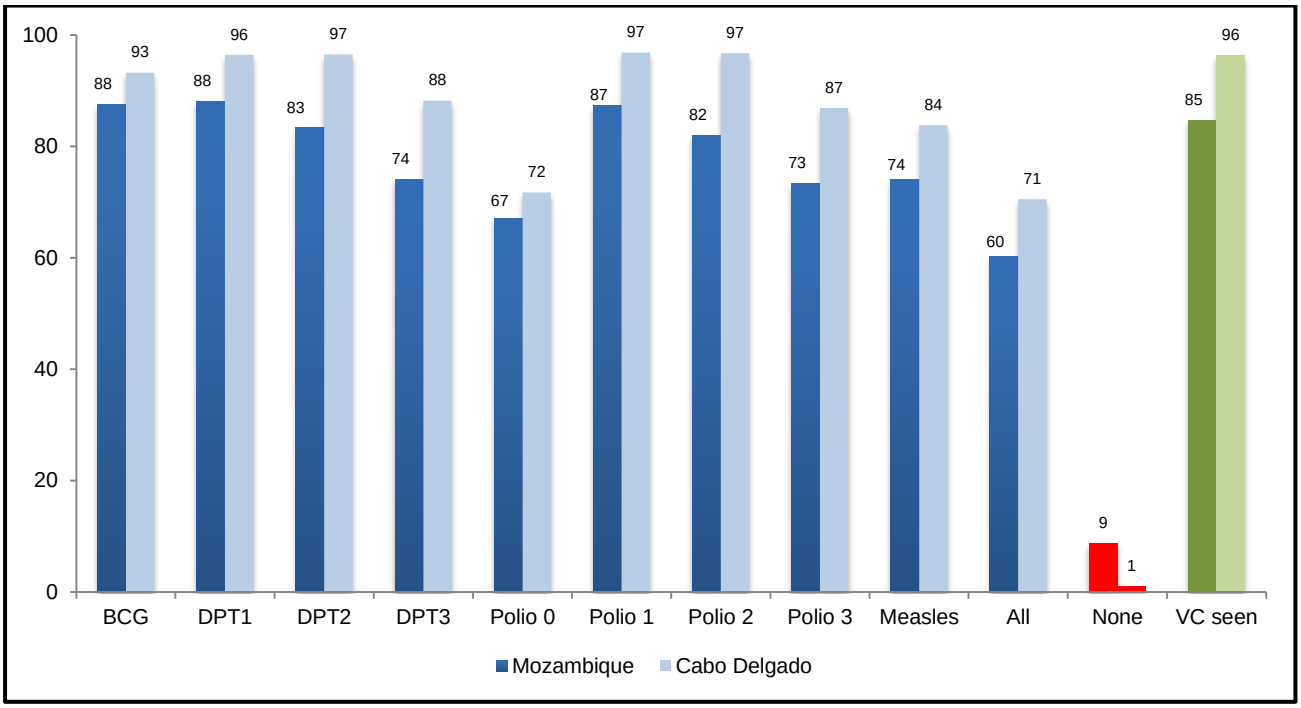


Figure 8-30: Rate of immunization before 12 months of age, Mozambique 2008

8.2.10.6.2 Regional level

- In Cabo Delgado, according to the 2008 MICS, 70.5% of children 12-23 months old have completed all their vaccinations, according to information provided by the vaccination card or by the mother (Instituto Nacional de Estatistica and UNICEF, 2009).
- Vaccination coverage in Cabo Delgado was in general higher than the national average. Moreover, 96% of mothers provided a vaccination card for their child (Figure 8-30).
- 71% of children have received all recommended vaccines (compared to 60% nationally) (Instituto Nacional de Estatistica and UNICEF, 2009).

8.2.10.6.3 Local Level

- The district health authorities reported that all women in the district take their children for vaccinations and that they believed the prevalence of children who had been vaccinated was 100%.

8.2.10.7 Program Management Delivery Systems

8.2.10.7.1 Donor Funded Programmes or active NGO programmes in the area

Within Balama District there are a handful of Non-Governmental Organizations (NGOs) which are involved in various health related activities. The most active organizations involved in health and other humanitarian activities include:

- Medecins Sans Frontieres (MSF): an international, independent, medical humanitarian organization that delivers aid to people. They mainly help with transportation of sick people from Balama to Montepuez or Pemba.
- Fundação Ariel Glaser contra o SIDA Pediátrico (ARIEL): is an affiliate of the Elizabeth Glaser Pediatric AIDS Foundation (EGPAF). They try to increase and support country-led HIV programmes by expanding local capacity (Fundação Ariel Glaser Contra o SIDA Pediátrico, 2011).
- Pathfinder International: is an international NGO that promotes healthy sexual and reproductive health practices. They provide contraception to support family planning practices within the local community.
- Medicus Mundi International: is an international NGO that supports health cooperation and advocacy. They provide consumables for health facilities in the local community, especially cleaning equipment.

8.2.11 EHA #11 – Non-communicable Diseases

According to a report on non-communicable diseases 2011 published by WHO, Mozambique reported 96,400 deaths due to NCD in 2008 (WHO, 2011i). In men, almost half (49.0%) of all NCD deaths occurred before the age of 60 (42.8% in women). In 2004, the Global Burden of Disease study estimated that 20.2% of total DALYs are associated with NCD (see Table 5-1) (WHO, 2004b).

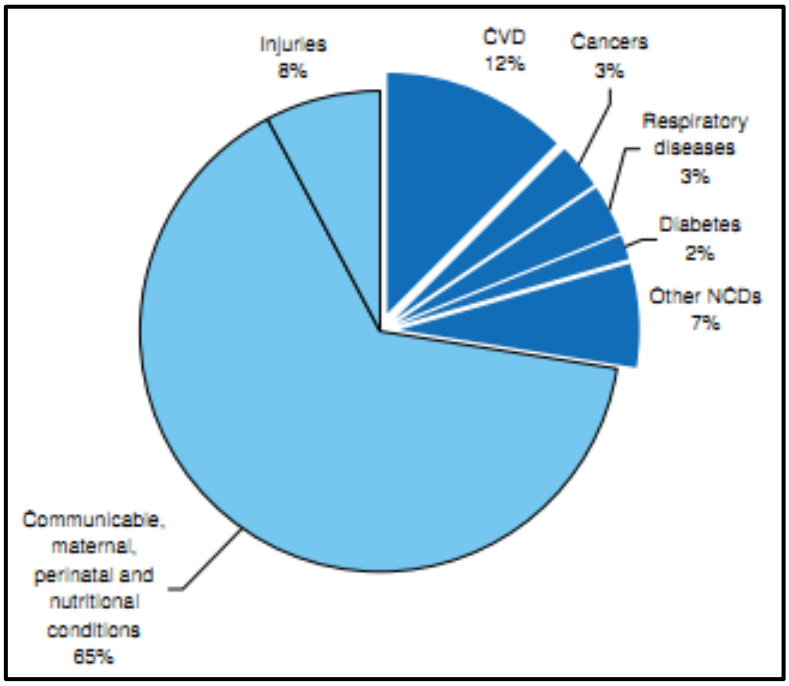


Figure 8-31: Proportional mortality (% of total deaths, all ages)

8.2.11.1 Cardiovascular Disease

Cardiovascular disease is caused by disorders of the heart and blood vessels, and includes coronary heart disease (heart attacks), cerebrovascular disease (stroke), raised blood pressuer (hypertension), rheumatic heart disease, heart failure, etc. The major causes of cardiovascular disease are tobacco use, physical inactivity, an unhealthy diet and harmful use of alcohol (WHO, 2013c).

8.2.11.1.1 National level

- There are an estimated 1,072-1,282 CVD (incl. diabetes) deaths in Mozambique per 100,000 population.
- Estimated hypertension prevalence was 44.9% in 2008 (46.7% in men and 43.3% in women) (WHO, 2011i).
- 26.5% of women and 14.9% of men were overweight in 2008 (WHO, 2011i).

- The major outcomes of a recent national study on the prevalence, awareness, treatment, and control of hypertension in the Mozambican population (3,323 participants) aged 25 to 64 years is presented in Figure 8-32 (Damasceno et al., 2009). The study emphasized on the need for strategies to improve prevention, correct diagnosis, and access to effective treatment in the country and raised concern about the lack of knowledge and poor control of hypertension.

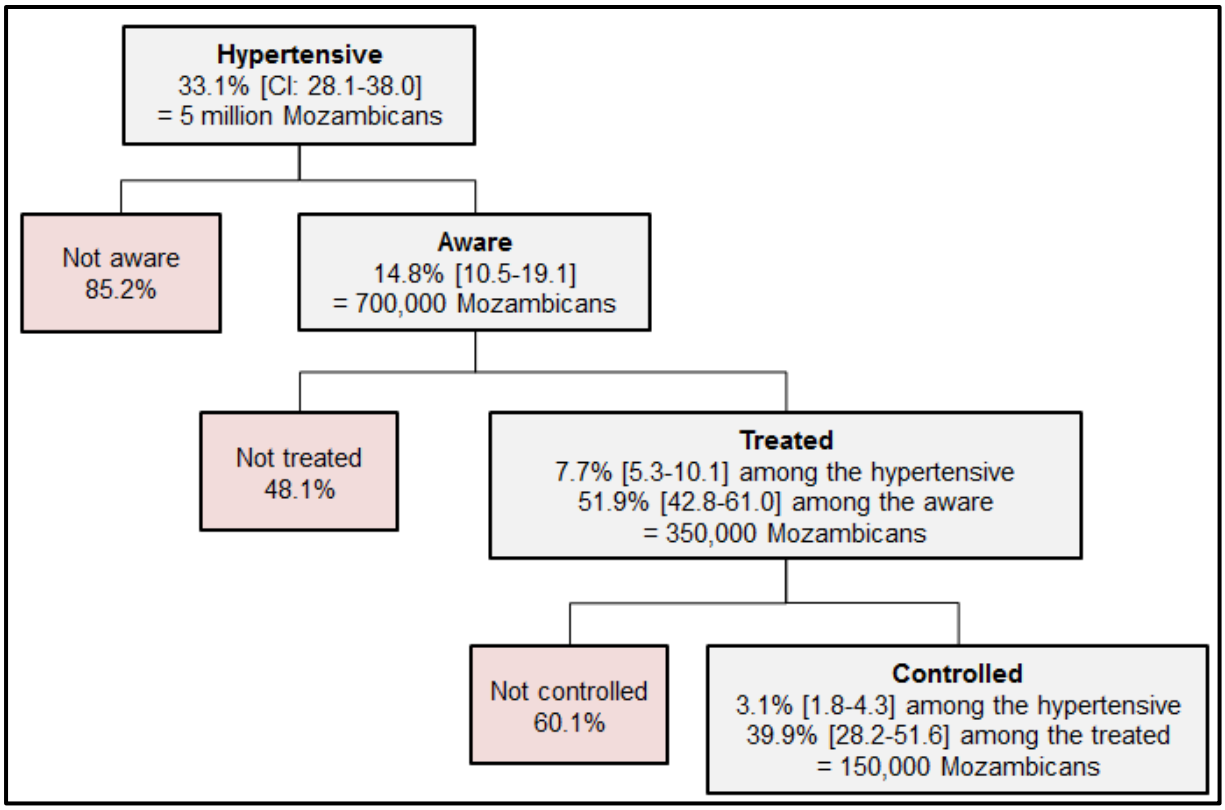


Figure 8-32: Prevalence, awareness, treatment, and control of hypertension

8.2.11.1.2 Local Level

- Cardiovascular diseases are not common within the district.

8.2.11.2 Cancer

Cancer is a leading cause of death worldwide, accounting for 7.6 million deaths (around 13% of all deaths) in 2008. Lung, stomach, liver, colon, and breast cancer cause the most cancer deaths each year. The most frequent types differ between men and women. About 30% of cancer deaths are due to the five leading behavioural and dietary risks:

- High body mass index;

- Low fruit and vegetable intake;
- Lack of physical activity;
- Tobacco use; and
- Alcohol use.

Cancer causing viral infection such as HBV and the human papilloma virus are responsible for up to 20% of all cancer deaths in low- and middle-income countries. About 70% of all cancer deaths in 2008 occurred in low- and middle-income countries. Deaths from cancer worldwide are projected to continue rising, with an estimated 13.1 million deaths in 2030 (WHO, 2013b).

8.2.11.2.1 National level

- Death rate in Mozambique for cancer (any kind) per 100,000 population was estimated at 90.9 for men and 95.0 for women (WHO, 2011i).
- 3% deaths were attributable to cancers in 2008 (Figure 8-31) (WHO, 2011i).
- Most common cancers are KS, oesophagus cancer and prostate cancer in men, regarding incidence as well as mortality rates (per 100,000). Women are most affected by Cervix uteri, breast cancer and KS (Globocan, 2008b).

