JCM Matswani Solar Corp Limited

Environmental and Social Impact Assessment for the proposed 60 MW Solar Power Plant in Kanzimbe Village, TA Kalonga, Salima District, Central Region, Malawi

Final Report

March 2019

The business of sustainability

Environmental and Social Impact Assessment (ESIA)

60 MW Solar Power Plant in Kanzimbe Village, TA Kalonga, Salima District, Central Region, Malawi

JCM Matswani Solar Corp Limited

Final Report

Prepared for:	JCM Matswani Solar Corp Limited
Date Submitted:	March 2019
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Introduction

This is the Environmental and Social Impact Assessment (ESIA) report for the construction and operation of a 60 megawatt (MW) (1) alternating current solar photovoltaic (PV) plant and 4 km transmission line ('the Project') on a 168 hectare (ha) land plot in Salima District situated in the Central Region of Malawi. In addition, the transmission line wayleave will impact approximately 57 ha of land. Impacts from the land acquisition, and construction and operation of the Project (including wayleave) are included in this ESIA. In total, 72 people were affected by the land acquisition for Phase I and 166 for Phase II, with the majority of affected land plots comprising under one ha.

The Project is being undertaken by JCM Matswani Solar Corp Limited (a limited liability corporation in Malawi owned and managed by a consortium composed of JCM Power, InfraCo Africa Limited, and Matswani Capital (PTY) Limited) (herein referred to as 'ProjectCo'). The Project will take approximately 12 months to construct and construction is expected to start at the end of 2018. The Project has an investment value of USD $80,000,000 and will be operational for a minimum of 20 years. The Project has agreed a Power Purchase Agreement (PPA) with ESCOM and the power from the Project will be fed directly into the national grid via a 4 km 132 kilovolt (kV) transmission line through to the Nanjoka substation.

The ESIA Process

A Project Brief was submitted to the Malawian Environmental Affairs Department (EAD) in late 2017 and received a response on the 6th of January 2018. Following a review of the Project Brief, which was prepared in line with the Environment Management Act 1996 (EMA), it was confirmed by the EAD that the Project required a detailed Environmental Impact Assessment (EIA). As the ProjectCo intends to seek international finance for the Project, the ESIA has also been developed in line with the International Finance Corporation (IFC) Performance Standards (PS) as well as the Malawian EMA.

Project Justification

This Project is an investment in renewable energy and will help with the diversification of the energy sector as well as add to increased capacity for the national grid. In addition, the Project is part of the government IPP process and is part of sector reform development.

(1) The capacity of the project may increase to 60 MW at request of the Government of Malawi at any time. However, it is important to note that no new land take will be required as result of this change.

The Project

The Project comprises of a 60 MW solar PV plant on a 168 ha green field site in Kalonga Traditional Authority (TA), Salima District. It is adjacent to the villages of Kanzimbe and Mayambo, under Kanzimbe Group Village (KGV), 20 km from the town of Salima and 88 km from Lilongwe (along on the M5 and M14 roads).

The solar plant will connect to a 4 km 132 kV transmission line that runs alongside an existing Electricity Supply Corporation of Malawi (ESCOM) 132 kV transmission line to the Nanjoka substation. Electricity generated will be sold to ESCOM and will be transferred to the national grid via the existing ESCOM Nanjoka substation.

The PV solar technology chosen for this Project consists of the following main components:

- **PV cell:** The PV cell is the device that generates electricity when exposed to solar radiation.

- **PV module:** The PV module is the set of interconnected photovoltaic cells encapsulated between a transparent front (usually glass) and a backing support material then mounted in an aluminium frame

- **Mounting structures**: Multiple PV modules are bolted onto a mounting structure which tracks the suns progress across the sky in an east to west direction.

- **PV array:** The PV array is the complete power generating plant consisting of multiple PV modules wired in series and in parallel.

- **Inverter:** The inverter converts the Direct Current (DC) to Alternative Current (AC)

- **Substation:** The substation receives all power from the inverters via underground cables and provides protection and control equipment required to safely manage the plant and to ensure grid code compliance regulations.

- **Transformer:** The transformer steps up the AC power from the inverters (typically at 33 kV) to match the grid voltage (expected to be 132 kV).

- **Stores, offices and control building**.

- **Access tracks and fencing.**

- **5 km 132 kV transmission line.**

Project Phases

The Project will be completed in three phases:

- site preparation and construction;
- operational; and
- decommissioning.

Site preparation and construction will involve the clearance of vegetation, installation of fencing and levelling of the site and preliminary earthworks. The site will be marked out, safety and security fencing installed, the access road will be upgraded, and internal site access tracks will be constructed. It is anticipated that there will be approximately 200 workers on the Project site across the six-nine month construction phase.

The solar PV power plant will be operated on a 24 hour, 7 days a week basis with 20 on site workers. Key operational activities will include:

- cleaning of the modules
- vegetation management for under and around the modules
- maintenance of all Project Components
- site security monitoring.

The proposed Project is expected to operate for at least 20 years. It is important to note that the ProjectCo and ESCOM may agree to trigger a clause in the PPA which would simply extend the term beyond 20 years. Therfore, it is possible the plant will operate beyond a 20 year life span. Furthermore, the land leases for the Project are for 50 years.

Project Baseline

The sensitivity of the site was assessed and the habitats in the near vicinity of the Project show considerable evidence of transformation, with the overall floral and faunal species composition showing a divergent change from the natural state. The vegetation is dominated by plant species that provide benefits to local communities, with many non-beneficial species having been eliminated through settlement and cultivation practices. As a result there are many species of non-native origin present. Human activity has substantially modified an area's primary ecological functions and species composition, and the habitats there conform to modified habitats as described in Performance Standard (PS) 6.

The Project is not located within the vicinity of protected areas, no highly threatened or range restricted floral or faunal species are considered likely to be present, and no large congregations of species are expected to occur. What remains of the habitats are representative of a widespread vegetation formation, and are therefore not unique. Based on these observations, no critical habitats are expected to occur, and a critical habitat assessment following IFC PS6 is therefore not necessary.

The ecological sensitivity of the Project area is therefore considered to be low. PS6 does not stipulate minimum requirements for developments within modified habitats, but states measures should be taken to minimise impacts on remaining biodiversity and implement mitigation as appropriate.

The Project Site is situated in the central region of Malawi, approximately 30 km Salima District Centre, and within Kalonga TA and the Kanzimbe GVH. All the villages in the Project area rely on subsistence farming for their household food consumption, with some households generating a small income from crops. Additionally, livestock rearing, particularly of goats and poultry is common. Livestock use the Project area for grazing.

Farmers generally have land plots that are under one ha. In combination with small land plots and a lack of irrigation, communities suffer food shortages during the dry seasons, especially December to February. Malaria is the most prevent illness experienced by men, women and children in the Project area due to poor sanitary conditions in villages. It is particularly prevalent during the rainy season as pools of rain water accumulate in low lying areas. Gastric illnesses such as diarrhoea, colds and other illnesses can spread if proper sanitation and hygiene is not effectively managed. Sexually transmitted diseases are also prevalent in the District.

Stakeholder Engagement

Extensive stakeholder engagement has been undertaken as part of the ESIA, the land acquisition activities, and the corporate social responsibility feasibility study. Through these actions all relevant stakeholders have been engaged and their feedback gathered. *Chapter 7* describes the stakeholder engagement undertaken to date.

Impact Assessment

The ESIA identified both potential positive and adverse impacts, as illustrated in the *Table 1*. The table summarises the potential impacts of the Project phases (construction and operation) before and after mitigation measures. Mitigation measures that are included in this Report become set project commitments, which will be implemented by ProjectCo as part of the Environmental and Social Management Plan (ESMP).

Table 1 *Summary of Impact Assessment Findings*

Potential Impact	Project Phase	Significance (Pre-mitigation)	Residual Significance (Post-mitigation)
Generation of electricity	Operation	Positive	Positive
Employment and economy	Construction and Operation	Positive	Positive
Nuisance and impact to air quality from dust emissions	Construction	Moderate	Minor
Nuisance from construction noise	Construction	Moderate	Minor
Soil erosion and reduced soil quality	Construction	Moderate	Minor
Reduction in groundwater quality and availability	Construction	Moderate	Minor
Biodiversity- loss of habitat and faunal disturbance	Construction	Minor	Negligible
Biodiversity- loss of threatened flora	Construction	Moderate	Minor
Biodiversity- risk of increased invasive alien plants	Construction	Minor	Negligible
Biodiversity-disruption of ecosystem services	Construction	Moderate	Minor
Change in landscape and visual amenity	Construction	Moderate	Minor
Change in landscape and visual amenity from solar reflection	Operation	Moderate	Minor
Physical and economic displacement from project land take	Construction	Major	Minor
Access restrictions from project land take	Construction and Operations	Moderate	Minor
Increased risk of vector borne or communicable diseases	Construction	Minor	Negligible
Increase risk in STI/HIV transmission	Construction	Minor	Negligible
Increase risk to community safety and security	Construction	Moderate	Minor
Increase risk to community safety and security	Operation	Minor	Negligible

Positive Impacts

As noted in *Chapter 8*, positive impacts are associated with economy and livelihoods, through the creation of approximately 200 jobs during construction and 20 during operation. There will be on the job training and capacity development opportunities. Enhancement measures have been proposed to maximise the potential positive benefits.

The generation of 60 MW of power will lead to an 11% increase in the generation capacity of Malawi, representing a significant benefit to the macro economy of the country.

Finally, as part of the Project the ProjectCo will invest in a Corporate Social Responsibility (CSR) programme which will ensure the Project affected communities directly benefit from the Project.

Potential Adverse Impacts

Due to the nature of a solar plant, its construction and operation, the majority of the potential environmental and social impacts occur during the construction phase. As described in the table above there were several potential impacts from routine Project activities of *major* or *moderate* significance. All of these potential impacts have been addressed through mitigation and management measures (as included in *Table 10.1 and 10.2*) of the ESIA report, and the potential impacts have been reduced to *minor* or *negligible* significance.

There is always the potential for unplanned events such as spills and traffic accidents. These have been identified (see *Section 9.13)* and preventative measures will be put in place to reduce the likelihood of these occurring.

Resettlement Activities

The land acquisition for the Project has been undertaken in two phases. Phase I refers to an initial 80 ha plot of land and Phase II refers to additional 88 ha plot of land. The land acquisition process for Phase I was Government-led process, led by the Salima District Office and undertaken at the end of 2017, prior to the development of the ESIA. The Phase II land acquisition is still underway at the time of completing this ESIA.

Land acquisition will trigger economic displacement of land users, primarily comprising subsistence farmers. Due to food shortages in communities resulting from inefficient farming techniques, the impact of land acquisition and economic displacement is likely to exacerbate food insecurity and heighten poverty levels. The high levels of subsistence farming within the communities in the Project area produces low income levels and high levels of poverty.

72 people were compensated by Phase I of land acquisition: 50 people in Kanzimbe Village (24 males and 26 females) and 22 people in Mayambo Village (8 males and 14 females). In terms of Phase II, a total of 166 people are impacted (77 males and 89 females).

In order to mitigate the impacts of economic displacement, a Livelihood Restoration Plan (LRP) is in the process of being developed that sets out the extent and scale of displacement impacts, engagement activities related to land acquisition, eligibility and entitlements for affected persons and the implementation, monitoring and evaluation requirements.

Development and Implementation of ESMP

An ESMP has been developed to specify the standards and controls required to manage and monitor the environmental and social impacts. To achieve this, the ESMP Framework identifies potential adverse impacts from the planned activities and outlines mitigation measures required to reduce the likely negative impacts on the biophysical and social environment. The ESMP actions, contained in this report are legally binding on authorisation of the ESIA and ESMP by the EAD.

The key mitigation and enhancement measures are summarised as below *Table 3* and *Table 4* (full mitigation and enhancement measures included in *Section 10*.

In summary, the proposed Project will benefit the local economy through job creation and upskilling of the local workforce as well as generation of additional electricity for the country. Whilst adverse impacts have been identified, there are no potential impacts, which cannot be managed and outweigh the positive impacts of the Project and the objective of the Project in developing additional power generation for Malawi. This Project is in line with the Malawian Government's drive to produce renewable energy in the country. Finally, those adverse impacts that have been identified in the ESIA have been minimised through the implementation of the ESMP, which is based on the approach of continual improvement following international best practice.

Likewise, positive impacts have been enhanced and maximised through the ESMP by the ProjectCo's commitment to ongoing engagement with the community and key stakeholders and an open and transparent dialogue and hiring process throughout the life cycle of the Project. On the basis of this ESIA Report it is recommended that the Project continue as planned.

Table 2 Summary of Enhancement Measures

Impact	Project Phase	Summary of Enhancement Measure
Employment and the Economy • Employment opportunities and the need for the supply of goods and services has the potential to create jobs for the local community and improve income levels.	Construction and Operation	• Provide opportunities to local communities to enhance income levels, skills/employability and improve the quality of life • Ongoing costs for recruitment activities are included in the EPC contractor's bid. • ProjectCo to verify that the procedure has been implemented.
Generation of Electricity	Operation	• As electricity generation is ambit of ESCOM there are no applicable enhancement measures
Corporate Social Responsibility	Construction and Operation	• The CSR Plan has already been developed and will be implemented across the Project Lifecycle

Table 3 Summary of Mitigation Measures

Impact	Project Phase	Summary of Mitigation Measures
Reduction in air quality from fugitive dust emissions	Construction	• Restrict the removal of vegetation and soil cover; • Land clearance will be sequential and the smallest possible area for working will be exposed; • Stripping of topsoil will not be conducted earlier than required in order to prevent the erosion; • Speed limits will be enforced; • All transported materials must be covered with tarpaulins to prevent fugitive dust; • Where feasible, surface binding agents will be used on exposed open earthworks; • Exposed ground and earthworks should be covered as much as possible; • Stockpiles stored longer than six weeks should be vegetated or covered to reduce soil loss from wind or storm water runoff; • Stockpiles will be located as far away from receptors as possible and will be covered (with sheeting, shade cloth or tarpaulin); • Wind breaks will be erected around the key construction activities • All construction vehicles must be regularly maintained to minimise exhaust emissions; • When not in use, vehicles will be switched off, unless impractical for health and safety reasons; • Any complaints received from neighbours must be reported to the ProjectCo
Nuisance from construction noise emissions	Construction	• Maintain machines and plant equipment in good working condition and inspect regularly; • Selection of equipment and vehicles in accordance with best available techniques for noise reduction; • Minimise vehicle movements within and around the site as much as possible; • Use local screening/site hoardings to screen noise where appropriate; and • Complaints received from neighbours must be reported to ProjectCo
Soil erosion and reduced soil quality	Construction	• Mitigation measures for air emissions are applicable to this impact • Erosion control measures will be constructed where necessary. • Access roads will be well drained in order to limit soil erosion.
Reduction in groundwater quality and availability	Construction	• Monitoring water levels within existing wells and boreholes will be undertaken during installation drilling and pump testing of project abstraction boreholes. • Radius of influence will be recalculated using site-specific hydrogeological parameters. Project abstractions will be located outside the radius of influence if practical. • Further assessment will be done at a later stage with updated information from all community boreholes; • Continuous monitoring of affected village supplies and a cessation of project abstraction if the groundwater elevation in village water supply wells reaches a pre-agreed level. • Water storage solutions (eg tanks) for water pumped during the wet season for use during the dry season.
Reduction in groundwater quality and availability	Operation	• Continuous monitoring of affected village supplies and a cessation of project abstraction if the groundwater elevation in village water supply wells reaches a pre-agreed level. • Water storage solutions (eg tanks) for water pumped during the wet season for use during the dry season.

Biodiversity- loss of habitat and faunal disturbance	Construction	• Ensure that vegetation is methodically cleared to avoid unwarranted clearance of vegetation. • Provisions that prohibit staff and contractors from engaging in all forms of hunting in the Project area • Rehabilitation of all disturbed areas must be undertaken following construction.
Biodiversity- loss of threatened flora	Construction	• Rehabilitation of all disturbed areas must be undertaken following construction. • Ensure that vegetation is methodically cleared to avoid unwarranted clearance of vegetation. • Provisions that prohibit workers and contractors from clearing/utilising word and plant species in the Project Area
Biodiversity- risk of increased invasive alien plants	Construction	• Invasive alien plants will be removed from areas controlled by EPC Contractor. • All alien vegetative and/or seed bearing material that is removed through control measures should be contained in a cordoned off area, dried and burnt on site to prevent the distribution of seeds. • Vehicles and construction equipment should be washed on a regular basis • Source areas such as vehicle parking, construction camps should be kept clean of invasive plants to minimise the presence of seeds that can be dispersed unintentionally. • Disturbed areas will be rehabilitated at the earliest opportunity to minimise the establishment of invasive alien plants. • Regular and ongoing monitoring of the presence of invasive alien plants should be conducted within construction and rehabilitated sites.
Biodiversity-disruption of ecosystem services	Construction	• Rehabilitation of all disturbed areas must be undertaken following construction. • Maintain ongoing engagement between the Project and local communities, with communities informed in advance of any vegetation clearing to allow pre-harvesting of resources such has wood fuel, mangoes, building materials or other useable resources. • Piles of woody vegetation cleared for construction activities are to be made available to communities to access it for use as wood fuel or other purposes.
Change in landscape and visual amenity	Construction	• Ongoing rehabilitation of cleared areas to minimise visual scarring and maintenance clearing will be kept to the absolute minimum • Any excavated or cut and fill areas will be landscaped and allowed to revegetate; • No debris or waste materials will be left at the work sites; and • Appropriate directional and intensity settings will be utilised on all lighting.
Change in landscape and visual amenity from solar reflection	Operations	• Rehabilitation of all disturbed areas must be undertaken following construction. • Maintain ongoing engagement between the Project and local communities with regards to potential solar reflection impacts.
Unplanned Events: • Spill events/improper disposal of waste leading to soil and groundwater contamination	Construction	• The Project will develop a Hazardous Spill Response Plan (HSRP) and maintain spill clean-up and response capability adequate for addressing spills for all phases of the Project. • The Project will develop and implement a Waste Management Plan. • Refuelling of equipment and vehicles will be carried out in designated areas on hard standing ground to prevent seepage of any spillages to ground. Collection systems will be installed in these areas to manage any spills, fuels will be collected and either reused, or removed by a local contractor. • Hazardous material storage will be on hard standing and impermeable surface and the storage facility will be bunded.

Unplanned Events: • Spill events/improper disposal of waste leading to soil and groundwater contamination	Operations	• The Project will implement a Hazardous Spill Response Plan (HSRP) and maintain spill clean-up and response capability adequate for addressing spills for all phases of the Project. All spills will be immediately contained and cleaned up. Contaminated areas will be remediated. • The Project will implement and Waste Management Plan. • Hazardous material storage will be on hard standing and impermeable surface and the storage facility will be bunded.
Unplanned Events: • Traffic Accidents	Construction	• A Traffic Management Plan, driving codes of conduct and enhanced driver safety awareness will be implemented • Plan traffic routes to limit road use by the Project during high traffic periods and in sensitive areas such as near schools • Assess local road conditions and discuss road maintenance during Project construction to minimise traffic risks associated with roads deteriorated from Project activities. • The Project will provide driver training to promote safe and responsible driving behaviour. • Engage with local communities and authorities to inform them about plans and procedures • Implement awareness campaigns recording traffic and road safety in communities along the transport corridor. • Work with the relevant local and regional government to ensure the roads used by Project vehicles are well maintained, and that potential problems or hazards are communicated to the relevant authority timeously.
Land acquisition and displacement • Land clearance, causing economic displacement, in particular of subsistence farmers and land for livestock grazing. • Displacement of one structure used for a goat farmer in the wayleave. The structure is not used for residential purposes.	Construction	• Develop a Livelihood Restoration Plan (LRP) • Ensure an inclusive and participatory consultation process that ensures the participation of women, men, youth, elderly, disabled and other groups in the decision making process in relation to replacement land and livelihood restoration programmes.
Access restrictions • The presence of construction equipment and activities during this period may block pathways that transect the solar site, including access to communities and farmland	Construction	• Undertake consultation with communities using farmland in areas affected during construction to establish the best alternative routes.
Access restrictions • The presence of construction equipment and activities during this period may block pathways that transect the solar site,	Operations	• Undertake consultation with communities using farmland in areas affected during operation to establish the best alternative routes and measures that the Project should put in place to minimize impacts related to access restrictions.

including access to communities and farmland		
Vector borne and communicable diseases • Construction equipment and activities have the potential to create dust emissions and create breeding grounds for vector borne illnesses affecting communities living in villages adjacent to the solar site. • Additionally the presence of the workforce during this period in combination with poor sanitary conditions has the potential to increase communicable diseases	Construction	• Provide workforce training on communicable diseases, disease prevention and treatment to raise awareness. • Establish a worker Code of Conduct that includes guidelines on worker-worker interactions andworker-community interactions • Provide workers with appropriate gender friendly sanitary facilities • Develop a robust waste handling system to avoid the creation of new vector breeding grounds. • Establish measures to reduce the presence of standing water onsite during site preparation • Ensure that working areas are kept clean and free from any accumulation of wastes as well as supplied with clean potable water. • Have a first aid point on site to avoid adding pressure on local health facilities. . • In line with best practice requirements regarding the health of the workforce, develop and implement pre-employment screening measures to ensure that workers are fit for work, as well as identify any pre-existing conditions. However, no one should be denied employment on the basis of their health status as long as they are able to undertake the required duties (following treatment if relevant).
• Increase risk in STI/HIV transmission	Construction	• Develop and implement an STI/HIV Management Plan and support a women's NGO that is addressing gender and GBV issues in Salima and in Project affected communities, to raise awareness of such issues and to encourage prevention.
Community safety and security • Security risk in relation to petty crime, increased GBV and perceptions that people in the communities are benefitting more than others creating tensions. • Worker-community interactions, including the presence of security may pose a threat to the community.	Construction and operation	• Project will train security personnel in safeguarding of the community in high tension situations • Project security will comply with Malawian laws and regulations as well as the requirements of the Voluntary Principles for Security and Human Rights. • Project will provide security measures for the construction site to minimise safety risks and the possibility of theft. • Project will establish clear and visible signage in construction areas to warn the community of any risks and hazards. • Project will establish a community engagement programme to provide information about safety hazards and raise awareness of how these are being managed. • Project will raise awareness to communities regarding their Grievance Mechanism to deal with community concerns and issues in a timely manner to avoid issues escalating.
Labour and working conditions • During peak construction the workforce may be subject to poor labour and working conditions	Construction and operation	• Develop a Human Resources Policy, which includes a Labour and Employment Plan and Worker Grievance Mechanism. • Prepare a Gender Development Plan to promote gender equality in relation to job opportunities • Ensure that contracts will make explicit reference to the need to abide by Malawian law and international standards. • Ensure that as part of any contractor and supplier selection process, performance with regard to worker management, worker rights, health and safety as outlined in Malawian law and international standards will be managed and reported on. • Support contractors in adhering to labour and working conditions that are in line with Malawian legislation and IFC PS 2 • Undertake regular checks of contractors to ensure the relevant labour laws are adhered to at all times.