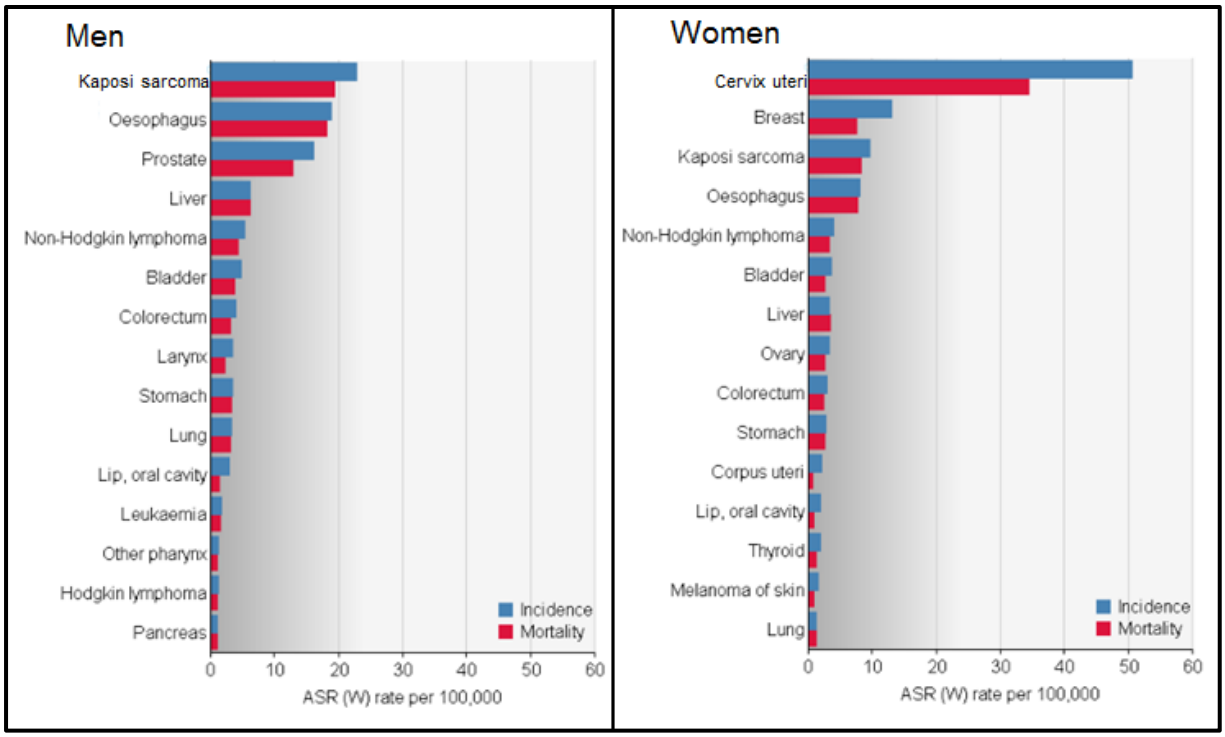


Figure 8-33: Estimated age-standardized incidence and mortality for men and women, 2008

8.2.11.2.2 Local Level

- Cancer is not common within the district.

8.2.11.3 Diabetes Mellitus

Diabetes is a chronic disease that occurs either when the pancreas does not produce enough insulin or when the body cannot effectively use the insulin it produces. Insulin is a hormone that regulates body sugar. Hyperglycaemia, or raised blood sugar, is a common effect of uncontrolled diabetes and over time leads to serious damage to many of the body's systems, especially the nerves and blood vessels. 347 million people worldwide have diabetes. Moreover, more than 80% of diabetes occur in low- and middle-income countries. WHO projects that diabetes will be the 7th leading cause of death in 2030 (WHO, 2013e).

8.2.11.3.1 National level

- Diabetes accounted for an estimated 2% of deaths in Mozambique in 2008 (see Figure 8-31) (WHO, 2011i).
- In a recent study published in 2009 the adult diabetes prevalence rate for Mozambique was estimated at 3.1% (see Figure 8-34) (Gill et al., 2009).
- In a study conducted on a representative sample of the Mozambican population in 2005, it has been found that the prevalence of diabetes was 2.5%. Diabetes was more frequent among urban dwellers, mostly due to urban-rural differences in age, education, body mass index (BMI) and waist circumference. 13% of all found diabetic were aware of their condition, 10.9% had undergone glycaemia determination during the previous year, and 9% were being treated with oral blood glucose-lowering drugs and 3% with insulin (Silva-Matos et al., 2011).
- Burden of cost for treatment is very high: it has been calculated that in Mozambique, diabetes care for one person requires 75% of the per capita income (World Diabetes Foundation, 2012)
- Access to care remains challenging for patients: Mozambique faces problems with availability of syringes and testing equipment. Lack of diagnostic tools and lack of trained health care workers resulted in misdiagnosis or failure to detect diabetes. The estimated prevalence of insulin-requiring diabetes differs more than 10-fold between urban and rural areas in Mozambique (Beran et al., 2005).

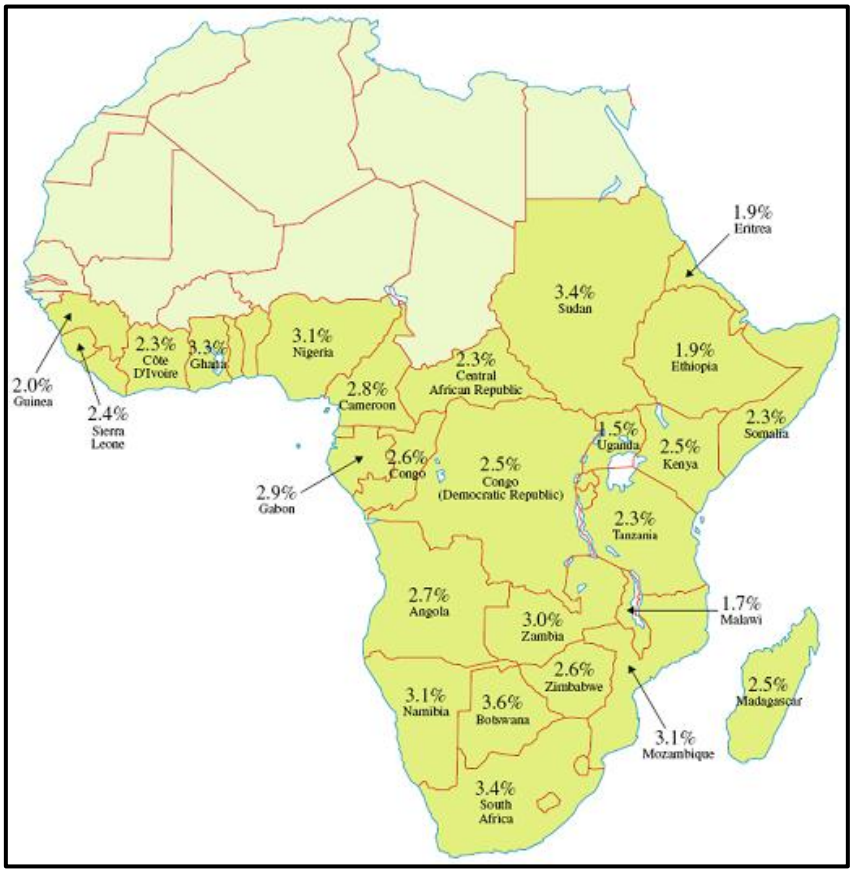


Figure 8-34: Diabetes prevalence in sub-Saharan Africa

8.2.11.3.2 Local Level

- Diabetes is not very common within the district. Moreover, most health facilities do not have any diagnostic equipment for diabetes.

8.2.11.4 Chronic Respiratory Disease

Chronic respiratory diseases are chronic diseases of the airways and other structures of the lung. Some of the most common are: asthma, chronic obstructive pulmonary disease, occupational lung disease and pulmonary hypertension.

8.2.11.4.1 National level

- 7.0% of Mozambicans were estimated to smoke in 2008. This was considerably higher in men (13.1%) than in women (1.5%) (WHO, 2011i).
- The use of solid fuels in households is a proxy indicator for indoor air pollution. In Mozambique, more than 95% of households are using solid fuels to cook (WHO, 2012g).

8.2.11.5 Mental Health

Mental health refers to a broad array of activities directly or indirectly related to the mental well-being of a person. It is related to the promotion of well-being, the prevention of mental disorders, and the treatment and rehabilitation of people affected by mental disorders (WHO, 2013l).

8.2.11.5.1 National level

- In 1990, a national program for mental health was launched in Mozambique with the aim to better integrate the important issue of mental health into the country's health system. The main components of the policy are advocacy, prevention, treatment and rehabilitation of mental disorders.

- According to the statistics of the Ministry of Health, Mozambique had, by 2008, 6 psychiatrists, 36 psychologists, 56 psychiatric technicians, and 2 therapists (MISAU, 2009). The number of professionals working in the field of mental health will increase significantly in the future as more than 100 students are actually undergoing training in this field. In 2005 each province had at least 2 mental health professionals. Service delivery primarily occurs in the two psychiatric national hospitals. Admissions are also made in general medicine wards, where approximately 3 to 5 beds are allocated to mental health cases (WHO, 2005b). However the mental health care in Mozambique is extremely poor and insufficient to cover the needs of the country as shown in Table 8-4.

Table 8-4: Psychiatric Beds and Professionals in 2005

Indicator (per 10 000 population)	**Mozambique**	**African Region**
Total psychiatric beds	0.23	0.34
Psychiatric beds in mental hospitals	0.2	n. a.
Psychiatric beds in general hospitals	0.04	n. a.
Psychiatric beds in other settings	0.01	n. a.
Number of psychiatrists	0.04	0.04
Number of neurosurgeons	0.01	0.01
Number of psychiatric nurses	0.01	0.2
Number of neurologists	0.01	0.02
Number of psychologists	0.05	0.05
Number of social workers	0.01	0.05

- Reliable information on the prevalence of mental disorders in Mozambique is scarce. According to the WHO Global Burden of Disease Statistics (year 2004) for Mozambique, mental health related ailments contributed 5% of the DALY in Mozambique as shown in Table 5-1 (WHO, 2004a).

Table 8-5: Estimated total DALYs ('000) for neuropsychiatric disorders in Mozambique

Neuropsychiatric conditions	DALYs
Unipolar depressive disorders	125
Bipolar disorder	50
Schizophrenia	50
Epilepsy	45
Alcohol use disorders	9
Alzheimer and other dementias*	11
Parkinson disease	2
Multiple sclerosis	3
Drug use disorders	15
Post-traumatic stress disorder	10
Obsessive-compulsive disorder	25
Panic disorder	23
Insomnia (primary)	9
Migraine	14
TOTAL (i.e. 5% of 9,656 DALYs in 2004)	**484**

- A recent study had per objective to assess the prevalence of three severe mental and neurological disorders in Mozambique that were identified as priorities by the Ministry of Health (psychoses, epilepsy and mental retardation) in one rural and one urban setting (Patel et al., 2007). Investigation of 2,739 households (1,796 in Maputo city; 943 in the rural town of Cuamba) revealed that lifetime prevalence rates for all three disorders were higher in rural than in urban settings. Prevalence of psychoses was 4.4% in Cuamba versus 1.6% in Maputo, mental retardation 1.9% vs. 1.3%, and epilepsy 4.0% vs. 1.6%. In about 75% of all cases, households had consulted a traditional medical practitioner. Moreover, nearly half the people with these disorders in rural areas were described as being of poor health.

8.2.11.5.2 Regional level

- The nearest psychiatric hospital or facility from the Project area is in Montepuez with the referral hospital in Pemba.

8.2.11.5.3 Local Level

- District health authorities reported that mental illnesses are not very prevalent in the district.

8.2.12 EHA #12 – Veterinary Medicine and Zoonotic Diseases

Zoonotic diseases are diseases caused by infectious agents that can be transmitted between animals and humans. Many factors lead to the emergence of zoonotic diseases. Environmental changes, human and animal demography, pathogen changes and changes in farming practice are a few of them. Social and cultural factors such as food habits and religious beliefs play a role too. Examples are avian influenza, Bovine Spongiform Encephalitis and the Nipah virus. Some zoonoses such as brucellosis and dog rabies are re-emerging in some regions, although they seem to attract less public attention. Emerging zoonotic diseases have potentially serious human health and economic impacts and their current upwards trends are likely to continue.

In the sub-Sahara African region zoonotic diseases are mostly under-diagnosed and under-reported due to poor disease surveillance coverage, poor diagnostic capacity, and the lack of clear strategies to address zoonotic diseases.

8.2.12.1 Influenza, H5N1 (Avian Flu) and H1N1 (Swine Flu)

Influenza viruses circulating in animals pose threats to human health. Humans can become ill when infected with viruses from animal sources, such as avian influenza (virus subtype H5N1) and swine influenza (virus subtype H1N1). The primary risk factor for human infection appears to be direct or indirect exposure to infected live or dead animals or contaminated environments (WHO, 2013h).

No cases of H5N1 or H1N1 have been reported in Mozambique in the past 3 years (WHO, 2011j).

8.2.12.2 Rabies

Rabies is a zoonotic disease that is caused by a virus. The disease affects domestic and wild animals, and is spread to people through close contact with infectious material, usually saliva, via bites or scratches. Once symptoms of the disease develop, rabies is nearly always fatal. Rabies is a neglected disease of poor and vulnerable populations whose

deaths are rarely reported. It occurs mainly in remote rural communities where measures to prevent dog to human transmission have not been implemented (WHO, 2013o).

8.2.12.2.1 National level

- Rabies is endemic in Mozambique as it is in most of sub-Saharan Africa (Figure 8-35). In fact, Mozambique is classified as a high-risk country for rabies (CIA, 2012).
- A country report on rabies in Mozambique was released in 2003. Rabies was reported to be a challenge due to the low socio economic conditions and the limited ability of the veterinary health authorities to control the disease. Dog rabies accounts for over 88% of confirmed cases. The case load is listed in Table 8-6. Only 16% of people bitten by dogs in Maputo City are reported receiving effective post exposure treatment against rabies. The situation is worse in the rural areas (M.P.R. Travassos Dias and F. Rodrigues, 2003).