	• Implement a health and safety programme will be developed that includes risk assessments work permit systems and a H&S management system, in line with industry best practice. • Establish a hiring mechanism to ensure no employee or job applicant is discriminated against on the basis of his or her gender, marital status, nationality, ethnicity, age, religion or sexual orientation. • Ensure that all workers will, as part of their induction, receive training on worker rights in line with Malawian legislation and international standards. • Ensure that all workers will have contracts which clearly state the terms and conditions of their employment and their legal rights. • Ensure that a fair and transparent worker Grievance Mechanism is in place that will be accessible to all workers, whether permanent or temporary, directly or indirectly employed. • Ensure that all workers will have access to training on communicable diseases, STI's and community interactions in general.

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ABBREVIATIONS

Abbreviation	Definition
AC	Alternate Current
ADC	Area Development Committee
AoI	Area of Influence
ARI	Acute Respiratory Infection
CSR	Corporate Social Responsibility
DAoI	Direct Area of Influence
DC	District Commissioner
DC	Direct Current
DCC	District Consultative Committee
DEC	District Executive Council
DLO	District Lands Officer
EAD	Environmental Affairs Department
EHS	Environmental Health and Safety
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
EP	Equator Principles
EPC	Engineering, Procurement, Construction contractor
ERM	Environmental Resources Management
ES	Environmental and Social
ESCOM	Electricity Supply Corporation of Malawi
ESIA	Environmental and Social Impact Assessment
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
ESMP	Environmental and Social Management Plan
GVH	Group Village Headman
Ha	Hectares
IA	Impact Assessment
IAoI	Tractor-loader-backhoe
IFC PS	International Finance Corporation Performance Standards
ILO	International Labour Organisation
IPP	independent power producer
JCM	JCM Matswani Solar Corp Limited
KGV	Kanzimbe Group Village
kV	Kilovolt
LACS	Land Acquisition and Compensation Specialist
LRP	Livelihoods Resettlement Plan
MBS	Malawi Bureau of Standards
MERA	Malawi Energy Regulatory Authority
MITC	Ministry of Trade and Commerce
MW	Mega Watt
NACP	National AIDS Control Programme
NEAP	National Environmental Action Plan
NEP	National Environmental Policy
NGO	Non-Governmental Organisation
ORES	Other Renewable Energy Sources
PPA	Power Purchase Agreement
PV	Photovoltaic
RET	Renewable Energy Technologies
SDG	Sustainable Development Goals
SEP	Stakeholder Engagement Plan
TA	Traditional Authority
TLB	Tractor-loader-backhoe
ToR	Terms of Reference

Abbreviation	Definition
VDC	Village Development Committee
WBG	World Bank Group
WWEC	Waste Water Environment Consultants

1 INTRODUCTION

1.1 OVERVIEW

JCM Matswani Solar Corp Limited (JCM) (a limited liability corporation in Malawi owned and managed by a consortium composed of JCM Power, InfraCo Africa Limited, and Matswani Capital (PTY) Limited) (herein referred to as 'ProjectCo'). The ProjectCo are planning to develop a 60 megawatt (MW) alternating current solar photovoltaic (PV) plant ('the Project') on a 168 hectare (ha) land plot adjacent to the villages of Kanzimbe and Mayambo, under Kanzimbe Group Village Kalonga Traditional Authority (TA), Salima District situated in the Central Region of Malawi. ProjectCo have agreed on form of Power Purchase Agreement (PPA) with the Electricity Supply Corporation of Malawi Limited (ESCOM) and the power from the Project will be fed directly into the national grid via a short 132 kilovolt (kV) transmission line through to the Nanjoka substation. The transmission line wayleave will be 30m and will impact 57ha of land. The Project will employ approximately 200 workers during construction and 20 during operations.

In total, 225 people have been affected by land acquisition, with the majority of affected land plots comprising under one ha. A Livelihood Restoration Plan (LRP) is in the process of being developed to mitigate impacts from economic displacement (loss of land as result of the Project). The plan will set out the extent and scale of displacement impacts, engagement related to land acquisition, eligibility and entitlements for affected persons and the implementation, monitoring and evaluation requirements.

Environmental Resources Management (ERM) in collaboration with *Waste, Water and Environment Consultancy* (WWEC) based in Lilongwe, has been appointed by the ProjectCo to undertake the ESIA and LRP in line with the Malawi laws and regulations, as well as the requirements of international finance institutions, namely the International Finance Corporation (IFC) Performance Standards (PS), in order to facilitate lender financing.

It is important to note that the Project will now generate 60 MW and not 40 MW as indicated in the draft ESIA. This change was driven by the Government of Malawi where they indicated that they national grid could accommodate the additional generation. The increase in capacity does not alter the land take for the Project, the additional generation can be achieved within the footprint which was assessed in the draft ESIA. Therefore there are no additional livelihood impacts. Resource use has not increased (conservative estimates were used for the draft ESIA Report) and therefore there is no change in significance of impact ratings.

1.2 PROJECT COST

The overall Project investment cost across all phases of the Project is approximately USD 80,000,000.

1.3 PROJECT PROPONENT

The ProjectCo is owned and managed by a consortium composed of JCM Power, InfraCo Africa Limited, and Matswani Capital (PTY) Limited.

JCM Power is an independent power producer (IPP) dedicated to accelerating social, economic and environmental sustainability in growth markets through the development, construction and operation of renewable energy facilities and HVDC transmission lines. InfraCo Africa seeks to alleviate poverty by mobilising private sector expertise and finance to develop infrastructure projects in sub-Saharan Africa. InfraCo Africa was approached by JCM and a local developer, Matswani, to co-develop the Project.

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1.4 PURPOSE OF THIS ESIA REPORT

Environmental Resources Management (ERM) has been appointed by the ProjectCo to undertake an EIA in line with the requirements of the Malawian laws (including the Environment Management Act (1996)) and regulations as well as the requirements of international finance institutions.

This Report presents an assessment of the environmental, social and community health impacts associated with the Project activities during the construction and operational activities.

This ESIA has been undertaken in two phases; a Scoping phase and an EIA phase including specialist studies.

The purpose of this ESIA Report is to present the following:

- a detailed description of the proposed Project and relevant Project alternatives;

- the ESIA process and a legal review of legislation and guidelines pertinent to the proposed Project and associated ESIA;

- the outcomes associated with stakeholder engagement activities carried out to date;

- a detailed baseline review of the physical, biological and socio-economic characteristics of the Project area;

- an assessment of impacts to the physical, biological and socio-economic environments related with the different phases (construction, operational and decommissioning phases) of the proposed Project;

- mitigation measures that aim to avoid /minimise/manage the severity of identified impacts; and

- an assessment of cumulative impacts associated with Project-related developments in the Project area.

1.5 PROJECT CYCLE AND IMPACT ASSESSMENT PROCESS TO DATE

1.5.1 Scoping

On the basis of the initial design a Project Brief was submitted by ProjectCo to the Environmental Affairs Department (EAD) and received a response on the 6th of January 2018. The EAD is the authority responsible for the environmental permitting process, in line with the requirements of Section 24 of the Environmental Management Act (EMA, No 23 of 1996).

Following a review of the Project Brief, in line with the EMA, it was confirmed by the EAD that the Project required a detailed Environmental Social Impact Assessment (EIA) (See *Annex E* for the EAD Terms of Reference). The term ESIA is used in this report to acknowledge that the assessment evaluated impacts and risks to both environmental (biological, physical) and social (people, livelihoods, socioeconomics, etc.) resources and receptors. In order to comply with national and international requirements, the EIA and ESIA will form one document serving both purposes. We will refer to this report as the ESIA.

Accordingly, ERM undertook a scoping site visit in April 2018, in line with international best practice. A Scoping Report was prepared and submitted to the potential lenders in June 2018. Scoping is the means to identify issues most important to Project planning, decision-making, and stakeholders. During scoping, potential interactions between the Project and Project activities with environmental and social resources and receptors are identified and prioritised in terms of potential risk and impacts. Scoping also identifies the areas which are not likely to have the potential for risks or impacts so that

these can be eliminated from the detailed assessment to follow. The findings of the scoping activities identified potential significant impacts that required further study in the ESIA (*see Chapter 4*). A number of findings emerged from the scoping consultations (during the scoping visit) *(see Chapter 7*) with the key actions going forward included in this ESIA.

1.5.2 Land Acquisition

The land acquisition for the Project has been undertaken in two phases. Phase I refers to an initial 80 ha plot of land (government-led land acquisition process already completed) and Phase II refers to additional 88 ha plot of land (land acquisition process in progress). The land acquisition process for Phase I was led by the Salima District Office and undertaken at the end of 2017. Phase II land acquisition has been undertaken by the Salima District Office with support from ERM and WWEC. The Ministry of Land (MoL) Report for Phase I land acquisition is included in Annex F and a draft of the MoL Report for Phase II of the land acquisition is also included in Annex F. Please note that the Phase II MoL Report is in draft as the final stages of the compensation is being completed.

This Phase I land acquisition was assessed by ERM under a Land Acquisition and Compensation Specialist (LACS) scope of work (SoW) (herein referred to as 'LACS studies'), to identify measures to align the government-led land acquisition process with international requirements. This has also included development of an overarching Stakeholder Engagement Plan (SEP) to facilitate communications regarding the Project, ongoing establishment of a grievance mechanism, and development of a socio-economic baseline to monitor the impacts of the land acquisition process and to identify impacts to inform this ESIA. Additionally, Corporate Social Responsibility (CSR) feasibility studies have also been undertaken, which has included a community needs assessment and engagement on potential community investment options (herein referred to as 'CSR studies'). The CSR will form part of the ProjectCo's investment into the affected communities.

Both the LACS and CSR studies, undertaken in January 2018, have included providing information on the Project to communities and gathering feedback to inform the outcomes of the scoping process. Further, socio-baseline information gathered during the studies was used for the scoping baseline. In addition, since additional land is required for the Project, further data was gathered and additional engagement was undertaken as part of the ESIA process.

Land acquisition already undertaken is referred to as 'Phase I land acquisition'. Additional land required for the Project is referred to as 'Phase II land acquisition'. 72 people were compensated by Phase I of land acquisition: 50 people in Kanzimbe Village (24 males and 26 females) and 22 people in Mayambo Village (8 males and 14 females). In terms of Phase II, a total of 166 people are impacted (77 males and 89 females).

1.6 *IMPACT ASSESSMENT OBJECTIVES*

The ESIA process involves the identification, prediction and evaluation of potential environmental and social impacts of a Project and outlines the proposed mitigation measures for residual impacts and enhancement measures for positive impacts which the Project will implement.

The information contained in this Report, along with the comments and inputs from stakeholders and commenting authorities will assist the EAD (the competent authority), in granting the environmental permit for the Project.

The objectives of this impact assessment process are to:

- identify all potentially significant adverse and positive environmental and social impacts of the Project;
- gather baseline data to inform the assessment of impacts and to monitor changes to the environment as a result of the Project and to evaluate the success of the mitigation measures implemented;
- communicate the results of the ESIA process for the proposed Project and alternatives considered;
- ensure that the impacts identified during the ESIA process are assessed;
- present the mitigation and enhancement measures which will be implemented by the Project to manage the impacts identified;
- provide a record of comments and responses received from the stakeholders during the ESIA process; and
- facilitate an informed decision making process by the relevant authorities.

1.7 *PROJECT JUSTIFICATION*

Malawi has an installed generation capacity of 363 MW, however there is large reliance on large hydropower (1). Over 95% of Malawi's electricity is generated from hydropower with the Shire River as the main source. Due to drought and low rainfall electricity generation has been reduced by up to 40% due to dwindling water levels (2). However, in Malawi there is also high potential for solar energy development.

(1)USAID (2018), *Malawi Power Africa Factsheet* Accessed at: https://www.usaid.gov/powerafrica/malawi
(2) ESCOM (n,d) *An Update On The Current Water Levels And The Energy Situation In Malawi* Accessed at: http://www.escom.mw/waterlevels-energysituation-malawi.php

Malawi's energy sector has gone through important sector reform efforts recently, including the partial unbundling of the national utility, the ESCOM [1]. The restructuring of Malawi's power market is underway, with strong investor interest and political will for Independent Power Producers (IPPs) to enter the market [2].

This Project is an investment in renewable energy and will help with the diversification of the energy sector as well as add to increased capacity for the national grid. In addition, the Project is part of the government IPP process and is part of sector reform development.

Finally, there is also a global drive towards the generation and implementation of affordable clean energy. One of the UN Sustainable Development Goals (SDGs) is 'Affordable Clean Energy'. This goal recognises a global economy reliant on fossil fuels, and the increase of greenhouse gas emissions is creating drastic changes to our climate system [3]. Therefore, expanding infrastructure and upgrading technology to provide clean energy in all developing countries is a crucial goal that can both encourage growth and help the environment [4]. This Project aligns with this global initiative to develop renewable energy resources in developing countries.

1.8 STRUCTURE OF THE ESIA REPORT

The remainder of this ESIA report is organised as follows:

- Chapter 2: Project Description
- Chapter 3:Administrative and Legal Framework
- Chapter 4:Impact Assessment Methodology and Scoping
- Chapter 5: Environmental Setting: Biophysical Baseline
- Chapter 6: Social Setting: Socioeconomic Baseline
- Chapter 7: Public Consultation: Stakeholder Engagement
- Chapter 8: Assessment of Positive Environmental and Social Impacts
- Chapter 9: Assessment of Negative Environmental and Social Impacts
- Chapter 10: Environmental and Social Management Plan
- Chapter 11: Impact Summary
- Chapter 12: Conclusion

The ESIA Report is supported by the following annexes:

- Annex A: Project Team CV's
- Annex B: ERM Impact Assessment Methodology

(1) USAID (2018), *Malawi Power Africa Factsheet* Accessed at: https://www.usaid.gov/powerafrica/malawi
(2) USAID (2018), *Malawi Power Africa Factsheet* Accessed at: https://www.usaid.gov/powerafrica/malawi
(3) UNDP (n,d) *Sustainable Development Goals* Accessed at: http://www.undp.org/content/undp/en/home/sustainable-development-goals/goal-7-affordable-and-clean-energy.html
(4) UNDP (n,d) *Sustainable Development Goals* Accessed at: http://www.undp.org/content/undp/en/home/sustainable-development-goals/goal-7-affordable-and-clean-energy.html

- Annex C: Specialist Reports
- Annex D: Stakeholder Engagement Documentation
- Annex E: EAD Terms of Reference
- Annex F: Ministry of Land Compensation Reports

2 PROJECT DESCRIPTION

This *Chapter* provides a description of the proposed Project and presents an overview of the key elements and activities involved in the planned construction, operation and decommissioning phases based on available design information.

2.1 PROJECT OVERVIEW AND LOCATION

The Project comprises of a 60 megawatt (MW) alternating current solar photovoltaic (PV) plant on a 168 ha green field site in Kalonga Traditional Authority (TA), Salima District. It is adjacent to the villages of Kanzimbe and Mayambo, under Kanzimbe Group Village (KGV), 20 km from the town of Salima and 88 km from Lilongwe (along on the M5 and M14 road). *Figure 2.1* illustrates a topographical map of the Project.

The solar plant will connect to a new 5 km 132 kV transmission line that runs alongside an existing Electricity Supply Corporation of Malawi (ESCOM) 132 kV transmission line to the Nanjoka substation. Electricity generated will be sold to ESCOM and will be transferred to the national grid via the existing ESCOM Nanjoka substation. The proposed grid connection solution is therefore to establish a new 132 kV feeder bay at the Nanjoka substation, in which the existing 132 kV overhead transmission termination point will be relocated. A new 132kV overhead transmission line will run, from a new on-site switching station at the solar PV plant, parallel to the existing line and terminate in the existing feeder bay at the Nanjoka substation. There will be a 30m wayleave for the transmission line which will result in 57 ha of land being impacted.

The design of the 132kV overhead line, from the solar PV plant to the Nanjoka substation is proposed to be a single circuit overhead line with an optical ground wire (OPGW) which operates as a communications cable. The proposed solution has been agreed with ESCOM in principle, however the final configuration is subject to approval from ESCOM, the Malawian Energy Regulatory Authority (MERA) and stakeholders.

The layout for the Project is shown in *Figure 2.2*

2.2 PROJECT SITE

The Project Site is generally flat land and is predominantly used for agricultural purposes. Crops cultivated in the area include maize, groundnuts, beans, soya and tobacco among others. Trees on the Site include natural and planted and fruit trees such as mangoes are harvested. Within the Project area, residents also rear livestock like cattle, goat and pigs.