Table 8-6: Human and animal rabies cases 1998-2002

	1998	1999	2000	2001	2002	Total
Human rabies	25	22	26	33	29	135
Animal rabies	24	31	17	22	33	127

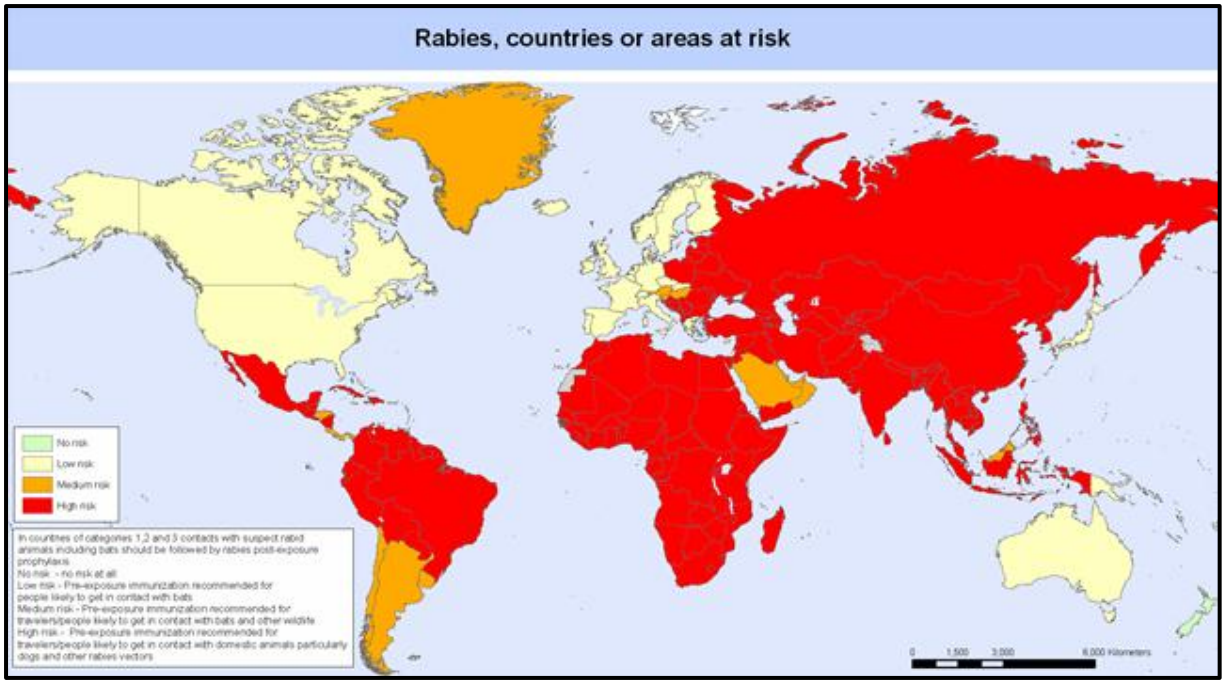


Figure 8-35: Rabies, countries at risk, 2008

8.2.12.2.2 Local Level

- There have been no recent cases of rabies in the district according to the district health authorities.

9 CONCLUSION

This HIA has outlined the significant changes on the health status of the local community that may be caused the Project. An attempt has been made to give a comprehensive outlook of the baseline health status of the Project area (where possible) and also to understand and prioritise future project health impacts, based on the available evidence.

The following are regarded as the key next steps to support the HIA:

- Development of a study protocol and budget for a BHS based on comments on the scoping study;
- Baseline health data collection in the field for selected indicators, including clinical indicators;
- Analysis of additional data collected and reporting;
- Integration of data into a final comprehensive health impact assessment report; and
- Development of the CHMP in collaboration with key stakeholders.

10 REFERENCES

AGENCY FOR TOXIC SUBSTANCES & DISEASE REGISTRY (ATSDR). 2002. *Radiation exposure from iodine 131 exposure pathways* [Online]. Atlanta: Agency for Toxic Substances & Disease Registry. Available: http://www.atsdr.cdc.gov/csem/csem.asp?csem=23&po=4 [Accessed 17 April 2013.

ARAÚJO, C., SILVA-MATOS, C., DAMASCENO, A., GOUVEIA, M. L., AZEVEDO, A. & LUNET, N. 2011. Manufactured and hand-rolled cigarettes and smokeless tobacco consumption in Mozambique: Regional differences at early stages of the tobacco epidemic. *Drug and Alcohol Dependence,* 119**,** e58-e65.

ASANTE, F. A. & ASENSO-OKYERE 2003. Economic burden of malaria in Ghana. University of Legon, Ghana: Institute of Statistical, Social and Economic research (ISSER).

AUGUSTO, G., NALÁ, R., CASMO, V., SABONETE, A., MAPACO, L. & MONTEIRO, J. 2009. Geographical Distribution and Prevalence of Schistosomiasis and Soil-Transmitted Helminths among Schoolchildren in Mozambique. *American Jounal of Tropical Medicine and Hygiene,* 81.

AUSTRALIAN AND NEW ZEALAND ENVIRONMENTAL COUNCIL 1990. Technical basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration.

BERAN, D., YUDKIN, J. S. & DE COURTEN, M. 2005. Access to care for patients with insulin-requiring diabetes in developing countries. Case studies of Mozambique and Zambia. Diabetes Care. Available: http://discovery.ucl.ac.uk/37959/. [Accessed January 2012].

BOELEE, E., CECCHI, P. & KONE, A. 2009. Health impacts of small reservoirs in Burkina Faso. Colombo, Sri Lanka: International Water Management Institute.

BUCUANE, A. & MULDER, P. 2007. Exploring natural resources in Mozambique, will it be a blessing or a curse?

CDC. 2012. *Intermittent preventive treatment of malaria for pregnant women (IPTp)* [Online]. Atlanta: Center for Disease Control and Prevention. Available: http://www.cdc.gov/malaria/malaria_worldwide/reduction/iptp.html [Accessed 12 April 2013.

CIA, C. I. A. 2012. *The World Factbook* [Online]. Available: https://www.cia.gov/library/publications/the-world-factbook/geos/mz.html March 2012].

COLCLOUGH, C., ROSE, P. & TEMBON, M. 2000. Gender inequalities in primary schooling - The roles of poverty and adverse cultural practice. *International Journal of Educational Development,* 20**,** 5-27.

DAMASCENO, A., AZEVEDO, A., SILVA-MATOS, C., PRISTA, A., DIOGO, D. & LUNET, N. 2009. Hypertension Prevalence, Awareness, Treatment, and Control in Mozambique Urban/Rural Gap During Epidemiological Transition. *Hypertension,* 54**,** 77-U119.

DE SILVA, N. R., BROOKER, S., HOTEZ, P. J., MONTRESOR, A., ENGELS, D. & SAVIOLI, L. 2003. Soil-transmitted helminth infections: updating the global picture. *Trends in Parasitology,* 19**,** 547-551.

DFID 2011. Malaria Country Profiles.

DONALD, P. R. & VAN HELDEN, P. D. 2009. The Global Burden of Tuberculosis — Combating Drug Resistance in Difficult Times. *New England Journal of Medicine,* 360**,** 2393-2395.

EDDLESTON, M., DAVIDSON, R., BRENT, A. & WILKINSON, R. 2008. *Oxford handbook of tropical medicine,* New York, Oxford University Press.

ENVIRONMENTAL BUSINESS STRATEGIES LTD. 2012. Terms of Reference for Syrah Resources Balama Graphite Project ESIA. Johannesburg: Environmental Business Strategies Ltd.

FAO. 2006. *Prevalence of undernourishment in total population. Food Security Statistics* [Online]. Available: http://www.fao.org/es/ess/faostat/foodsecurity/index_en.htm [Accessed January 2012.

FERRINHO, P. & OMAR, C. 2007. The human resources for health situation in Mozambique. The World Bank: Africa Region Human Development Working Paper Series No. 91.

FUNDAÇÃO ARIEL GLASER CONTRA O SIDA PEDIÁTRICO. 2011. *Launch of Fundação Ariel Glaser contra o SIDA Pediátrico in Mozambique marks beginning of transition of HIV/AIDS programs to local organization* [Online]. Maputo: Fundação Ariel Glaser contra o SIDA Pediátrico. Available: http://www.pedaids.org/Mozambique/Press---Media/Launch-of-Fundacao-Ariel-Glaser-contra-o-SIDA-Pedi [Accessed April 2, 2013.

GESSLER, M. C., MSUYA, D. E., NKUNYA, M. H. H., SCHÄR, A., HEINRICH, M. & TANNER, M. 1995. Traditional healers in Tanzania: The perception of malaria and its causes. *Journal of Ethnopharmacology,* 48**,** 119-130.

GILL, G. V., MBANYA, J. C., RAMAIYA, K. L. & TESFAYE, S. 2009. A sub-Saharan African perspective of diabetes. *Diabetologia,* 52**,** 8-16.

GLOBOCAN. 2008a. *Estiated incidence of cancer in men in Sub-Saharan Africa* [Online]. Available: http://globocan.iarc.fr/factsheet.asp January 2012].

GLOBOCAN. 2008b. *World Summary Statistics 2008* [Online]. Available: http://globocan.iarc.fr/factsheet.asp#BOTH January 2012].

HAGOPIAN, A., MICEK, M. A., VIO, F., GIMBEL-SHERR, K. & MONTOYA, P. 2008. What if we decided to take care of everyone who needed treatment? Workforce planning in Mozambique using simulation of demand for HIV/AIDS care. *Human Resources for Health,* 6.

IAIA. 2006. *Health impact assessment international best practice principles* [Online]. Fargo, USA: International Association for Impact Assessment. Available: http://www.iaia.org/modx/assets/files/SP5.pdf [Accessed September 2009.

IFC. 2009. *Introduction to health impact assessment* [Online]. Washington D.C.: International Finance Corporation: World Bank Group. Available: http://www.ifc.org/ifcext/sustainability.nsf/Content/Publications_Good_Practice_HealthAssessment [Accessed Feburary 2010.

IFC. 2012. *IFC Performance Standards on Environmental and Social Sustainability* [Online]. Washington D.C. : International Finance Corporation: World Bank Group. Available: http://www.ifc.org/ifcext/sustainability.nsf/Content/PerformanceStandards [Accessed August 7, 2012.

ILEP. 2011. *Working for a world without leprosy* [Online]. London: International Federation of Anti-Leprosy Associations. Available: http://www.ilep.org.uk [Accessed September 19, 2011.

IMF. 2011. *Mozambique Average Inflation* [Online]. Available: http://www.tradingeconomics.com/mozambique/inflation-average-imf-data.html [Accessed January 2012.

INSTITUT NATIONAL DE LA STATISTIQUE ET DE LA DÉMOGRAPHIE (INSD), MEASURE DHS & ICF MACRO 2011. Enquête démographique et de santé et à indicateurs multiples (EDSBF-MICS IV): Burkina Faso 2010: Rapport Préliminaire. Calverton, Maryland, USA: Ministére de l'Economie et des Finances, Institut National de la Statistique et de la Démographie, MEASURE DHS et ICF Macro.

INSTITUTO NACIONAL DE ESTATÍSTICA, MINISTÉRIO DA SAÚDE & MEASURE DHS+/ORC MACRO 2005. Inquérito Demográfico e de Saúde 2003.

INSTITUTO NACIONAL DE ESTATÍSTICA, MINISTÉRIO DA SAÚDE & MEASURE DHS+/ORC MACRO 2010. Inquérito Nacional de Prevalência, Riscos Comportamentais e Informação sobre o HIV e SIDA em Moçambique (INSIDA) 2009.

INSTITUTO NACIONAL DE ESTATISTICA & UNICEF 2009. Mozambique Multiple Indicator Cluster Survey 2008. Maputo: Instituto Nacional de Estatistica and UNICEF.

INSTITUTO NACIONAL DE ESTATÍSTICA (INE), MINISTÉRIO DA SAÚDE & MEASURE DHS 2005. Moçambique Inquérito Demográfico e de Saúde 2003. Calverton, Maryland: INE, Ministério da Saúde and ORC Macro.

INSTITUTO NACIONAL DE ESTATÍSTICA (INE), MINISTÉRIO DA SAÚDE & MEASURE DHS 2012. Mozambique Demographic and Health Survey 2011 (Preliminary Report). Maputo: Instituto Nacional de Estatística, Ministério da Saúde and Measure DHS/ICF International

INSTITUTO NACIONAL DE SAÚDE (INS), INSTITUTO NACIONAL DE ESTATÍSTICA (INE) & ICF MACRO 2010. Inquérito Nacional de Prevalência, Riscos Comportamentais e Informação sobre o HIV e SIDA em Moçambique 2009. Calverton, Maryland: INS, INE and ICF Macro.

INTERNATIONAL FINANCE CORPORATION (IFC). 2008. *Good Practice Documents* [Online]. Geneva: International Finance Corporation. Available: http://www.ifc.org/ifcext/sustainability.nsf/Content/Publications_GoodPractice [Accessed June 15, 2011.

INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE (IFPRI) 2005. HIV/AIDS and Food and Nutrition Security: from evidence to action. Washington DC: International Food Policy Research Institute.

INTERNATIONAL LABOUR ORGANIZAITON (ILO). 2011. *List of Ratifications of International Labour Conventions: Republic of Tanzania* [Online]. Geneva: International Labour Organization. Available: http://webfusion.ilo.org/public/applis/appl-byCtry.cfm?lang=EN&CTYCHOICE=2270&hdroff=1 [Accessed October 22, 2011.

IRIN. 2010. *Mozambique: Drought and floods bring food shortages* [Online]. Available: http://www.irinnews.org/report.aspx?reportid=88612 [Accessed January 2012.