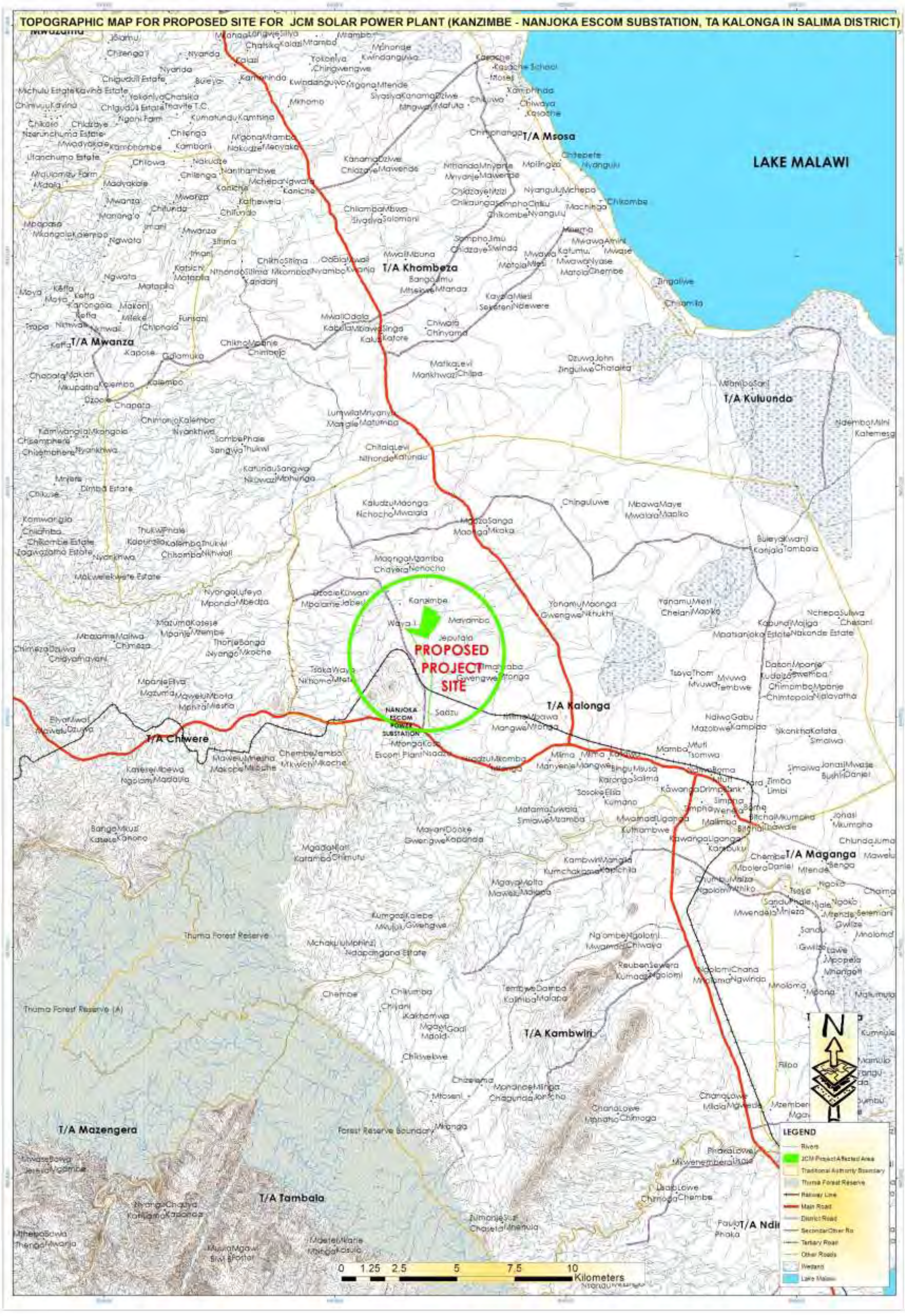

Figure 2.1 Project Location Topographical Map

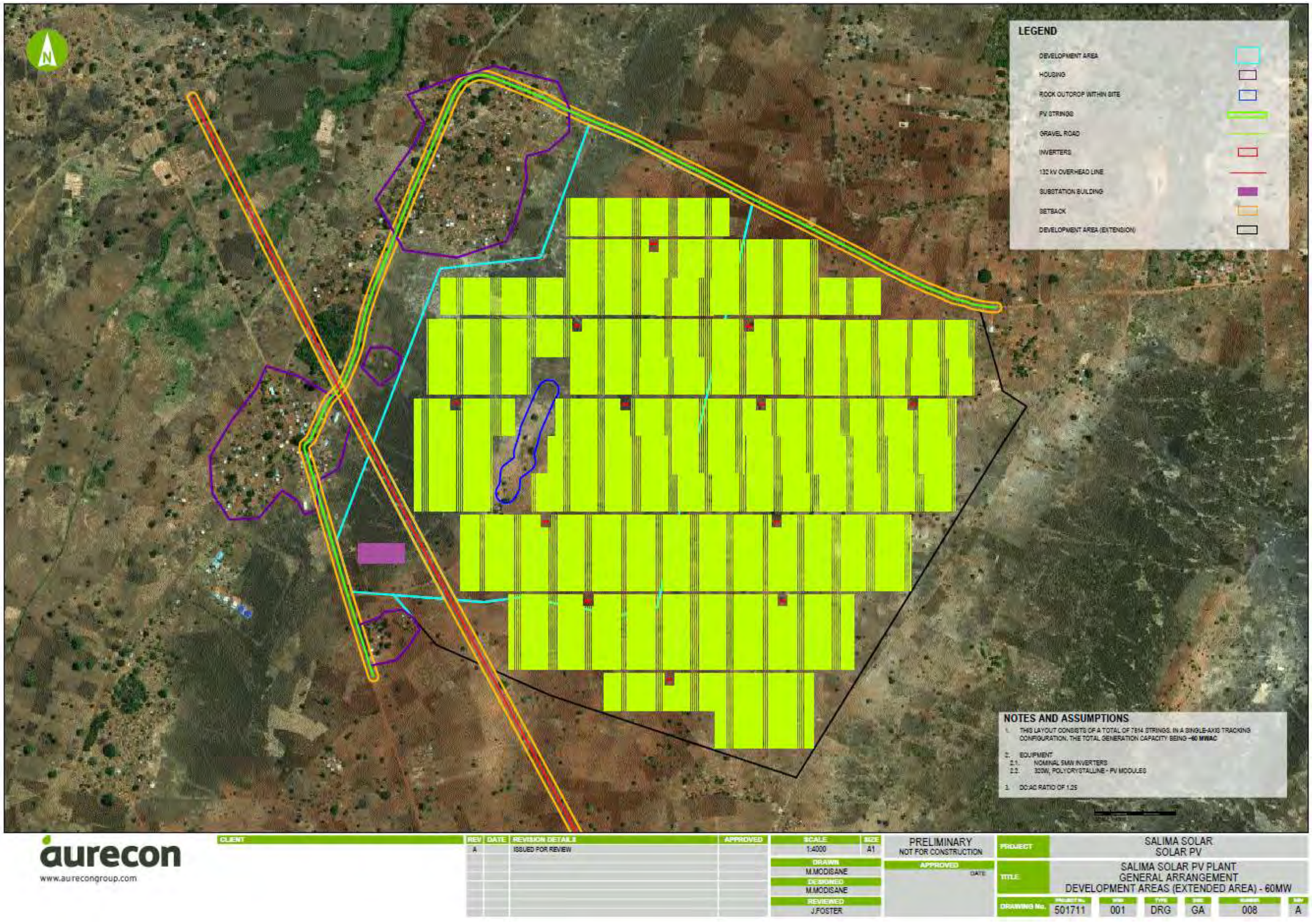

Figure 2.2 Site Layout (Source Aurecon, 2018)

2.3 *LAND OWNERSHIP*

The predominant land ownership in the Project area is customary whereby the Traditional Authority (TA), in this case Kalonga TA, administers land on behalf of the local community. The TA is mandated by the government to distribute land to individuals as well as address land disputes and report to the government through the office of the District Commissioner (DC).

Approximately 78% of the land in Salima District is under customary land tenure system (1). The land is mainly used for subsistence farming since most of the people who own the land have some sizeable plots (2). The remaining land is privately or publicly owned; 18% and 4% respectively. Additional information regarding the land ownership system and land uses in the Project area is described in *Chapter 5*.

As mentioned above, 80 ha of land has already been acquired by ProjectCo. An additional 88 ha of land will be acquired in conjunction with the LRP developed for the Project (3). A list of Project Affected Persons (PAPs) are included in *Annex D*.

2.3.1 *Process Followed to Acquire the Land for the Project*

Section 2.8.2 describes how the land for the Project was identified. Once the land for the Project was identified the following actions were undertaken for Phase I land Acquisition.

April 2016: Land Sensitization Meetings

Land sensitization meetings commenced focusing on the following:

- Extensive community engagement sessions aided by Ministry of Trade and Commerce (MITC) and facilitated by District Commissioner (DC), Traditional Authority (TA), and District Lands Officer (DLO); and

- After extensive engagement, the ProjectCo received approval to allow Ministry of Lands to conduct a survey.

May-July 2016: Community Engagement and initial Survey by Ministry of Lands

- The ProjectCo met with all stakeholders to go over the site and land requirements.

- Owners were contacted to ensure that they were satisfied for Ministry of Lands to conduct the survey.

(1) Salima District (2006) *Salima Socio-Economic Profile,* Salima
(2) Salima District (2006) *Salima Socio-Economic Profile,* Salima
(3) The LRP for the Project will integrate gender issue into proposed plan to mitigate resettlement impacts.

- The ProjectCo/MITC/Ministry of Lands conducted the preliminary survey.

- Once the preliminary survey of the available land was undertaken an additional 20Ha was added to the initial 30Ha, taking the total land to 50Ha.

- Results of survey were satisfactory and Ministry of Lands engaged by the ProjectCo to conduct valuation.

August 2016: Ministry of Lands Valuation

- Ministry of Lands conducted detailed survey and valuation.

- Full Ministry of Lands assessment facilitated by Local Government, Chiefs and owners completed over a 2-week period.

September 2016: Draft Ministry of Lands Report and Dispute Resolution with specific Owners

- Ministry of Lands completed survey and valuation report for 50Ha.

- Local Government engaged through the DC to run a separate process to increase land take for the Project from 50Ha to 80Ha.

- Local Government/ProjectCo community engagement session to sensitize affected community members.

October 2016: Additional 20Ha Identified

- Ministry of Lands conduct full survey and valuation of the additional 20Ha.

- Valuation agreed between the ProjectCo and Ministry of Lands.

November 2016: Ministry of Lands Presentation to Land Owners

- Ministry of Lands and DC presented the land values to the owners and all owners expressed willingness to sell.

- ProjectCo/Ministry of Lands/MITC made several iterations and additions to the final report.

- ProjectCo undertook compensation payment.

- Process initiated to convert from customary owned land to leasehold land.

December 2016- January 2017: Provisional Lease

- Provisional lease to be completed to accommodate ESCOM tendering process and in January 2016 the provisional lease was received.

September 2018: Summary of Phase II Disbursement

Land Acquisition for Phase II has almost been completed. Disclosure and Disbursement for Phase II occurred between the 19th and 26th of September 2018. The land acquisition process for Phase II followed a similar process as above. The Ministry of Lands was engaged to undertake the survey and acquisition with additional support from the ProjectCo and ERM.

The initial disclosure to the PAPs for Phase II was undertaken on Wednesday the 19th of September 2018 with approximately 100 people present at the initial meeting. After the meeting the start of the individual negotiations also took place. The MoL ran an objections desk, where 19 total people made an objection to through the course of the first day. The main objections were - missing copy of the form, disagreement about the measurements of the land, and disagreement about the number of trees.

All objections related to the negotiations were heard with about 12-15 PAPs with objections. The MoL took each PAP through their compensation and how it was calculated. Issues centred on measurements of acres vs hectares, number of trees, and information from survey forms not carried over correctly into the database and final forms. After these individual meetings, just two PAPs ultimately wanted to go out to their plots for re-measurement. In both cases the PAPs were allowed to carry the GPS tracker and in both cases an error was discovered, which was then documented by the MoL. All objections were resolved and updated forms generated.

Final disbursement is expected to be undertaken by the end of September/beginning of October 2018.

2.4 PROJECT COMPONENTS

Solar energy systems produce energy by converting solar radiation into electricity or heat. The proposed Project will use PV solar technology to generate electricity (*Figure 2.3).*

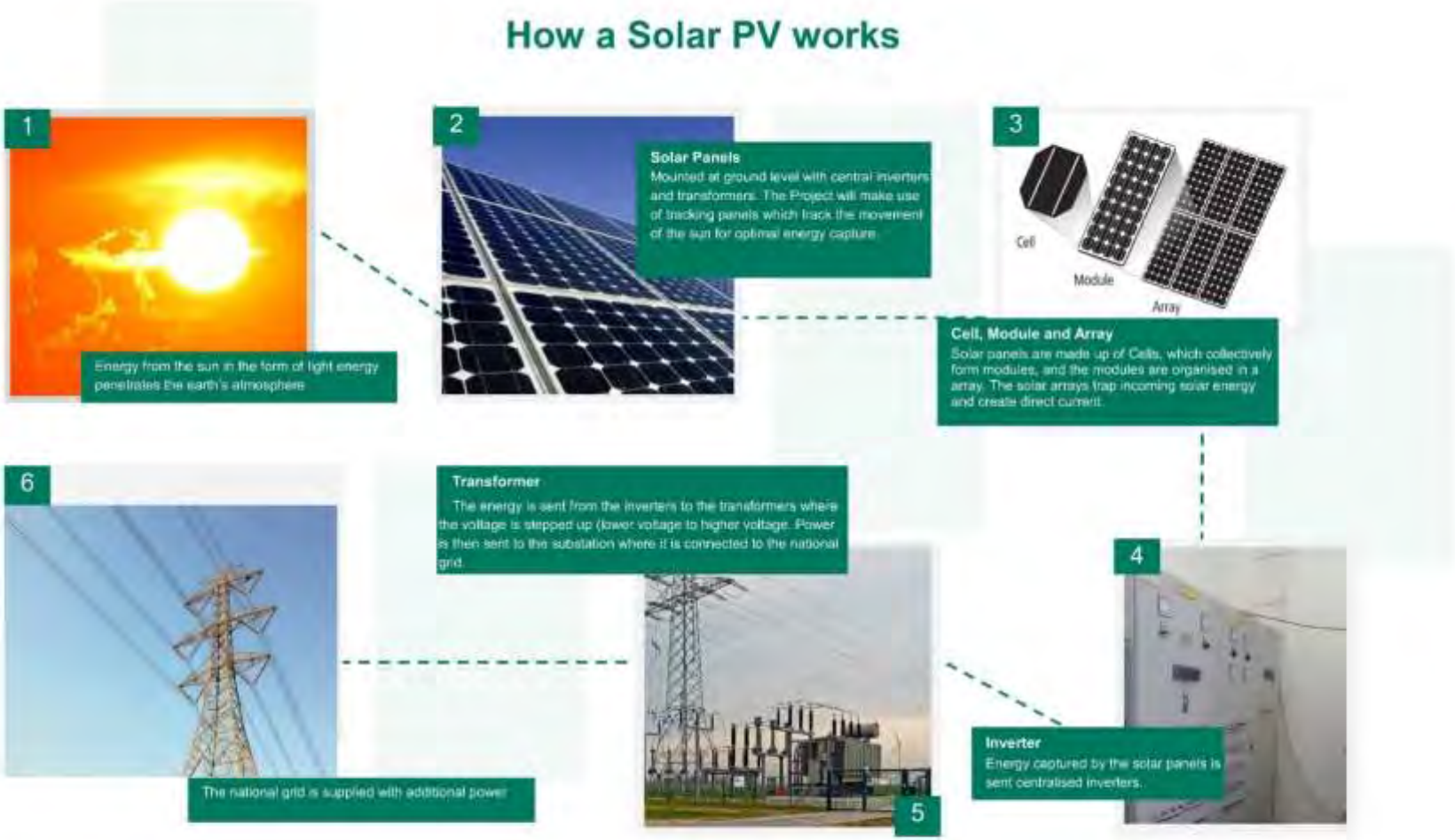

***Figure 2.3 How Solar PV Works** (Source ERM, 2018)*

The PV solar technology chosen for this Project consists of the following main components:

- **PV cell:** The PV cell is the device that generates electricity when exposed to solar radiation. The absorbed solar energy excites the electrons inside the PV cell and produces electrical energy. All PV cells produce Direct Current (DC). There are three main types of solar cells:

  - Monocrystalline – made from a single silicon crystal;

  - Polycrystalline — made from multiple silicon crystals; and

  - Thin film — common material used for thin film modules are cadmium telluride (CdTe) and copper indium gallium selenide (CIGS).

  The Project will use poly-crystalline solar modules, potentially model CS6U – 320p 1500V, or similar depending on market availability, best pricing and final technical design. The Project will use 227,280 panels.

- **PV module:** The PV module is the set of interconnected photovoltaic cells encapsulated between a transparent front (usually glass) and a backing support material then mounted in an aluminium frame. The modules will appear dark blue or black and will be mounted in an aluminium frame. The modules are designed to absorb the solar radiation and hence are not susceptible to reflection or glinting. The glare and reflectance levels from a given PV module are decisively lower than the glare and reflectance generated by a standard glass.