JANI, J. V., JANI, I. V., ARAUJO, C., SAHAY, S., BARRETO, J. & BJUNE, G. 2006. Assessment of routine surveillance data as a tool to investigate measles outbreaks in Mozambique. *Bmc Infectious Diseases,* 6.

LEPROSY VOICE. 2011. *World Leprosy Day 2012* [Online]. Peterborough, England: Leprosy Mission England & Wales. Available: http://leprosyvoice.wordpress.com/2011/11/17/world-leprosy-day-2012/ [Accessed 12 April, 2013.

LISTORTI, J. A. 1996. Bridging environmental health gaps. Lessons for sub-Saharan Africa infrastructure projects. *In:* ENVIRONMENTAL SUSTAINABLE DEVELOPMENT DIVISION. AFRICA TECHNICAL DEPARTMENT (ed.) *AFTES Working paper No. 20.* The World Bank.

LISTORTI, J. A. & DOUMANI, F. M. 2001. Environmental health: bridging gaps. *World Bank discussion paper No. 422.* Washington D.C.: The World Bank Group.

M.P.R. TRAVASSOS DIAS AND F. RODRIGUES 2003. RABIES IN MOZAMBIQUE.

METALLICON 2013. Balama Scoping Study Process Desing Report. Hartebeespoort, South Africa: Metallicon Process Consulting (Pty) Ltd.

MINDELL, J., HANSELL, A., MORRISON, D., DOUGLAS, M. & QUANTIFIABLE HIA DISCUSSION GROUP 2001. What do we need for robust, quantitative health impact assessment. *J Public Health Med.,* 23**,** 173-8.

MINISTÉRIO DA SAÚDE 2011. Plano da Campanha Nacional de Vaçinao contra o sarampo.

MINISTRY OF HEALTH MOZAMBIQUE. 2009. *Expanded programme on immunization: Comprehensive multi-year plan (2009-2013)* [Online]. Available: http://www.who.int/countries/moz/publications/moz_immunization.pdf [Accessed January 2012.

MISAU. 2009. *Official website* [Online]. Available: http://www.misau.gov.mz/ [Accessed January 2012.

MOLA, O. D., MERCER, M. A., ASGHAR, R. J., GIMBEL-SHERR, K. H., GIMBEL-SHERR, S., MICEK, M. A. & GLOYD, S. S. 2006. Condom use after voluntary counselling and testing in Central Mozambique. *Tropical Medicine & International Health,* 11**,** 176-181.

NATIONAL MALARIA CONTROL PROGRAMME, INSTITUTO NACIONAL DE ESTATISTICA, WORLD HEALTH ORGANIZATION (WHO), US AGENCY FOR INTERNATIONAL DEVELOPMENT (USAID), CENTERS FOR DISEASE CONTROL AND PREVENTION (CDC), SATELLIFE PROJECT, U., DEVELOPMENT FOR INTERNATIONAL DEVELOPMENT (DFID) & MALARIA CONSORTIUM 2009. National Malaria Indicator Survey Mozambique (MIS - 2007). Maputo: National Malaria Control Programme.

OSÓRIO, M. M., LIRA, P. I. C., BATISTA-FILHO, M. & ASHWORTH, A. 2001. Prevalence of anemia in children 6-59 months old in the state of Pernambuco, Brazil. *Revista Panamericana de Salud Pública,* 10**,** 101-107.

PADRÃO, P., DAMASCENO, A., SILVA-MATOS, C., LASZCZYŃSKA, O., PRISTA, A., GOUVEIA, L. & LUNET, N. 2011. Alcohol consumption in Mozambique: Regular consumption, weekly pattern and binge drinking. *Drug and Alcohol Dependence,* 115**,** 87-93.

PARDINI, M., NIEMANN, S., VARAINE, F., IONA, E., MEACCI, F., ORRÙ, G., YESILKAYA, H., JAROSZ, T., ANDREW, P., BARER, M., CHECCHI, F., RINDER, H., OREFICI, G., RÜSCH-GERDES, S., FATTORINI, L., OGGIONI, M. R. & BONNET, M. 2009. Characteristics of drug-resistant tuberculosis in Abkhazia (Georgia), a high-

prevalence area in Eastern Europe. *Tuberculosis (Edinburgh, Scotland),* 89**,** 317-324.

PATEL, V., SIMBINE, A. P. F., SOARES, I. C., WEISS, H. A. & WHEELER, E. 2007. Prevalence of severe mental and neurological disorders in Mozambique: a population-based survey. *Lancet,* 370**,** 1055-1060.

PRINCE, M., PATEL, V., SAXENA, S., MAJ, M., MASELKO, J., PHILLIPS, M. R. & RAHMAN, A. 2007. Global Mental Health 1: No health without mental health. *Lancet,* 270**,** 859-77.

SAHN, D. & STIFEL, D. 2002. Parental preferences for nutrition of boys and girls: evidence from Africa. *Journal of Development Studies,* 1**,** 21-45.

SIGAÚQUE, B., ROCA, A., SANZ, S., OLIVEIRAS, I., MARTÍNEZ, M., MANDOMANDO, I., VALLÈS, X., ESPASA, M., ABACASSAMO, F., SACARLAL, J., MACETE, E., NHACOLO, A., APONTE, J., LEVINE, M. M. & ALONSO, P. L. 2008. Acute bacterial meningitis among children, in Manhiça, a rural area in Southern Mozambique. *Acta Tropica,* 105**,** 21-27.

SILVA-MATOS, C., GOMES, A., AZEVEDO, A., DAMASCENO, A., PRISTA, A. & LUNET, N. 2011. Diabetes in Mozambique: Prevalence, management and healthcare challenges. *Diabetes & Metabolism,* 37**,** 237-244.

STEINMANN, P., KEISER, J., BOS, R., TANNER, M. & UTZINGER, J. 2006. Schistosomiasis and water resources development: systematic review, meta-analysis, and estimates of people at risk. *Lancet Infectious Diseases,* 6**,** 411-425.

SYRAH RESOURCES LTD. 2013. *Syrah Resources LTD.* [Online]. Melbourne: Syrah Resources Ltd. Available: http://www.syrahresources.com.au/index.html [Accessed March 18, 2013.

THE GLOBAL ALLIANCE TO ELIMINATE LYMPHATIC FILARIASIS. 2008. *Map of LF endemic countries* [Online]. Available: http://www.filariasis.org/resources/countries_map_list.htm [Accessed September 2009.

THE WORLD LAW GUIDE. 2013. *Legislation Mozambique* [Online]. The World Law Guide. Available: http://www.lexadin.nl/wlg/legis/nofr/oeur/lxwemoz.htm#Environmental Law [Accessed March 18, 2013.

TRANSPARENCY INTERNATIONAL. 2011. *Corruption Perceptions Index* [Online]. Available: http://cpi.transparency.org/cpi2011/results/#CountryResults [Accessed January 2012.

UN CERF. 2013. *CERF allocated more than $700,000 in emergency agriculture response to Mozambique* [Online]. New York: United Nations Central Emergency Response Fund. Available: http://www.unocha.org/cerf/cerf-worldwide/where-we-work/moz-2013 [Accessed 15 May 2013.

UNAIDS 2010. UN Report on the Global AIDS Epidemic 2010.

UNDP. 2011. *Human Development Index (HDI)* [Online]. Available: http://hdr.undp.org/en/media/HDR_2011_EN_Table1.pdf [Accessed January 2012.

UNGASS 2010. Progress Report, 2008 - 2009, Mozambique.

UNGASS, U. N. G. A. S. S. O. H. A. A., CNCS, C. N. D. C. A. H. S. & UNAIDS 2010. Progress Report, 2008-2009.

UNICEF. 2009. *Mozambique Statistics* [Online]. Available: http://www.unicef.org/infobycountry/mozambique_statistics.html [Accessed January 2012.

UNICEF 2010a. Child poverty and disparities in Mozambique 2010.

UNICEF. 2010b. *WHO and UNICEF concerned about measles outbreak in Eastern and Southern Africa* [Online]. Available: http://www.unicef.org/media/media_54018.html [Accessed January 2012.

UNICEF. 2011a. *Breastfeeding Fact Sheet* [Online]. Geneva: United Nations Children's Fund. Available: http://www.unicef.org/nutrition/index_24824.html [Accessed November 7, 2011.

UNICEF. 2011b. *Education in Mozambique -The picture* [Online]. Available: http://www.unicef.org/mozambique/education_2043.html [Accessed January 2012.

UNICEF. 2011c. *Ministry of Health expects to immunize 3.6 million Mozambican children against measles during intensive Child Health Week* [Online]. Available: http://reliefweb.int/node/403218 [Accessed January 2012.

USAID. 2009. *Tuberculosis Profile: Mozambique* [Online]. Available: http://www.usaid.gov/our_work/global_health/id/tuberculosis/countries/africa/mozambique_profile.html [Accessed September 2009.

USAID 2010. HIV/AIDS Health Profile Mozambique.

WHO 1999. Guidelines for Community Noise. Geneva: World Health Organization.

WHO. 2004a. *Global burden of disease statistics* [Online]. Available: http://www.who.int/healthinfo/bod/en/index.htm [Accessed January 2012.

WHO. 2004b. *Maternal health: Mozambique Country Profile* [Online]. Available: http://www.who.int/maternal_child_adolescent/countries/moz.pdf [Accessed January 2012.

WHO. 2004b. *Global burden of disease statistics* [Online]. Available: http://www.who.int/healthinfo/bod/en/index.html [Accessed September 2009.

WHO 2005a. Global strategy for further reducing the leprosy burden and sustaining leprosy control activities (Plan period: 2006-2010). Geneva: World Health Organization.

WHO. 2005b. *Mental Health Atlas 2005* [Online]. Available: http://www.who.int/mental_health/evidence/mhatlas05/en/index.html [Accessed January 2012.

WHO. 2006a. *Cholera Country Profile: Mozambique* [Online]. Available: http://www.who.int/cholera/countries/Mozambique%20country%20profile.pdf [Accessed January 2012.

WHO. 2006b. *Country health system fact sheet Mozambique* [Online]. Available: http://www.afro.who.int/home/countries/fact_sheets/mozambique.pdf [Accessed September 2009.

WHO. 2006c. *Country health system fact sheet: Mozambique* [Online]. Available: http://www.afro.who.int/home/countries/fact_sheets/mozambique.pdf [Accessed January 2012.

WHO. 2008a. *Epidemiological Fact Sheet on HIV and AIDS: Mozambique* [Online]. Available: http://apps.who.int/globalatlas/predefinedReports/EFS2008/full/EFS2008_MZ.pdf [Accessed January 2012.

WHO. 2008b. *Traditional medicine* [Online]. Geneva: World Health Organization. Available: http://www.who.int/mediacentre/factsheets/fs134/en/ [Accessed 17 April 2013.

WHO 2008a. Online Q&A: Do most countries have enough health workers?

WHO. 2009a. *Death and DALY estimates for 2004 by cause for WHO Member states* [Online]. Geneva: World Health Organization. Available: http://www.who.int/healthinfo/global_burden_disease/estimates_country/en/index.html [Accessed September 16, 2011.

WHO. 2009b. *Fact sheet on Hepatitis B* [Online]. Available: http://www.who.int/mediacentre/factsheets/fs204/en/ [Accessed January 2012.

WHO. 2009c. *WHO Global Atlas* [Online]. Available: www.who.int/GlobalAtlas [Accessed January 2012.

WHO. 2010a. *Drug-resistant tuberculosis now at record levels* [Online]. Available: http://www.who.int/mediacentre/news/releases/2010/drug_resistant_tb_20100318/en/index.html [Accessed January 2012.

WHO 2010b. Global Tuberculosis Control 2010.

WHO. 2010c. *Health Impact Assessment* [Online]. Available: http://www.who.int/hia/policy/en/ [Accessed April 13, 2011.

WHO. 2010d. *PCT databank* [Online]. Available: http://www.who.int/neglected_diseases/preventive_chemotherapy/sch/en/index.html [Accessed January 2012.

WHO. 2010x. *Weekly Emergency Situation Update, March 8th, 2010* [Online]. Available: http://www.who.int/hac/crises/moz/en/.

WHO 2010y. Neglected Tropical Diseases Country Profile Mozambique.

WHO. 2011a. *African Programme for Onchocerciasis Control (APOC): Mozambique* [Online]. Available: http://www.who.int/apoc/countries/moz/en/index.html [Accessed January 2012.

WHO. 2011b. *Fact Sheet: Soil-transmitted helminths* [Online]. Geneva: World Health Organization. Available: http://www.who.int/wormcontrol/documents/fact_sheets/soil_transmitted_helminths/en/index.html [Accessed September 20, 2011.

WHO. 2011c. *Health Situation Analysis in the African Region* [Online]. Available: www.afro.who.int/index.php?option=com_docman&task [Accessed January 2012.

WHO. 2011d. *Leprosy Factsheet* [Online]. Available: http://www.who.int/wer/2009/wer8433.pdf [Accessed January 2012.

WHO. 2011e. *Leprosy today* [Online]. Geneva: World Health Organization. [Accessed September 19, 2011.

WHO. 2011f. *Social determinants of health* [Online]. Geneva: World Health Organization. Available: http://www.who.int/social_determinants/en/ [Accessed 17 April 2013.

WHO. 2011g. *Tuberculosis: MDR-TB & XDR-TB 2011 Progress Report* [Online]. Available: http://www.who.int/tb/challenges/mdr/factsheet_mdr_progress_march2011.pdf [Accessed January 2012.

WHO. 2011h. *Road Safety Country Profile Mozambique* [Online].

WHO 2011i. Non-Communicable Diseases Country Profiles 2011.

WHO. 2011j. *Global Health Observatory Map Gallery* [Online]. Available: http://gamapserver.who.int/mapLibrary/app/searchResults.aspx January 2012].

WHO. 2012a. *Cholera: Fact sheet* [Online]. Geneva: World Health Organization. Available: http://www.who.int/mediacentre/factsheets/fs107/en/ [Accessed 14 May 2013.

WHO. 2012b. *Human African trypanosomiasis (sleeping sickness)* [Online]. Geneva: World Health Organization. Available: http://www.who.int/mediacentre/factsheets/fs259/en/ [Accessed March 20, 2012.

WHO. 2012b. Tuberculosis in Mozambique. Available: http://www.afro.who.int/en/mozambique/country-programmes/aids-tuberculosis-and-malaria/tuberculosis.html [Accessed March 2012].

WHO. 2012c. *Schistosomiasis Fact Sheet* [Online]. Available: http://www.who.int/mediacentre/factsheets/fs115/en/index.html [Accessed January 2012.

WHO. 2012f. Tuberculosis Profile Mozambique. Available: http://www.who.int/gho/tb/en/ [Accessed March 2012].

WHO 2012g. World Health Statistics 2011.

WHO. 2013a. *Anaemia prevention and control* [Online]. Geneva: World Health Organization. Available: http://www.who.int/medical_devices/initiatives/anaemia_control/en/ [Accessed 10 May 2013.

WHO. 2013b. *Cancer: Fact sheet* [Online]. Geneva: World Health Organization. Available: http://www.who.int/mediacentre/factsheets/fs297/en/ [Accessed 14 May 2013.

WHO. 2013c. *Cardiovascular diseases* [Online]. Geneva: World Health Organization. Available: http://www.who.int/topics/cardiovascular_diseases/en/ [Accessed 14 May 2013.

WHO. 2013d. *Child health* [Online]. Geneva: World Health Organization. Available: http://www.who.int/topics/child_health/en/ [Accessed 18 April 2013.

WHO. 2013e. *Diabetes: Fact sheet* [Online]. Geneva: World Health Organization. Available: http://www.who.int/mediacentre/factsheets/fs312/en/ [Accessed 14 May 2013.

WHO. 2013f. *Diarrhoea* [Online]. Geneva: World Health Organization. Available: http://www.who.int/topics/diarrhoea/en/ [Accessed 15 April 2013.

WHO. 2013g. *Filariasis* [Online]. Geneva: World Health Organization. Available: http://www.who.int/topics/filariasis/en/ [Accessed 15 April 2013.

WHO. 2013h. *Influenza at the Human-Animal Interface (HAI)* [Online]. Geneva: World Health Organization. Available: http://www.who.int/influenza/human_animal_interface/en/ [Accessed 15 May 2013.

WHO. 2013i. *Malaria Factsheet* [Online]. Geneva: World Health Organization. Available: http://www.who.int/mediacentre/factsheets/fs094/en/ [Accessed 12 April 2013.

WHO. 2013j. *Maternal health* [Online]. Geneva: World Health Organization. Available: http://www.who.int/topics/maternal_health/en/ [Accessed 18 April 2013.

WHO. 2013k. *Measles Fact Sheet* [Online]. Geneva: World Health Organization. Available: http://www.who.int/mediacentre/factsheets/fs286/en/ [Accessed 12 April, 2013.

WHO. 2013l. *Mental health* [Online]. Geneva: World Health Organization. Available: http://www.who.int/topics/mental_health/en/ [Accessed 14 May 2013.

WHO. 2013m. *Onchocerciasis* [Online]. Geneva: World Health Organization. Available: http://www.who.int/topics/onchocerciasis/en/ [Accessed 15 April 2013.

WHO. 2013n. *Pneumonia factsheet* [Online]. Geneva: World Health Organization. Available: http://www.who.int/mediacentre/factsheets/fs331/en/index.html [Accessed 12 April 2013.

WHO. 2013o. *Rabies* [Online]. Geneva: World Health Organization. Available: http://www.who.int/mediacentre/factsheets/fs099/en/ [Accessed 15 May 2013.

WHO. 2013p. *Reproductive health* [Online]. Geneva: World Health Organization. Available: http://www.who.int/topics/reproductive_health/en/ [Accessed 18 April 2013.

WHO. 2013q. *Tuberculosis factsheet* [Online]. Geneva: World Health Organization. Available: http://www.who.int/mediacentre/factsheets/fs104/en/index.html [Accessed 12 April 2013.

WHO & FAO 2010. International Code of Conduct on the Distribution and Use of Pesticides. Rome: World Health Organization, Food and Agriculture Organization of the United Nations.

WHO AFRO. 2013. *Malara Country Profiles* [Online]. Brazzaville. Available: http://www.afro.who.int/en/clusters-a-programmes/dpc/malaria/mal-country-profiles.html [Accessed 12 April 2013.

WHO/ECHP. 1999. *Gotheburg consensus paper. Health impact assessment: Main concepts and suggested approach.* [Online]. Available: http://www.euro.who.int/document/PAE/Gothenburgpaper.pdf [Accessed September 2009.

WHO/UNICEF. 2007. *Joint Monitoring Programme for Water Supply and Sanitation* [Online]. Available: http://www.wssinfo.org/en/welcome.html [Accessed July 2011.

WHO/UNICEF 2010. Progress on Sanitation and Drinking Water: 2010 Update.

WHO/UNICEF. 2010c. *Mozambique. WHO and UNICEF estimates of immunization coverage: 2010 revision* [Online]. Available: http://apps.who.int/immunization_monitoring/en/globalsummary/countryprofileselect.cfm.

WINKLER, M. S., DIVALL, M., KRIEGER, G., BALGE, M. Z., SINGER, B. H. & UTZINGER, J. 2010. Assessing health impacts in complex eco-epidemiological settings in the humid tropics: advancing tools and methods. *Environmental Impact Assessment Review,* 30**,** 52-61.

WINKLER, M. S., DIVALL, M. J., KRIEGER, G. R., BALGE, M. Z., SINGER, B. H. & UTZINGER, J. 2011. Assessing health impacts in complex eco-epidemiological settings in the humid tropics: The centrality of scoping. *Environmental Impact Assessment Review,* 31**,** 310-319.

WINKLER, M. S., DIVALL, M. J., KRIEGER, G. R., SCHMIDLIN, S., MAGASSOUBA, M. L., KNOBLAUCH, A. M., SINGER, B. H. & UTZINGER, J. 2012. Assessing health impacts in complex eco-epidemiological settings in the humid tropics: Modular baseline health surveys. *Environmental Impact Assessment Review,* 33**,** 15-22.

WORLD BANK. 2003a. *Mozambique Public Expenditure Review* [Online]. Available: http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2003/09/29/000160016_20030929104857/Rendered/PDF/259690MZ.pdf [Accessed January 2012.

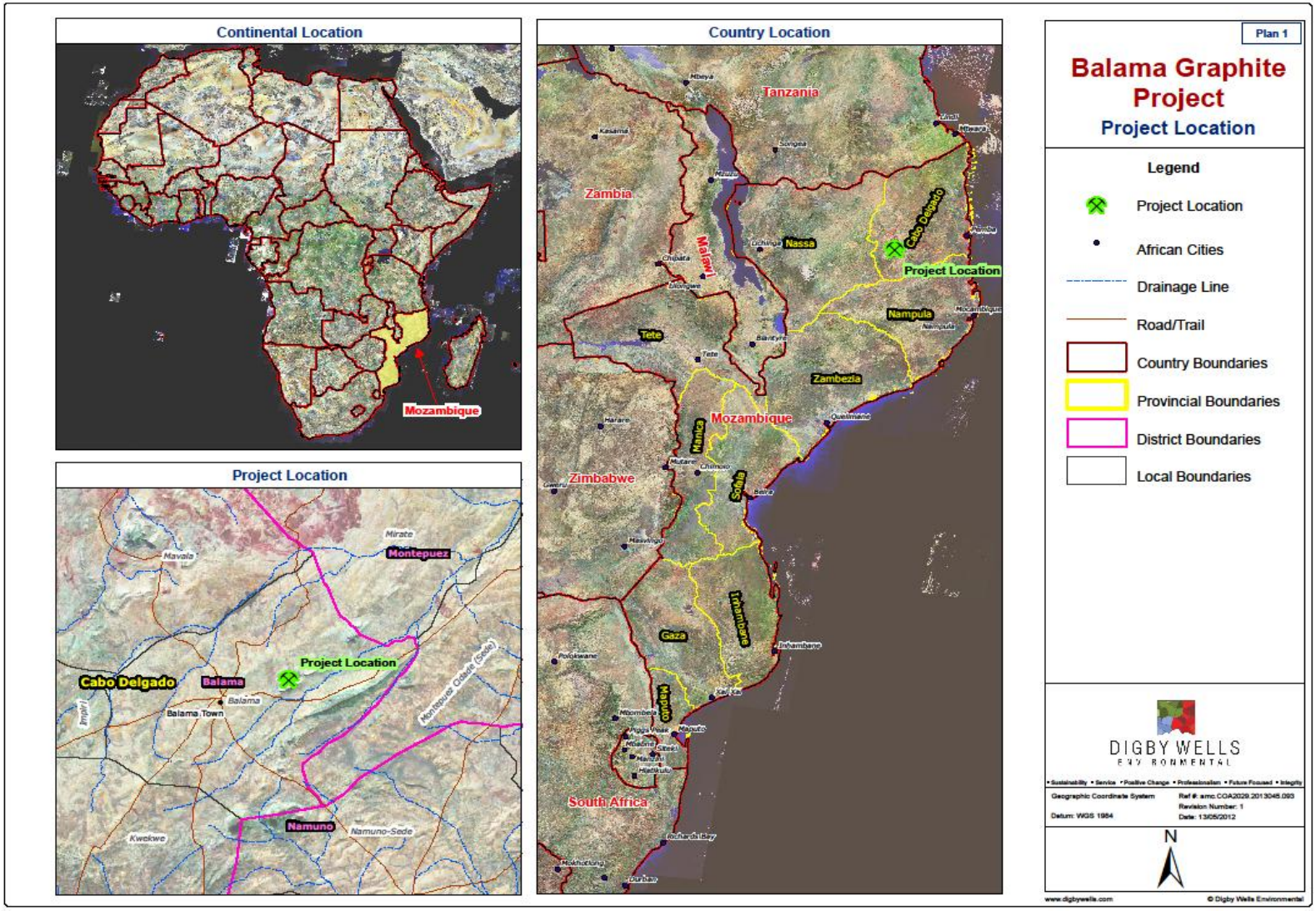
WORLD BANK. 2003b. *Mozambique Statistics* [Online]. Available: http://web.worldbank.org/WBSITE/EXTERNAL/COUNTRIES/AFRICAEXT/MOZAMBIQUEEXTN/0,,contentMDK:20585330~pagePK:141137~piPK:141127~theSitePK:382131,00.html [Accessed January 2012.

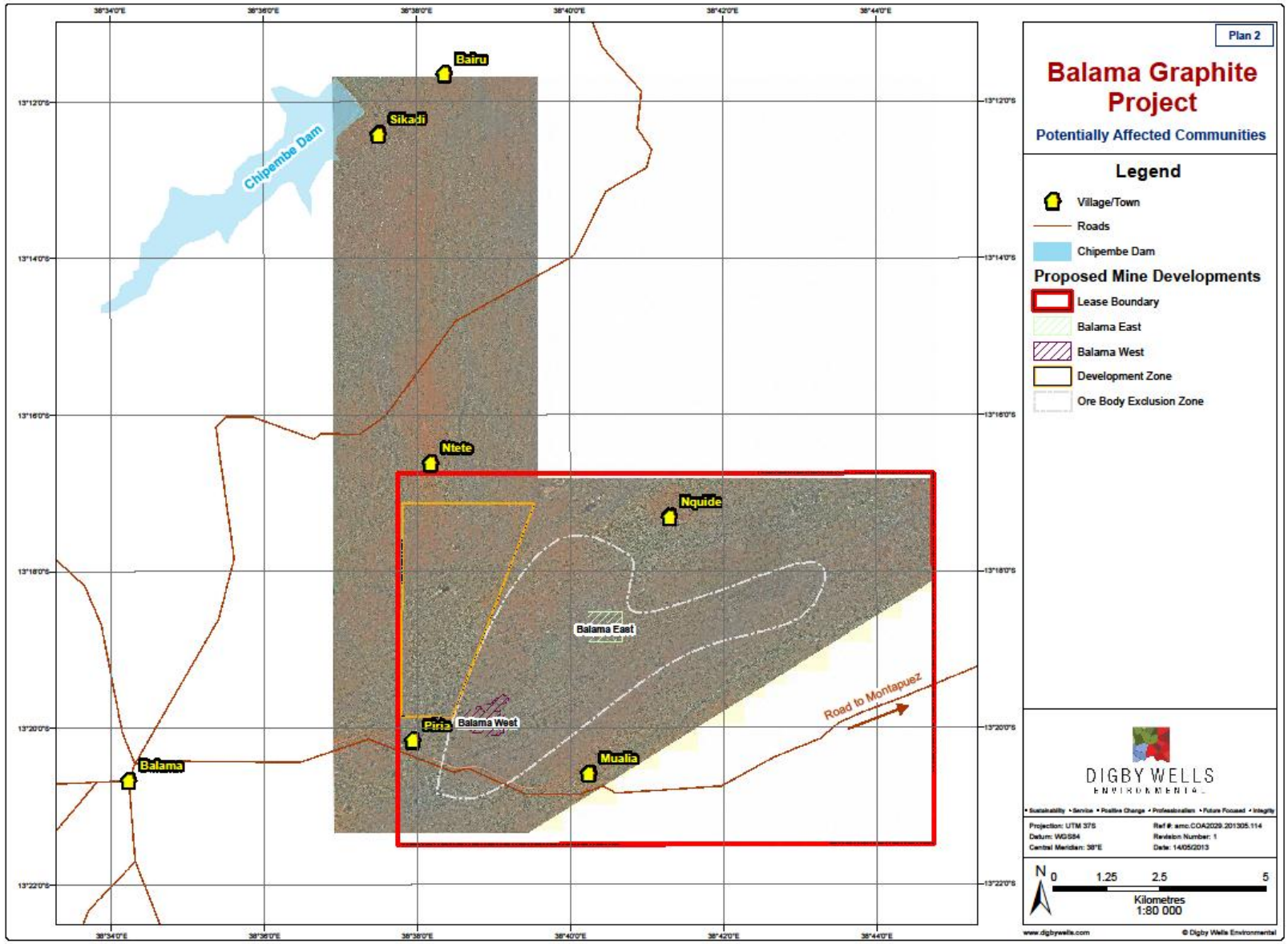
WORLD BANK. 2011. *World Bank Country Data* [Online]. Available: http://data.worldbank.org/country/mozambique [Accessed January 2012.