- **Mounting structures**: Multiple PV modules are bolted onto a mounting structure which tracks the suns progress across the sky in an east to west direction. The mounting structures will be either steel or aluminium sections extending between 1 and 3 m into the ground depending upon the ground conditions. Approximately 20 to 40 modules will be fitted per frame. There will be approximately 4 to 6 m spacing between each row.

- **PV array:** The PV array is the complete power generating plant consisting of multiple PV modules wired in series and in parallel. The PV modules will be connected by DC cables to combiner boxes mounted underneath the PV module mounting structures. Each combiner box will occupy an area of approximately one square metre. The power generated by many PV module strings is combined in the combiner box and transmitted via underground 400 V-1000V DC cables to an inverter and transformer enclosure.

- **Inverter:** The inverter converts the DC to AC. The inverter and transformer are anticipated to be housed within the same inverter station housing (typically an insulated, steel-framed 20-foot shipping container). The transformers transform the low voltage AC from the inverter to

medium voltage. There will be approximately 1,429 inverters for the Project.

- **Substation:** The substation receives all power from the inverters via underground cables and provides protection and control equipment required to safely manage the plant and to ensure grid code compliance regulations. The substation will consist of at least one small building, outdoor electrical plant and equipment and the transformers and will be approximately 2000 m^2.

- **Transformer:** The transformer steps up the AC power from the inverters (typically at 33 kV) to match the grid voltage (expected to be 132 kV).

- **Stores, offices, guardhouse and control building**: A small building containing space for spares, office seating, welfare facilities and computer control equipment will be located near the substation approximately 100 m^2 in size. This building will be on the perimeter of the plant. The guardhouse will include a small kitchen and toilet. Building will include a storeroom for spare parts kept onsite. The control room will contain switchgear and monitoring equipment for the PV plant. The buildings will be a standard height of approximately 3 m.

- **Access tracks and fencing:** The Project will include tracks throughout the site to permit access for maintenance vehicles and personnel. Vegetation (such as grass) will be permitted to grow throughout the site but will be kept low. A security fence, alarm system, and close circuit television security cameras will surround the site.

- **Balance of system:** The remaining components that will make up the Project, commonly referred to as 'balance of plant' components, typically include, but are not limited to, combiner boxes, DC cables, trenches, power conversion stations, AC cables and earthing and lightning protection.

- Transmission line: a 132 kV transmission line will connect the Project and the Nanjoka substation. The transmission line will be 5 km long and have 16 poles at a spacing of 300 m. The wayleave for the transmission line will be 30m.

- Connection to the grid: The grid connection requires transformation of the voltage from 480 V to 132,000 V. The normal components and size of a distribution rated electrical substation will be required. A small switching station for the plant will be located on the outside of the control room.

Key Project components for the Project will be source by the EPC Contractor and most likely be sourced from China.

2.5 *PROJECT ACCESS*

The existing access road from the M14/M5 road to Kanzimbe is expected to be used as the primary access to the site. This access road will be upgraded to permit heavy goods vehicles to pass safely. Solar PV component and materials are likely to arrive via cargo ships in Mozambique, and the transported via road networks to the Project site. It is expected that the best route is likely to be through Mozambique from either the port at Beira or that at Nacala. These routes cover a significantly shorter overland distance compared to the alternatives though Tanzania, South Africa or Zambia and appear to be the main routes for the import and export of goods to Malawi

2.6 *PROJECT PHASES*

2.6.1 *Project Planning and Design*

The Project has been in the Project planning and design phase since June 2015. During this time multiple pre-feasibility and feasibility studies and engagement with government and community stakeholders have been undertaken. The studies that have been undertaken during this phase include:

- Grid Analysis and Market Review.
- Site Pre-feasibility Study.
- Feasibility Study.
- On-site Weather Station and Energy Assessments.
- Land Acquisition and Compensation Study.
- Corporate Social Responsibility Study.

In addition this ESIA and the LRP are also part of the studies conducted during this phase.

2.6.2 *Site Preparation and Construction Phase*

This phase of the Project will involve the clearance of vegetation, installation of fencing and levelling of the site and preliminary earthworks. The site will be marked out by a contractor lay down area, safety and security fencing installed, the access road will be upgraded, and site access tracks will be constructed.

The construction phase will be initiated following the completion of site preparation activities. During the construction phase the following activities will take place:

- transportation and of equipment and components to site;
- establishment of workshops, temporary laydown areas;
- excavation of cable trenches;
- ramming or drilling of the mounting structure frames (depending on the geotechnical condition of the ground);

- installation of the modules onto the frames;
- installation of measuring equipment;
- laying of cables between the module rows to the inverter stations;
- construction of inverter and transformer station foundations and installation of inverter stations;
- construction of transmission lines, switch stations and upgrades/expansions at the Salima (Nanjoka) substation;
- construction of stores, workshop and office buildings;
- testing and commissioning; and
- removal of equipment and demobilisation of construction team.

The following facilities will be constructed:

- workshop and maintenance area;
- stores (for storing and handling fuel, lubricants, solvents, paints and construction material);
- contractor lay-down areas;
- mobile site offices;
- temporary waste collection and storage area; and
- parking area for cars and equipment.

Construction will occur over 12-18 months and it is anticipated that during this phase there will be approximately 100-200 construction workers (skilled and unskilled) on the Project Site.

During construction the primary Project components will be delivered in the following way:

- inverters - eight truck deliveries ;
- main Transformer - two specialised abnormal load deliveries ;
- LV/MV Transformers – Eight truck deliveries;
- PV modules – 200 truck deliveries;
- tracker/structure – 300 truck deliveries; and
- miscellaneous – 200 truck deliveries.

2.6.3 Operational Phase

The solar PV power plant will be operated on a 24 hour, 7 days a week basis (although generation of electricity will only occur during sunlight hours). Operational activities will include:

- cleaning of the modules by trained personnel using a high pressure water hoses;

- vegetation management for under and around the modules to allow maintenance and operation at full capacity;

- maintenance of all components including modules, mounting structures, trackers, inverters, transformers switching station plant and equipment;

- control room management and maintenance of the welfare facilities;

- supervision of the electricity production; and

- site security monitoring.

During operations it is estimated that there will be up to 20 workers on the Project Site and minimal Project related traffic. The breakdown of workers will be as follows:

- Skilled (8 workers)
    - Technicians.
    - Operators.
    - Security (negotiable if you classify that as skilled).

- Unskilled (12 workers)
    - General facility housekeeping (Weeding).
    - Panel cleaning.
    - Cleaners.

2.6.4 Decommissioning Phase

The proposed Project is expected to operate for at least 20 years. Once the plant reaches the end of its life, the PV modules may be refurbished or replaced to continue operations or the facility may be closed and decommissioned. If decommissioned, all components would be removed and the site rehabilitated. Where possible all materials will be recycled, otherwise they will be disposed of in accordance with local regulations and international best practise and approximately 120 workers will be required.

2.7 PROJECT EMISSIONS AND RESOURCE USE

2.7.1 Wastewater

Construction

Wastewater from construction activities include the following:

- temporary sanitary facilities;
- storm water; and
- drainage over potentially contaminated areas (e.g. concrete batching/ mixing areas and equipment storing areas).

Operation

During operations wastewater will arise from onsite sanitary facilities and run off from panel cleaning activities.

2.7.2 Air Emissions

Construction

Emissions during construction will vary in magnitude, frequency and duration for the various construction activities required. During construction, temporary air emissions will be associated with the following activities:

- combustion emissions from the operation of construction machinery and generators;
- particulate (dust) emissions from exposed areas and earthmoving activities;
- vehicle emissions from supply vehicles and generator operation; and
- welding operations.

The following construction vehicles/machinery will be onsite during the construction period:

- two Dump trucks;
- three Bob Cats;
- one tractor;
- four Water truck;
- four Tractor-loader-backhoe (TLB)s;
- ten Pick-up trucks; and
- three Excavators.

The potential impacts from air emissions during construction are assessed in in *Chapter 9*.

Operations

Little to no emissions are anticipated during the operational phase through management of on-site vehicle speed and vegetation and soil landscaping. As illustrated in *Chapter 4,* air quality impacts during operations have been scoped out of further assessment.

2.7.3 *Noise Emissions*

Construction

The construction phase will be characterised by noise generated by diesel mobile construction and earth moving equipment, drilling, and foundation work. Traffic associated with the transport of construction materials, transformers, turbine-generator units etc. and construction workers will also result in increased noise levels along transport routes.

The potential impacts from noise emissions during construction are assessed in *Chapter 9*.

Operations

The operation of the solar PV power plant is not expected to generate significant noise emissions.

As illustrated in *Chapter 4* air quality impacts during operations have been scoped out of further assessment.

2.7.4 *Non-Hazardous and Hazardous Waste*

Construction

During construction, wastes will comprise of general domestic waste including sanitary and food waste, office waste and organic material. Petrol and diesel by-products will be generated from the transport of goods and personnel, generators and heavy construction equipment.

Large quantities of non-hazardous waste will be generated from the solar PV panel packaging material, which typically arrive in wooden pallets. The disposal and possible recycling of these materials will be investigated.

Operations

Minimal waste is expected to be generated during the operations phase. Hazardous materials used on site during operations will include fuels, oils, lubricants, cleaning products, and specialised gases (for use in switchgear). Oil that needs to be replaced will be recycled, if possible, or safely stored and removed from the site and correctly disposed.

2.7.5 *Waste Management*

Solid Waste

Waste will be separated at source, and labelled bins provided within the facility for the storage of the various categories. Staff will be trained in proper waste management practices and the importance of implementing them.

Cleaning staff will be trained in safe handling and storage of waste and hazardous materials; they will also be provided with adequate PPE.

During construction all hazardous waste will be removed by the EPC contractor and safely disposed of in a licensed facility. The ProjectCo will investigate the possibility of recycling non-hazardous waste. Non-recyclable non-hazardous solid waste will sent to the Salima waste site.

During operations it is estimated that 50 kg of domestic waste will be produced weekly by the 20 person workforce. Industrial waste production will be occasional (e.g. solar panels, electrical waste) as they will only require disposal if they become damaged.

Wastewater

The EPC contractor will manage construction wastewater. Any hazardous wastewater will be stored on site, and treated (if required) before disposal.

During operations, there will be minimal sewage from sanitary facilities. These facilities will operate on a septic tank system and the ProjectCo will arrange for safe disposal of waste from the septic tank.

Run-off from the panel cleaning or storm water are not expected to be contaminated and adequate drainage of the site will be a design requirement for the Project Site.

2.7.6 Energy and Fuel Requirements

Electricity during the construction phase will be provided through the use of diesel powered generators. It is estimated that 5 x 24kW generators running at ¾ for 10 hours a day, 5 days a week for 36 weeks will satisfy the electricity requirements of the office trailers during construction. Therefore, the estimated consumption of fuel during construction for office trailers is 48,6000L.

It is estimated that 10 x 8kW generators running at ¾ for 6 hours a day, 5 days a week for 36 weeks will satisfy the electricity requirements of the operations of equipment during construction. Therefore, the estimated consumption of fuel during construction for equipment use is 18,360L.

Operations

Once operation has been established, the facility will be supplied with the solar generated electricity, electricity purchased from ESCOM when the plant is not generating electricity, and diesel-powered generators when there is no supply from the facility or the grid.