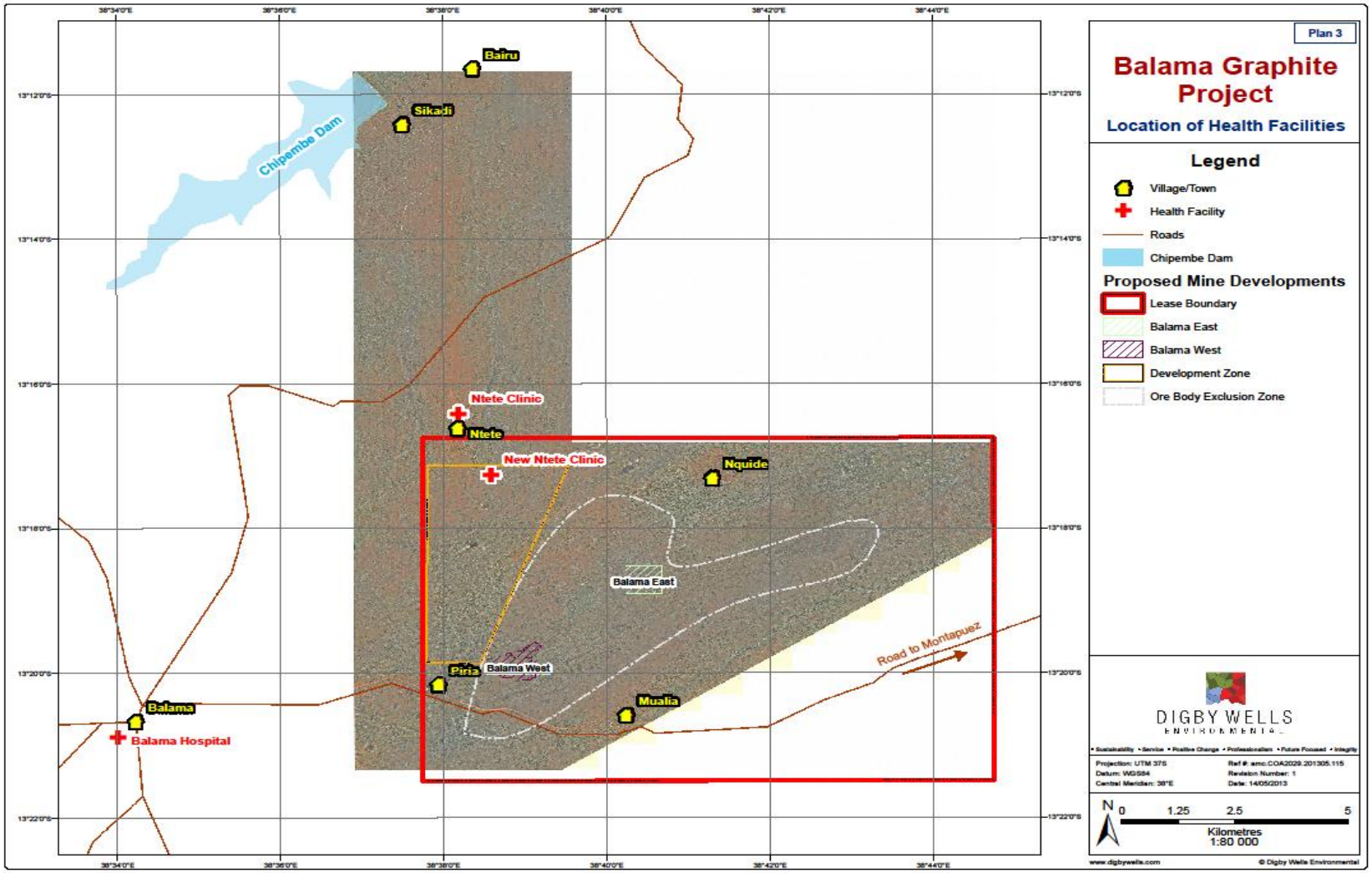
WORLD DIABETES FOUNDATION. 2012. *Diabetes Facts* [Online]. Available: http://www.worlddiabetesfoundation.org/composite-35.htm [Accessed January 2012.

ZIEGELBAUER, K., SPEICH, B., MÄUSEZAHL, D., BOS, R., KEISER, J. & UTZINGER, J. 2012. Effect of Sanitation on Soil-Transmitted Helminth Infection: Systematic Review and Meta Analysis. *PLoS Med,* 9.

Appendix A: Plans


Continental Location
Mozambique
Country Location
Tanzania
Zambia
Malawi
Nassa
Cabo Delgado
Project Location
Nampula
Tete
Zambezia
Mozambique
Manica
Zimbabwe
Sofala
Inhambane
Gaza
Maputo
South Africa
Project Location
Mavala
Mirate
Montepuez
Cabo Delgado
Balama
Balama Town
Project Location
Namuno
Namuno-Sede
Kwekwe
Plan 1
Balama Graphite Project
Project Location
Legend
Project Location
African Cities
Drainage Line
Road/Trail
Country Boundaries
Provincial Boundaries
District Boundaries
Local Boundaries
DIGBY WELLS ENVIRONMENTAL
Geographic Coordinate System
Datum: WGS 1984
Revision Number: 1
Date: 13/05/2012
N
www.digbywells.com
© Digby Wells Environmental


Plan 2
Balama Graphite Project
Potentially Affected Communities
Legend
Village/Town
Roads
Chipembe Dam
Proposed Mine Developments
Lease Boundary
Balama East
Balama West
Development Zone
Ore Body Exclusion Zone
Bairu
Sikadi
Chipembe Dam
Ntete
Nquide
Balama East
Balama West
Piria
Balama
Mualia
Road to Montapuez
DIGBY WELLS ENVIRONMENTAL
Projection: UTM 37S
Datum: WGS84
Central Meridian: 38°E
Ref #: amc.COA2029.201305.114
Revision Number: 1
Date: 14/05/2013
N
0
1.25
2.5
5
Kilometres
1:80 000
www.digbywells.com
© Digby Wells Environmental


Plan 3
Balama Graphite Project
Location of Health Facilities
Legend
Village/Town
Health Facility
Roads
Chipembe Dam
Proposed Mine Developments
Lease Boundary
Balama East
Balama West
Development Zone
Ore Body Exclusion Zone
Bairu
Sikadi
Chipembe Dam
Ntete Clinic
Ntete
New Ntete Clinic
Nquide
Balama East
Balama West
Piria
Mualia
Road to Montapuez
Balama
Balama Hospital
DIGBY WELLS ENVIRONMENTAL
0 1.25 2.5 5
Kilometres
1:80 000

Appendix B: Focus Group Discussions

DIGBY WELLS ENVIRONMENTAL
COMMUNITY HEALTH IMPACT ASSESSMENT
FEMALE FOCUS GROUP DISCUSSIONS

Location	Date, Interviewer	Number of women	Age range of participants
Ntete	March 11, 2013, Vumile	11	15-35
Pirira	March 12, 2013, Christian	14	22-45
Nquide	March 12, 2013, Christian	8	20-25
Mualia	March 13, 2013, Vumile	40	15-40
Sikadi	March 13, 2013, Vumile	17	20-60
Bairu	March 14, 2013, Vumile	35	15-45

Please may we ask a few questions related to health in your community? We will ask a number of questions related to health challenges you face in your community, the local health care services, the decision making in accessing the services and the general satisfaction of the available facilities. Please note that there are no right or wrong answers. Everyone's opinion is valued and important to us. Please let everyone speak and if you do not agree with a person then express this openly but without criticism as they are untitled to their opinion.

Please note that we do not represent Balama Graphite Mine and thus cannot make commitments on their behalf. So questions related to requests or commitments that Balama Graphite Mine has made should not be discussed. If you have any questions for us please feel free to ask.

Education: *About a half of them indicated that they went to school and could read and write.*

Employment: *None of them has formal employment; they mainly stay at home and take care of their children*

Health seeking behaviour	
Where did you go <u>first</u> the last time when your child had a fever/cough?	*Pirira* – Took the child to hospital *Nquide* – Took the child to hospital *Ntete* – Took to the local clinic

	Mualia – Took the child to Balama Hospital –everyone in the village goes there *Sikadi* – Took the child to Ntete Clinic *Bairu* – Took the child to the hospital (Ntete or another hospital in Nropa, a four hour walking distance from the village)
If they usually do not go to the health facility, ask for the main reason for not doing so (Accessibility; Acceptability; Affordability)	*Ntete* – Men are the heads of the household, and being a relatively cultured and patriarchal society, the men get to decide where the children are taken to during times of illness. The men prefer that children are taken to traditional healers and not to more modernized healthcare facilities, whilst women prefer their children to be taken to healthcare centres. *Mualia* – The women reported that everyone goes to healthcare facilities. *Sikadi* – Accessibility was reported to be an issue as this particular community has to travel an exceptional distance to get to Healthcare centres. *Bairu* – Accessibility was reported to be an issue in this village.
Where is the nearest health facility? (Also ask if there is any mobile clinic facility in the area and how frequently it comes to the community. Also inquire whether medical staff do home visits, e.g. during emergencies. Inquire about the presence of an ambulance) **How long does it take to walk there?** **How long does it take you to get there on motorbike?**	*Pirira* – Balama. It takes about six hours to walk there, 3 hours by bicycle. If they use public transport, it will take about 10 minutes and they will spend about 20Mets *Nquide* – Ntete. It takes about 2-3 hours to walk there, and about an hour by bicycle *Ntete* – Ntete Clinic, which is open for consultation between 7am until 3pm, is the closest healthcare facility. Respondents reported that it takes them anything between 5 minutes to 30 minutes to walk to Ntete Clinic. During the focus group meeting, it was also reported that the healthcare facility has no ambulance, and the staff do not conduct home visits. *Mualia* – An equal distance to Balama Hospital as well as Ntete Clinic. *Sikadi* – It takes the villagers three (3) hours to walk to walk to the nearest clinic –Ntete Clinic.

	Bairu – Ntete Clinic and Nropa Clinic. It takes 2 hours to walk to Ntete, and 4 hours to walk to Nropa. Villagers stated that they do not use bicycles or motorbikes to go to these Healthcare facilities.
Do you have to pay for medical services? (If yes) **How much do you pay?** (Find out if there is any community based health insurance scheme)	*Pirira* – They have to pay for services. 1Met for consultation and 5Met for medication *Nquide* – They have to pay for medical services. 50cents for children and 1Met for adults. *Ntete* – Respondents reported that medication at the Healthcare facility was free. They do, however, have to pay 1Met for consultation. It was also noted that no medical schemes exist within the community –"*everyone for himself*." *Mualia* – Respondents claimed that they pay 5Mets for medicals services (breakdown: 5Mets for medication and 1Met for consultation). *Sikadi* – Similar to Ntete village, *r*espondents reported that medication at the Healthcare facility was free. They do, however, have to pay 1Met for consultation (50 cents for children). *Bairu* – Yes, medical services are paid for. 0.5 Mets (50cents) for children, 1 Met for adults.
Are you satisfied with the health care services you receive? **If not why?**	*Pirira* – Not happy with services. They say that they sometimes get expired drugs. Also say that they are not treated well by hospital staff. Someone who is very sick does not get priority treatment *Nquide* – Generally happy with services. Unhappy with long queues. *Ntete* – Respondents reported that they were not satisfied with the quality of medical services they receive. They attributed this to reasons such as: overcrowding in the clinic; the dispatching of incorrect medication; as well as the dispatching of incomplete medication –i.e. certain antibacterial medicines should be taken over a five (5) day course to be effective, but in such instances, respondents reported that they receive medication that would suffice for only three (3) days.