It is estimated that 1 x 200kW generator running for 10 days a year for 8 hours at full load will satisfy the electricity requirements during operations,

specifically for lighting of offices and other administrative functions. Therefore, the estimated consumption of fuel during operations is 4,280L/year.

2.7.7 Water Requirements

Construction

Water for construction activities will be sourced from the boreholes on site (1). Uses will include construction activities such as concrete mixing, and sanitary facilities for workers. It is estimated that the Project will require up to 7000 cubic metres of water during construction.

Operations

Water usage during this phase will include domestic use and panel cleaning. It is estimated that up to 4000 cubic metres of water per annum will be required for panel cleaning during the dry season. Water will also be required for onsite staff which is approximately 30 litres per worker per day. All water for the Project will be obtained from the boreholes within the facility.

2.7.8 Chemical Requirements

No chemicals will be used apart from those present in construction materials such as paint and solvents.

2.8 PROJECT ALTERNATIVES

The following alternatives have been considered in the design phase of the Project:

2.8.1 Activity Alternatives

ProjectCo was awarded preferred bidder status through ESCOM's competitive tender for the supply of solar PV in 2016/2017. As such, the tender specified solar PV as the activity to generate power resulting in no activity alternatives being investigated.

2.8.2 Location Alternatives

The ProjectCo followed a rigorous process in order to select the land adjacent to the Kanzimbe community in Salima District. A summary of the Process I described below.

(1) It is noted that water abstracted for the Project will require permitting and necessary permits will be obtained prior to construction and operations

June 2015: Pre- Feasibility Study

The ProjectCo engaged a 3rd Party contractor to carry out a full prefeasibility study. The study included the following:

Part 1: Grid Analysis and Market Review:
- Grid analysis for the connection of a 25 – 50 MW PV plant.
- General analysis of electricity market in Malawi.

Part 2: Site Pre-feasibility
- Provide a shortlist of suitable priority connection options.
- Strategy to identify the most optimal site was based on the following:
    - Solar Resource.
    - ESCOM Grid infrastructure.
    - Social and environmental impact.
    - Terrain.
    - Associated infrastructure.

Potential areas in Malawi were reviewed based on the factors above. It was decided that the area around Salima was optimal.

July/August 2015: Preliminary Site Selection Process

3rd party consultant hired to evaluate prospective land per the following:

- Area of focus is 15km North of Salima through to 15km South of Golomoti.
- Flat land with little to no gradient.
- Ideally within 0-5 km from connection (132KvA line or substation) but up to max 8Km.
- Sparsely Populated.
- Good access roads.
- 60 to 80 Hectares land size.
- Land cannot be on a flood plain.

Five prospective site were uncovered, two in Salima and three in the Golomoti region.

September 2015: Further Site Selection

- Further analysis was done on the five prospective sites. It was decided to focus on the area around Salima largely owing to the radiation levels in the area.

- The ProjectCo engaged the District Land Officer (DLO) to assist in expanding the search in the Salima area.

- Five focus areas were identified in the Salima region. Various local government officials and owners engaged.

- Two shortlisted sites identified, one adjacent to the substation and one a few kilometres to the North of the substation.

- ProjectCo and local government initiated first community/owner engagement sessions for site adjacent to substation

November 2015 – March 2016: Land Negotiations

Land negotiations with DLO and traditional leaders were undertaken. Through this process the current site in Salima was identified. Following the identification the ProjectCo has undertaken all required steps for the leasing of land according to Malawi regulatory requirements.

2.8.3 Technology Alternatives

Various technology alternatives will be investigated as part of the EPC bidding process for the Project. The ProjectCo has shortlisted ten EPC contractors. Each EPC bid will include a variety of technical specifications which will then be evaluated by the ProjectCo.

2.8.4 No-go Alternative

If the Project is not undertaken then Malawi will not receive the significant increase in power generation for the country. In addition, temporary benefits from construction employment and permanent benefits from operational employment will not be realised. CSR programs to offset loss of livelihoods as a result of land take for the Project will not be undertaken.

3 LEGAL AND POLICY FRAMEWORK

3.1 INTRODUCTION

This *Chapter* presents an overview of the national environmental and social legislation and policies applicable to the Project, as well as the relevant international treaties, conventions and best practices (e.g. international treaties and conventions to which Malawi is party and financial institution standards).

Information in this section is largely drawn from World Bank (1) documentation as well as the Southern African Development Community (SADC) Handbook (2).

3.2 MALAWIAN INSTITUTIONAL FRAMEWORK

3.2.1 Constitution of Malawi

The Constitution of the Republic of Malawi, 1995, is the supreme law of the country. The Constitution recognises that responsible environmental management can make an important contribution towards achieving sustainable development, improved standards of living, and conservation of natural resources (SADC, 2012). The Constitution states that the environment of Malawi should be managed in order to:

- prevent the degradation of the environment;
- provide a healthy living and working environment for the people;
- accord full recognition of the rights of future generations by means of environmental protection; and
- conserve and enhance biological diversity.

The Constitution also includes a framework for the integration of environmental consideration into development programs. Therefore Government, its partners and the private sector have a responsibility to ensure development programs and projects are undertaken in an environmentally responsible manner.

The Constitution also sets the legislative basis for land acquisition in the country. Section 28 (2) of the Constitution states that "No person shall be arbitrarily deprived of property" and section 44 (4) states that "Expropriation of property shall be permissible only when done for public utility and only

(1) World Bank (2013), Independent Environmental Impact Assessment for the Upgraded Kamuzu Barrage – Final ESIA Volume 1: Main Report, World Bank

(2) Walmsley, B and Patel, S, 2011. Handbook on environmental assessment legislation in the SADC region. 3rd edition. Pretoria: Development Bank of Southern Africa (DBSA) in collaboration with the Southern African Institute for Environmental Assessment (SAIEA

when there has been adequate notification and appropriate compensation, and appeal mechanism exists.

With regard to women's rights, Section 24 of the Constitution states that *"Women have the right to full and equal protection by the law and have the right not to be discriminated against on the basis of their gender or marital status which includes (a) to be accorded the same rights as men in civil law, including equal capacity to (i) enter into contracts, (ii) acquire and maintain rights in property, independently or in association with others, regardless of their marital status.*

Applicability to Project

As the Project is located in Malawi it must abide by all applicable legislation. The Constitution of the country provides the overarching framework for all laws including environmental legislation.

3.3 NATIONAL POLICIES AND PLANS

3.3.1 National Environmental Action Plan (2004)

The NEAP was prepared in 1994 (updated in 2004) in response to Agenda 21 (Rio 1992 Declaration) as action plan for integrating environmental issues into socio-economic development programs. The objectives of the NEAP are to:

- document and analyse all major environmental issues and measures;
- promote sustainable use of natural resources; and
- develop an environmental protection and management plan.

The NEAP outlines actions that need to be considered to ensure adequate environmental protection. For example, EIAs will be required for any development that may affect fragile ecosystems and Government will ensure that workers are supplied with the appropriate protective equipment during construction and operation.

Applicability to Project

The Project has the potential to negatively impact the surrounding environment and therefore an ESIA is required. In the ESIA impacts and management measures are detailed and a management plan included in accordance with the objectives of the NEAP.

3.3.2 National Environmental Policy (2004)

The National Environmental Policy (NEP) aims to create a balance between protection of natural resources and national development. The Policy promotes sustainable social and economic development through sound management of the environment and natural resources. The policy seeks, among other things, to:

- secure an environment suitable for their health and well-being for all citizens of Malawi;

- promote efficient utilisation and management of the country's natural resources and encourage self-sufficiency in food, fuel wood and other energy requirements;

- facilitate the restoration, maintenance and enhancement of the ecosystems and ecological processes essential for the functioning of the biosphere and prudent use of renewable resources;

- integrate sustainable environment and natural resources management into the decentralised governance systems and ensure that the institutional framework for the management of natural resources supports environmental governance in local government authorities;

- enhance public education and awareness of various environmental issues and public participation in addressing them; and

- promote local community, NGO and private sector participation in environment and natural resources management.

In the NEP, there are strategies on environmental planning and environmental impact assessment. The objective on environmental planning is to ensure that national and district development plans integrate environmental concerns, in order to improve environmental management and ensure sensitivity to local concerns and needs.

Applicability to Project

In terms of EIA's the objective of the NEP is to regularly review and administer the guidelines for EIAs, audits, monitoring and evaluation so that adverse environmental impacts can be eliminated or mitigated and environmental benefits enhanced

3.3.3 National Land Policy (2002)

The policy guides land management and administration issues, provides definitions of land ownership categories, and describes details on compensation payment for land.

In terms of land use planning, the policy provides that land allocation should make effective use of land and take into account environment and welfare of community. In terms of environmental management, the policy aims at lending support to the policies and strategies that are already in place. The policy covers issues related to both urban and rural management of solid and liquid waste, protection of sensitive areas, agricultural resource conservation and land use, community forests and woodland management, over-dependence on fuel wood, forest programs, co-ordination of multiple land

use, water resources and wetlands, lakeshore environmental management and mining and minerals.

Applicability to Project

The Project includes a land acquisition process and therefore the contents of the policy are applicable.

3.3.4 National Water Policy (2004)

Malawi's policy on water resources management requires that:

- Water should be managed and used efficiently and effectively in order to promote its conservation and future availability in sufficient quantity and acceptable quality; and
- All programs related to water should be implemented in a manner that mitigates environmental degradation.

Applicability to Project

ProjectCo will draw water for the Project from groundwater resources. Permits for water abstraction are not part of the ESIA process but require the approved ESIA as part of the application. Once the ESIA has been obtained, ProjectCo will apply for the water use licence

3.3.5 National Energy Policy (2013)

Other Renewable Energy Technologies

The Policy describes the technical barriers to include lack of capacity in manufacturing, distributing, installing and maintaining Renewable Energy Technologies (RETs). Financial barriers to include high initial cost, a large proportion (45%) of which emanates from import duties and surtaxes. Other key financial barriers are lack of dedicated and affordable financing mechanism, lack of financers and suppliers knowledge about establishing dedicated financing mechanisms and appraising applications for credit, lack of skills to develop business plans, lack of knowledge about local, regional and international financial facilities for RETs, lack of confidence in RETs and low returns on investment (for financiers) and the non-availability of loans (for end users).

Institutional barriers include lack of standards and regulatory framework, limited delivery modes, small number of RET companies, a latent market and a small number of qualified technicians to undertake installations. Lack of deliberate policies and strategies; and lack of information about the efficacy of RETs among policy makers, NGOs and the public have further contributed to

the entrenchment of institutional barriers. Social-cultural barriers include gender insensitivity in the design and operation of some RETs.

Applicability to Project

The Project is investing in renewable energy and is therefore in line with the Policy.

3.3.6 National HIV/AIDS Policy (2003)

The National HIV/AIDS Policy (2003) provides technical and administrative guidelines for the design, implementation, and management of HIV/AIDS interventions, programs and activities at all levels of the Malawi society. It offers:

- guidance on critical intervention areas, for example social and economic support for people living with HIV/AIDS;
- provision of care and support for treatment to achieve a better quality of life for all Malawians living with HIV/AIDS; and
- protection of their human rights and freedoms.

The goals of the National HIV/AIDS Policy are to:

- prevent the further spread of HIV infection; and
- mitigate the impact of HIV/AIDS on the socioeconomic status of individuals, families, communities and the nation.

Applicability to Project

Potential HIV/AIDS impacts will be investigated in the ESIA. Mitigations measures to combat impacts will be in line with the National Policy.