	Mualia – Respondents were not satisfied with the quality of medical services received. They attributed this to reasons such as: incomplete medication dispensed; critical illnesses and emergencies are not treated as a priority upon arrival at the Healthcare facility; Healthcare personnel are "always late" –they report to duty as and when they please. *Sikadi* – Respondents are unhappy with the Healthcare services they receive. They attribute their dissatisfaction to the incorrect medication they receive –they are not provided with the full course of medication (similar to Ntete village). It was also reported that very ill children are not given priority over other patients –the clinic works on a "first come, first serve" basis. *Bairu* – Respondents are not happy with the Healthcare services they receive. They attribute the general feeling of discontent to the incorrect medication they receive upon illness –"*when I have malaria, they give me fever tablets*".
How many traditional healers do you have in your village? **What sort of reasons will take you to the traditional healer?**	*Pirira* – There is one traditional healer in their village. He mainly treats stomach pains and skin diseases. *Nquide* – There are about 5-6 traditional healers in the village. They take patients there when it is not feasible to take them to the hospital. *Ntete* – "There are many", more than twenty (20) *Mualia* – Mualia village is reported to have "many" traditional healers –an average of twenty (20). Individuals usually seek the help of tradition healers when they have been "*turned away*" by Healthcare centres –when clinics do not help or cure them. They are taken to traditional healers for illnesses/ reasons such as bilharzia as well as a swelling of the stomach. *Sikadi* – Two traditional healers are known in Sikadi village. People often seek the assistance of these traditional healers when they or members of their families suffer from mental illnesses and when they have been "cursed." *Bairu* – There are four (4) well-known traditional healers in the village. Individuals seek the help of traditional healers agenda

Are there other health actors (e.g. NGOs) active in the communities? **If so what do they do?** (Note down active NGOs and what services they provide)	*Pirira* – None that they know of *Nquide* – None *Ntete* – There are none *Mualia* – There are none. *Sikadi* – There are none. *Bairu* – There are none that the respondent knew of.

Maternal and Child Health	
Do women in your community get antenatal care services? Where? **Are you satisfied with the services you receive?**	*Pirira* – They all attended ante-natal care. They visit 4-6 times during their pregnancy. They are happy with the services received. However, they say sometimes they are not treated well by hospital staff. *Nquide* – Yes, in Ntete. They go once a month. *Ntete* – Yes, women in this village receive antenatal care services which they reported to be very happy with. *Mualia* – They all attended ante-natal care at Balama Hospital and are satisfied with the services they receive. *Sikadi* – They all attended ante-natal care at Ntete Clinic once a month and are not happy with the services they receive. Respondents claim that the Healthcare personnel are very rude. *Bairu* – They all attended ante-natal care and are generally content with the services they receive.

Do all the new born children get vaccinations up to the age of one year? **Are there people in your community who do not take their children for vaccination?** (If yes) **Why?**	*Pirira* –They all generally take their kids for vaccinations. All women take their children for vaccinations. *Nquide* – Yes, they all generally take their children for vaccinations. Some women are reluctant to take their children for vaccinations. They do not know why. *Ntete* – The respondents were adamant that almost all babies get monthly vaccinations. Those women that do not take their children to get vaccinated fail to do so because they "fear" for their children –the babies tend to cry a lot and mothers do not want to cause their babies pain. *Mualia* – Respondents asserted that they all take their children for vaccinations. *Sikadi* – Respondents claimed that all women take their children for vaccinations. *Bairu* – Respondents asserted that they all take their children for vaccinations.
Have your children under 5 been weighed and measured? **If so where? If not why?**	*Pirira* – Yes, at the hospital *Nquide* – Yes, all children are weighed and measured at Ntete Clinic. *Ntete* – Yes, all children are weighed and measured. When probed as to why they would get their children weighed and measured, the women stated that having their children weighed and measured enables them to tell whether their children are healthy. This shows an understanding of the importance of diet and nutrition by mothers. *Mualia* – All children are weighed and measured at Balama Hospital and Ntete Clinic –"*we take them there so we can know if the child is growing well.*" *Sikadi* – Yes, all children are weighed and measured. *Bairu* – Yes, all children are weighed and measured.

Where do women normally deliver? **If at home, who assists?**	*Pirira* – Most women deliver at the hospital. Some might deliver at home if they are unable to get to the hospital. They will be helped by either relatives or elderly women in the community. *Nquide* – Most deliver in the hospital. Some deliver at home due to difficulty in accessing the hospital. Assisted by relatives. *Ntete* – All women are said to deliver in hospitals, unless the woman goes into unexpected labour. In this case, she would deliver at home, with the assistance of other women in the village. *Mualia* – Most women are said to deliver in hospitals such as Balama. Others are reported to deliver at home, with the assistance of female family members. *Sikadi* – Women in this village mainly deliver at home due to the difficulty in accessing the Healthcare centres –these are relatively far. Respondents reported that there a numerous traditional midwives in the village who assist during labour and childbirth. *Bairu* – Similar to Sikadi, women in Bairu mainly deliver at home There a several traditional midwives in the village who women assist during labour and childbirth.
Do women practice family planning in your village? (Discuss what methods they commonly use)	*Pirira* – Yes they do. Normally get injectibles at the hospital *Nquide* – Yes, they practice family planning. Common methods include pills and injectibles. They said that they are not sure if the methods work. *Ntete* – Yes, women of Ntete practice family planning. They are reported to have discussions with their husbands –to decide how many children they want. Respondents also stated that contraceptives (in the form of injectibles and pills) are also used as family planning methods. *Mualia* – Yes, contraceptives (in the form of injectibles and pills) are also used as family planning methods.

	Sikadi – Yes, contraceptives (in the form of injectibles and pills) are also used as family planning methods. It was reported that a number of women have stopped going to the clinics for contraceptive measures due to the fear of the side effects brought on by these methods. *Bairu* – Yes, contraceptives (in the form of injectibles and pills) are also used as family planning methods. Respondents kill two birds with one stone and go for their injections or collect their pills when they take their children for monthly or tri-monthly vaccinations.
Epidemiology of disease	
What are the 3 most important diseases in your community?	*Pirira* – Malaria, Diarrhoea and ARIs *Nquide* – Malaria, stomach illnesses and ARIs *Ntete* – Malaria, gout, cholera, and Sexually Transmitted Diseases *Mualia* – Cholera, malaria, gout, and diarrhoea *Sikadi* – Cough, malaria, and diarrhoea *Bairu* – Malaria, cough, cholera, and diarrhoea
Do many people have skin disease?	*Pirira* – Yes, they are common *Nquide* – They are common *Ntete* – Yes, just a rash. *Mualia* – Yes, an itchy rash –in both children and adults. *Sikadi* – Not really common. Respondents reported to two particular years when skin diseases reached their peak – this was approximately 5 years ago *Bairu* – Yes, rashes and fungal infections are common. A respondent showed us her

	abdomen which was plagued by a rash.

Let's talk about malaria	
Do people know what causes the disease, malaria? (Prompt to see if mosquito is known as the only cause. Record any misconceptions)	*Pirira* – Only by being bitten by a mosquito *Nquide* – Because of mosquitoes *Ntete* – Because of mosquitoes. The respondents seemed to have a bit of confusion by the never ending presence of mosquitoes –"*when there is rain, the mosquitoes are many, but even without rain, they are still many*". *Mualia* – Respondents were all in agreement and adamant that malaria is contracted as a result of being bitten by mosquitoes. *Sikadi* – Malaria is contracted as a result of being bitten by mosquitoes –the respondents did not have any misconceptions on the causes of malaria. *Bairu* – From mosquito bites.
What measures do people apply to prevent themselves from getting malaria?	*Pirira* – They use mosquito nets *Nquide* – Use of bed nets *Ntete* – Respondents and their families use bed nets to prevent themselves from getting malaria. *Mualia* – Respondents and their families use mosquito nets to prevent themselves from getting malaria. *Sikadi* – Respondents and their families use mosquito nets to prevent themselves from getting malaria. *Bairu* – Respondents and their families use bed nets to prevent themselves from getting

	malaria. Other claimed to "hide" under the covers.
How many people have mosquito nets at home? (For those who don't have) **Why don't you have any?**	*Pirira* – Mosquito nets are only given to pregnant women. Therefore they do not all have mosquito nets. Nets were given to all families, but families with small children got priority. Families that were far away from the hospital did not get any nets. They generally use nets, when they have them. Once the net gets worn out (gets holes) they use them for other uses). *Nquide* – Not all people have received bed nets. But most of them have nets. They were given to households with children. If you didn't have a child, you did not get any. They are also not available in shops. *Ntete* – Of the eleven (11) respondents, three of them did not have nets, one of them had a net, but stated that one net was insufficient for the entire household. Four respondents claimed that their nets were destroyed and damaged by rats and other insects. *Mualia* – The majority reported to not having mosquito nets. Those that do have nets often use them for other functions such as farming and fishing. Respondents also claimed that nets have been destroyed by wear-and-tear, improper use and rats. *Sikadi* – "*Everyone has nets.*" It was reported that there are too many mosquitoes in the village and members of the community seldom see the need to bother using their nets – "there is no escape from them." *Bairu* – Everyone has mosquito nets, although some have been destroyed and damaged with time.
Are there any other interventions in the area to prevent malaria transmission? (Any malaria programmes that are on-going in the area?)	*Pirira* – None that they know off. The women said that they would not agree to IRS as they think it is an insecticide that might be used to kill them. *Nquide* – None that they know of. They would refuse IRS efforts if happened because they do not trust the method. *Ntete* – None that they know of.

	Mualia – There are none. *Sikadi* – None that they know of. It was reported that pregnant women receive free nets from Healthcare facilities (funded by the State). Each household had received nets based on the number of household members. *Bairu* – There are none that the respondents know of, however, it was noted that respondents would highly appreciate assistance with the acquisition of indoor residual sprays.
HIV/AIDS	
Have you heard about the disease called HIV/AIDS? **How serious a problem do you think it is in your community?** (Why do they think it is/isn't such a serious problem?)	*Pirira* – All have heard of HIV/AIDS. They think it is a serious problem. Because if you get it you will die. It has no cure. They know of a few people in the community who have HIV. *Nquide* – They have heard about it. They think it is serious but not many people in the village are afflicted. *Ntete* – The majority of respondents seemed not to know about HIV/AIDS, let alone having heard of it. They, therefore, did not consider the disease to be a major problem within Ntete. *Mualia* – All respondents have heard of HIV/ AIDS and are in agreement that it is a big problem in their community –"*if you get it, you know it has no cure and that you will die*." *Sikadi* – Respondents have all heard of HIV/ AIDS. They were in agreement that it is a relatively serious disease in general, but not necessarily in their respective village. When probed, they attributed their reasoning to not knowing any HIV positive community member. *Bairu* – All respondents have heard of HIV/ AIDS. Although respondents do not know anyone who is HIV positive in the community, they all agree that it is a big problem in their village chiefly because it has no cure.
When you hear the word protection/prevention- what does it mean to you? (Discuss methods of	*Pirira* – Being faithful. However, their husband might be unfaithful. You can use condoms to prevent infection.

prevention)	*Nquide* – Abstaining from sex, use of condoms *Ntete* – Preventing infectious diseases or "*anything else.*" *Mualia* – Preventing becoming sick –abstinence or the use of condoms. Most of the respondents had not heard about ARVs, but have knowledge of PMTC –learnt about this when receiving pre-natal care. *Sikadi* – Being faithful and controlling your urges. *Bairu* – Being faithful; using condoms. Have heard of ARVs as well as PMTC.
Do people use condoms? **Are they easy to get?** (If people don't use them) **Why do people use/not use them?**	*Pirira* – Some people use condoms, but others are scared of them as they think the condoms might spread HIV. Condoms are not easily accessible to them. They only see them when a man brings them. They don't have money to buy condoms. They are scared of buying them as people might laugh at them buying condoms. *Nquide* – Some people use condoms, some people buy, others get from the clinic. They are not scared of buying condoms. *Ntete* – Yes, most people use condoms as they are easily accessible from the clinic. Men often refuse to use condoms. *Mualia* – Most people do not use condoms because they do not have money to buy them. Respondents claimed that condoms are readily available in Healthcare facilities, but they do not get them from there as they are too scared and ashamed. Not all respondents reported to using condoms. They attributed this to the fact that they want a lot of children. *Sikadi* – Yes, people do use condoms. There seems however, to be a stigma attached to using condoms in the village. Respondents claimed that it was embarrassing for others to know that you use condoms. Ironically, individuals do not feel ashamed purchasing condoms from the shops. Condoms are readily available in the clinic, which unfortunately, is not easily accessible due to distance.

	Bairu – Respondents stated that people do use condoms and that they purchase these.
Is there much commercial sex? *These questions below are to guide the conversation* **What different kinds of commercial sex are there? Who are the sex workers and where do they work? Who are the clients and where do they work?**	*Pirira* – The unmarried women are usually the ones who engage in these activities. Balama has a few prostitutes. *Nquide* – There is not much commercial sex around. If it is present, it is in secret. *Ntete* – Commercial sex work was reported to be quite prominent in Ntete. This was attributable to the high unemployment rate in the village. Unmarried women are usually the ones who engage in these activities *Mualia* – Commercial sex was reported to be very prominent in this community. It is usually the unmarried women who partake in commercial sex, mainly with travelling men from Balama, Montepuez and Pemba –"*they do not like their own village men*." *Sikadi* – Respondents claimed that there was no commercial sex work in their community. *Bairu* – Commercial sex work was reported to be prevalent in the village (not only in Montepuez and Balama –the bigger centres). Respondents see commercial sex work as a "*means of survival*" by single/ unmarried women who target men who are most likely to have money.
Are there categories of men who are known to have many sexual partners? *These questions below are to guide the conversation* **Which categories are these? Who do they have sex with and why? Are some categories of men riskier than others and why?**	*Pirira* – Polygamy is common in the society. However, there are many men with many sexual partners in the community. This goes across all socio-economic classes *Nquide* – There are many men of this nature. They will sleep with any woman, young or old. *Ntete* – Men are known to have numerous sexual partners. Polygamy is also relatively prominent in this village –the Chief himself was reported to have seven (7) wives. *Mualia* – Men are known to have multiple sex partners. "*Local men, all men... fall victim to commercial sex workers.*" *Sikadi* – Respondents claim that the community is filled with philandering men. All men are

	known to have more than one sexual partner –whether married or unmarried. These men usually prefer younger girls. *Bairu* – It is reported that men who have money/ are better off tend to have more than one sexual partner.
Are young people having sex? *These questions below are to guide the conversation* **If so, at what age? Who are their partners? Why are they having sex so early?**	*Pirira* – Yes they area. From the age of about 15. Mainly because of poverty. *Nquide* – Start as early as 10 years. Usually sleep with each other. They are not sure why they start so early. Maybe it is because they cannot control their urges *Ntete* – Children as young as seven years old are engaging in sexual intercourse. They mainly sleep with others within the same age group. It was reported that there is a spread of pornographic videos amongst the youth. One respondent also stated that the youth go to nightclubs in Montepuez, and this has made them more "loose." *Mualia* – Many young people are reported to being sexually active in this community, even 13 year olds –"*they sleep with anyone, mainly for money.*" *Sikadi* – A lot of women have started having sex. They have started going to night clubs, where men pay for their drinks, and the female is then expected to pay back in kind later. *Bairu* – Children as young as 13 years of age are reported to be sexually active. "*They sleep with each other.*"
Is it possible for a healthy-looking person to have HIV/AIDS? **Would you buy food from somebody who you knew had HIV/AIDS?** **If someone in your family had HIV/AIDS would you keep it a secret?**	*Pirira* – Somebody healthy can have HIV. They would buy fruit/vegetable from somebody with HIV as they believe HIV cannot spread by food. But TB can spread through sharing food. They would keep it a secret if one of their family members had HIV, because they think the community would shun him/her. However, they would not mind it if their child's school teacher had HIV. *Nquide* – They say you cannot tell a HIV positive person from appearance. They would buy food from a HIV positive person. They believe that you cannot get HIV from food. They would not keep it a secret if one of their family members had HIV. There is no stigma in the

	community. *Ntete* – Healthy looking people may have HIV/ AIDS, but respondents assert that they would never know until such a person has been tested at the clinic and has openly spoken about his/ her status. Respondents claimed that there was no discrimination of any kind towards HIV positive people in the village and that they would purchase food from a '*sick person*', and even go as far as sharing a plate of food with them. Respondents seemed to have a good understanding of the transmission of the virus. It was also mentioned that no secrets would be kept. "*If we keep it as a secret, then nobody will know and everybody will sleep with him/ her*"… people should be told so as to help prevent the spread of the virus said a respondent. *Mualia* – Respondents state that it is not possible to tell whether a healthy person has the virus or not. They also claim that they would in fact buy food from a person who may be HIV positive. This suggests that respondents have a good understanding of the transmission of HIV AIDS. "*You cannot get sick from food*" –respondents claim that they would even share a plate of food with a 'sick' person. In addition, respondents feel that being HIV positive should not be kept a secret and that they would not shun HIV positive people. *Sikadi* – Respondents stated that it is possible for a healthy looking person to be HIV positive, and that they would continue to purchase food from a 'sick' individual. Respondents from Sikadi would keep an HIV positive family member's status a secret as they feel it would be a shame/ disgrace upon the family. They did however state that they would not shun their sick relatives away. *Bairu* – Respondents stated that it is possible for a healthy looking person to be HIV positive, and that they would purchase food from an HIV positive individual. Respondents would not announce the (positive) HIV status of their family members –they would keep it a secret.

Soil and water related disease	
What is the main source for <u>drinking</u> water in the community? (Record type of water source)	*Pirira* – They have two wells which were dug by Balama. One is improved, the other non-improved. They do not treat water before drinking. *Nquide* – They have a big problem with accessing water. They have to travel long distances to get water. There is only one improved well in the village. They do not treat water before

	drinking. *Ntete* – The respondents admitted to experiencing difficulty gaining access to clean drinking water. There is only one pump at the school. The drinking well is a non-protected borehole and water is not treated prior to consumption. *Mualia* – Majority have wells in their households –these are holes untreated holes which have not been cemented. These drinking wells are not clean and the water is not treated before consumption. *Sikadi* – Community members get water from the dam. This water is not treated before consumption. *Bairu* – Respondents claim to get water from the dam. This water is not treated before consumption.
Does every household have its own latrine? (Record types of sanitation facilities in the community)	*Pirira* – Not every household has a latrine. Some people go to the bush. *Nquide* – Most have their own toilets. But some share or go to the bush *Ntete* – Not every household has a latrine. Latrines in this village are shared amongst households, whilst others go to the bush. *Mualia* – Very few households have latrines. Most people go to the bush. *Sikadi* – Every household has its own latrine. An American NGO came to the village a few years ago to install latrines for every household. *Bairu* – Every household has its own latrine.
Do people swim in, or drink from open water bodies in the area?	*Pirira* – There is a nearby river *Nquide* – None

	Ntete – None in this area, but respondents were aware that others in neighbouring villages swim and drink from the Chipembe dam. *Mualia* – Yes, they swim at the river which flows under the bridge. *Sikadi* – Yes, the swim. *Bairu* – Yes, they swim.
Do you consider your environment clean or dirty? **Why?**	*Pirira* – They consider it dirty *Nquide* – They consider it dirty due to the disorganized nature of the village *Ntete* – Respondents consider their environment dirty because of water damage, littering and rats. *Mualia* – Respondents consider their environment to be clean. They have become so accustomed to it, that they have become oblivious to the dirt surrounding them. *Sikadi* – Yes, they consider their environment to be clean. *Bairu* – Yes, they consider their environment to be clean.

Housing	
Are there any challenges related to housing or accommodation in your community? **Is overcrowding a problem?**	*Pirira* – No challenge in accessing housing. No overcrowding as well. *Nquide* – Easy access to housing. Overcrowding is not a problem *Ntete* – There seems to be a challenge accessing housing in this village and respondents complained about overcrowding, with each household having no less than 8 household members. *Mualia* – Respondents reported that there is enough housing and that overcrowding is not a

	problem. *Sikadi* – Respondents reported that there is enough housing and that overcrowding is not a problem. *Bairu* – Respondents reported that there is enough housing and that overcrowding is not a problem.

Food and Nutrition	
Do you have enough food in your community? (If there is a food shortage, find out why) **Is malnutrition a problem in the community (especially in children)?** Why (Bad feeding practices, food shortage)	*Pirira* – There used to be a lot of food. But currently due to reduced rainfall, there is not enough food. Malnutrition is a problem as a result of poor feeding practices, especially during pregnancy. *Nquide* – There is a lot of food in the community. A few people don't have food. There are a few cases of malnutrition in the community mainly due to lack of food. *Ntete* – There is no shortage of food in the community as the village relies on agriculture for survival. There is thus no problem of malnutrition in this village. *Mualia* – Because there was little rainfall, there has not been enough food this year. Respondents claim that food is otherwise, usually sufficient –"*this is just a bad year.*" Malnutrition has become a problem due to the lack of food. *Sikadi* – There is sufficient food in the village. Malnutrition, however, is reported to be a problem in the community. This is attributed to bad feeding practices. *Bairu* – Generally, there is no shortage of food in this village. However, individuals and households sell their food to get money, therefore decreasing food availability. This decreased food availability then leads to malnutrition, which has been reported to be a problem in the community.
What food stuffs are most commonly consumed in the area?	*Pirira* – Cassava, maize, vegetables (leaves, especially one called *moringa*), beans, fish (from Pemba), goat meat, chicken and duck

	Nquide – Cassava, maize, meat (goat and chicken), leaves (vegetables), beans *Ntete* – Cassava, maize, beans, vegetables
Do you generally buy food or grow it/ obtain from domestic livestock?	*Pirira* – Generally grow their food. Food stuffs bought are usually fish and meat *Nquide* – Grow it, buy some *Ntete* – Respondents say they generally grow their own food in the '*mashambas*' –the fields. *Mualia* – Maize meal, cassava, pumpkin, beans, vegetable leaves. *Sikadi* – Maize, beans, wheat, vegetables, herbs (veg leaves), millet, peanuts. *Bairu* – Maize, beans, wheat, vegetables.
Do you use salt in your diet? **Where do you buy the salt from? (Do a visual check that it is iodated)**	*Pirira* – They use salt in their diet, however it is not iodated *Nquide* – Yes, not iodated *Ntete* – Yes, salt is used and it is not iodated. *Mualia* – Respondents use salt in their diet. The salt is not iodated. *Sikadi* – Respondents use salt which is not iodated their diet. *Bairu* – Respondents use salt in their diet. The salt they use however is not iodated.
Social Determinants of Health	
Do people in the community drink alcohol and smoke? (Discuss the extent of these vices)	*Pirira* – People in the community drink water. Not excessively though. They also smoke *Nquide* – They drink excessively, everyone including women. Mostly drink traditional brews.

	Also some smoking in the community in both men and women. *Ntete* – Alcohol abuse was reported to be prominent. Individuals smoke, but it is not as much of a problem as the alcohol abuse. *Mualia* – Both men and women are reported to drinking in moderation. Individuals smoke, but there are not many smokers in the community. *Sikadi* – A few people drink and smoke in moderation. *Bairu* – Excessive drinking has been reported in the village. Individuals smoke, but not a lot.
Do they use drugs?	*Pirira* – Not common. If done it is done in secret *Nquide* – Not common, maybe in secret *Ntete* – Respondents are convinced that drug abuse does happen in the village. However, they do not know who uses drugs as this would be done in secret and in the privacy of one's own home. Drug use is seen as taboo. *Mualia* – Respondents suspected that drugs are used in their community; however, this is done in secret. *Sikadi* – Drugs may very well be used by certain individuals, however, this is done behind closed doors. *Bairu* – Respondents are uncertain on drug abuse habits and this is probably done in secret.
Is domestic violence common in your community?	*Pirira* – Domestic violence is common in the community *Nquide* – It is common *Ntete* – Domestic violence is prominent and is said to be fuelled by substance (drug and alcohol) abuse. It was reported that men in the village have a sort of inferiority complex as

	they beat their women when they (the women) bring money home to the household. *Mualia* – Domestic violence was reported to be prominent in the village. *Sikadi* – Domestic violence was reported to be high in this village. *Bairu* – Respondents claimed that domestic violence was a serious matter in their community.
In general is there a feeling of wellbeing or state of hopelessness in your community?	*Pirira* – There is a general state of wellness. *Nquide* – They have a feeling of wellbeing, due to peace in the country after a long civil war. *Ntete* – There is a general state of wellness, although respondents claim they are not happy. *Mualia* – "*Generally, life is good… it could be better, as unemployment is a problem… but we are happy*" *Sikadi* – There is a sense of wellbeing in the community. The respondents say they have enough food and that makes them generally happy with their lives. *Bairu* – Respondents are happy with their lives and hopeful. There is a general sense of wellbeing

Project and Community Cohesion	
What are your general perceptions about the project?	*Pirira* – They have all heard about the project. They are happy it is here. People have gotten jobs (like some of their husbands). They now have disposable income. They can even hire people to do jobs. They are hopeful that they will also get jobs. *Nquide* – They are happy the project is here. It will bring development to the area, and bring about employment.

	Ntete – Respondents are happy that the project is here as they hope to gain employment from it. *Mualia* – Respondents think that the project will help a lot in terms of employment. *Sikadi* – Respondents could not comment much as they had not heard much information about the project. *Bairu* – The majority of the respondents had not heard about the project.
How do you think the project will influence your health and wellbeing?	*Pirira* – They do not know how it will influence their health. They however think it will potentially improve their health *Nquide* – They will be able to request development activities like a new health facility from the project. *Ntete* – Respondents are not sure but hope that the project will bring about "*civilization*" to the village. *Mualia* – Respondents are expecting money from the "white people" to improve healthcare – building the community a decent health care facility. *Sikadi* – Respondents hope that the development of the mine will bring some development alongside the associated positive ripple effects. *Bairu* – Respondents do not know how the project will influence their health, but expect it to bring along with it, development and employment.
How do you think the project can help improve the community's health? **What can you as a community do to improve your own health?**	*Pirira* – Build a hospital, health facility in Pirira with a maternity wing. They would also like an ambulance and access to clean water. They can improve their own health by saving money as a community to help each other get to hospital. They can also teach each other on proper health-seeking behaviour, use of nets, etc. *Nquide* – They think it will bring health development. A new health facility in their village, a

	new maternity wing, ambulance and clean water. They think that they can improve their own health by cleaning their environment, building pit-latrines to improve sanitation (everyone should have their own), find ways to access mosquito nets, educate their fellow community members on going to the health facility, and proper disposal of waste *Ntete* – Respondents are not expecting much from the project. "We will see what the project brings." *Mualia* – The respondents expect development from the project. This development would be in the form of: a health care facility with a maternity ward, electricity, clean drinking water source as well as an ambulance. They can improve their own health by assisting each other by pulling funds together to get each other to hospital. In addition, they can teach each other about various diseases and malaria prevention methods. *Sikadi* – The respondents expect some development from the project, namely: a hospital, a school, maternity facility, electricity, clean drinking water source as well as an ambulance. They can improve their own health by assisting each other to get to Healthcare facilities by raising funds; educating women on the importance of pre-natal care; and educating families about domestic violence and its implications. *Bairu* – Respondents are not sure how their health will be influenced. They would, however, like a new health care facility with an ambulance. They can improve their own health by pulling resources to take sick people to hospital; and educating each other on diseases and how to prevent them.