3.3.7 National Health Policy, 2008

The overall goal of the National Health Policy is to improve the health status of all the people of Malawi by reducing the risk of ill health and the occurrence of premature deaths(1).

(1) WHO, Malawi- Analytical summary - General country health policies, n,d. Accessed at: http://www.aho.afro.who.int/profiles_information/index.php/Malawi:Analytical_summary_-_General_country_health_policies (31/10/2017)

The National Health Policy acknowledges the inadequate resources available for the health sector hence it also defines the Essential Health Package, which will be available to all Malawians free of charge [1].

Applicability to Project

ProjectCo is committed to ensuring that health of workers and the surrounding communities is not impacted negatively.

3.3.8 Republic of Malawi Gender Policy, 2008

The policy [2] focuses on building a society where men, women, boys and girls equally and effectively participate in and benefit from development process. A key aspect of this is to increase land ownership for women and promote women's participation in community afforestation, water, land.

Applicability to Project

ProjectCo will (where possible) promote gender equality in Project aspects.

3.4 ENVIRONMENTAL LEGISLATION

3.4.1 Environment Management Act (1996)

The Act includes provisions on protection, management, conservation and sustainable utilisation for almost all forms of the environment. The Act provides for EIA and gives power to the Minister to publish details of projects that shall not be implemented without an EIA. A list of projects for which EIA is required is described in the Guidelines for EIA.

Part IV of the EMA makes provision for pollution control for air and water pollution and the Act prohibits the discharge of pollutants into the environment. In addition, the Act includes that it is the duty of every person to prevent the discharge of any pollutant into the environment otherwise than in accordance with specifications made by the Minister or director. Moreover, the Minister is able to direct anyone to prevent and/or minimise any pollutant discharged into the environment. Finally, any discharge of pollutants is in accordance with the EMA; however no regulations have been published.

Section 24 of the EMA provides information on the need for projects for which an EIA may be required. Details are as follows:

(1) WHO, Malawi- Analytical summary - General country health policies, n,d. Accessed at: http://www.aho.afro.who.int/profiles_information/index.php/Malawi:Analytical_summary_-_General_country_health_policies (31/10/2017
(2) Government of Malawi, Gender Policy 2008. Available at https://cepa.rmportal.net/Library/government-publications/National%20Gender%20Policy%202008.pdf (accessed 2017)

- the Minister may specify types and sizes of projects which shall not be implemented unless an EIA is undertaken;

- before implementing a project that requires an EIA the project developer must submit the following information to the Director of the EAD:

    - the description of the project;

    - the activities that shall be undertaken in the implementation of the project;

    - the likely impact of those activities on the environment;

    - the number of people to be employed by the project (construction and operation);

    - details of the environment likely to be affected by the project; and

    - any information that the Director deems to be relevant to the project.

    - the Director may require the developer to provide, further information as necessary with regards to details of the project.

Applicability to Project

A Project Brief has been submitted to the EAD which outlined the scope of the Project. The EAD confirmed that an EIA was required. This ESIA satisfies the requirements of the EMA.

3.4.2 Guidelines for Environmental and Social Impact Assessment (1997)

Subsequent to the promulgation of the Environment Management Act, the EIA Guidelines of 1997 were developed with the purpose to improve decision making and to ensure that projects under consideration and development are environmentally sound and sustainable (Republic of Malawi, 2014).

A revised set of guidelines have been drafted in 2014 but not yet approved. The purpose of these *Guidelines, for Environmental and Social Impact Assessment (ESIA),* is to facilitate compliance with Malawi's ESIA requirements by Government, project developers, donors and the general public (Republic of Malawi, 2014).

Applicability to Project

This EIA document follows the EIA process by submitting a Project Brief to the Director of EAD and then preparing an EIA for approval by licencing authorities.

3.4.3 EIA Regulations

Section 77 of the EMA makes provision for the Minister to make regulations pertaining to any aspect of environmental management. However, no regulations on EIA have been gazetted (SADC, 2012).

3.4.4 Forestry Act (1997)

The Act deals with the management of indigenous forests on customary land, private land, forest reserves, protected forest areas, and plantations. The Act aims to (amongst other elements):

- protect trees and resources in forest reserves;
- conserve and enhance biodiversity;
- protect and facilitate management of trees on customary land; and
- promote sustainable utilisation of timber and other forest produce and protect fragile areas such as river banks and water catchment.

Applicability to Project

The Project Site is largely modified by human activities with most of the site being used for the cultivation of crops. There is no land take required from forest reserves, protected forest areas or plantations. However any removal of trees will be in line with the Act.

3.4.5 Electricity Act, 2004

The Act (1) suggests that the developer is required to give no less than 30 days' notice before placing, laying down or carrying any transmission line, or distribution line, water pipeline or other equipment through, over or under any land without the consent of the owner, lessee or occupier of such land. Notice needs to be published in the *Gazette* or in a paper in general circulation. Notices should include the nature of the work and the name and location of the project. Notice will also be provided to the affected person.

It is the responsibility of the authorities to determine the amount of compensation, whether by way of payment of a lump sum or an annual rental, or of both, to such owner, lessee or occupier.

Applicability to Project

The ProjectCo have secured the necessary licenses from ESCOM for the generation of electricity. The requisite notifications will also be made prior to construction commencing.

(1) The Government of Malawi, Electricity Act 2004. Available at https://www.meramalawi.mw/index.php/legislation/send/2-legislation/5-the-electricity-act-2004 (accessed October 2017)

3.4.6 Energy Regulatory Act No. 20 of 2004

The Act established the Malawi Energy Regulatory Authority (MERA) as a corporate body and as the Energy Sector Wide Regulator. The mandate of MERA is to regulate the energy sector in Malawi in a fair, transparent, efficient and cost effective manner for the benefit of the consumers and operators. In addition, the Authority is mandated to promote renewable energy

Applicability to Project

As the Project will generate electricity from renewable resources and the operations of the Project will regulated by MERA. The ProjectCo will adhere to all licensing and monitoring requirements.

3.4.7 Water Resources Act (2013)

The Water Resources Act is the major legislation dealing with the control, conservation, apportionment, and use of water resources in the country. The Act also prohibits any person to divert, dam, store, abstract or use public water for any other purpose except in accordance with the provisions of the Act. The Act defines pollution of public water as the discharge into or in the vicinity of public water or in a place where public water is likely to flow, of any matter or substance likely to cause injury whether directly to public health, livestock, animal life, fish, crops orchards or gardens which such water is used or which occasions, or which is likely to occasion, a nuisance.

The activities of the proposed Project will have the potential to pollute surrounding water resources. It is important to note no offence is committed if a discharge is, inter alia, under the authority of the Act or any other written law as under the Water Resources (National Water Resources Authority) Regulations made pursuant to the Act. Permission to discharge into the environment must be sought from the Water Pollution Control Board. Finally, the right to use public water may be limited if the use may cause damage to natural resources of the area or in the vicinity.

Applicability to the Project

The activities of the proposed Project will require water and have the potential to pollute the water resources surrounding the Project Site. It is important to note no offence is committed if a discharge is, inter alia, under the authority of the Act or any other written law as under the Water Resources (Water Pollution Control) Regulations made the Act. Permission to discharge into the environment must be sought from the Water Pollution Control Board. Finally, the right to use public water may be limited if the use may cause damage to natural resources of the area or in the vicinity.

3.4.8 Land Act (2016)

The Act is the principal act with respect to land administration and management in Malawi and for all matters relating to land such as land tenure, land transfer, land use and compensation. The Act vests all land in the Republic in perpetuity. The Act has two categories of land, which are public land and private land. Section 7(2) classifies Public land as Government land and unallocated customary land while Section 7(3) classifies private land as freehold, leasehold or customary estate. (1)

Applicability to Project

The Project is being developed on land that was previously owned by community members in the area. All land related actions will occur in line with the Act.

3.4.9 Customary Land Act (2016)

Customary land is the land occupied and used by members of a community who live under customary law. Customary land, however, is not communal land. Most customary land is divided into pieces allocated for the use of individuals and their families. Rights to this land are usually well defined, often for exclusive use and transmissible. (2)

3.4.10 Land Acquisition Act (1970)

The Lands Acquisition Act sets out in detail, the procedures for acquisition of customary land and freehold land. Any land acquisition should follow the steps as provided for in the existing Lands Acquisition Act. Procedures include steps to be undertaken for government to acquire land starting from issuance of formal notices to persons with existing land interests to payment of compensation for land ownership transfer.

Applicability to Project

The Project is being developed on land that was previously owned by community members in the area. All land acquisition and compensation will occur in line with the Act.

3.4.11 Land Acquisition Amendment Act (2016)

The Lands Acquisition (Amendment) Act 2016 empowers the Minister to acquire land in the interest of Malawians.

(1) http://documents.worldbank.org/curated/en/572641502362203937/pdf/SFG3554-RP-P158805-Box405293B-PUBLIC-Disclosed-8-10-17.pdf
(2) http://documents.worldbank.org/curated/en/572641502362203937/pdf/SFG3554-RP-P158805-Box405293B-PUBLIC-Disclosed-8-10-17.pdf

Applicability to Project

The Project is being developed on land that was previously owned by community members in the area. All land acquisition and compensation will occur in line with the Act.

3.5 LABOUR AND OTHER SOCIAL RESPONSIBILITY LAWS

The Ministry of Labour is mandated to provide policy direction and guidance on all labour administration and vocational training matters. The Ministry is also mandated to protect and develop the labour force in order to contribute to the socio economic development of Malawi. Accordingly, the following Acts apply to the Project.

3.5.1 The Employment Act (2000) and Labour Relations Act (1996)

These two Acts regulate employment matters i.e. minimum wage, fair labour practices, non-discrimination, prohibition (in some cases) of employment of children.

Applicability to Project

All Project related employment will be in line with the Employment Act and the Labour Relations Act

3.5.2 Malawi Bureau of Standards

The Malawi Bureau of Standards (MBS) is charged with the preparation and promulgation of national standards. Formulation of standards is done through Technical Committees whose membership covers a variety of sectors. Current Technical Committees include one for environmental protection and pollution Control. Malawi is developing its own emissions standards. The standards developed to date by the Malawi Bureau of Standards are as follows:

- 13.020.10:Adoption of the ISO144000 series on environmental management
- MS691:2005: Tolerance limits for domestic sewage effluents discharged into inland surface waters
- MS214:2005: Drinking water – specification
- MS173:2005: Noise pollution – tolerance limits

Applicability to Project

All Project related activities will be in line with the Environmental Standards in Malawi.

3.5.3 Occupational Safety, Health and Welfare Act (1997)

The principal legislation that regulates OSH in Malawi is the Occupational Safety, Health and Welfare Act, 1997. The Act regulates conditions of employment in workplaces with regard to safety, health and welfare of employees. The Act imposes duties on employers, self-employed, other persons in control of premises, manufacturers and suppliers (Wage Indicator, 2017).

Applicability to Project

The Project will comply with all occupational health and safety regulations in Malawi. Working conditions on site be monitored to ensure there is no contravention of the Act.

3.5.4 Public Health Act (1948)

The Public Health Act is the overarching legislation guiding health legislation in Malawi. The Act is currently under revision.

Applicability to Project

All Project related activities will be in line with the Public Health Act.

3.5.5 Gender Equality Act (2013)

The Act seeks to promote gender equality and equal integration of men and women in all functions of society. Prohibiting and providing redress for sex discrimination, harmful practices, sexual harassment and provide public awareness and promotion of gender equality (UNESCO, 2012).

Applicability to Project

ProjectCo will (where possible) promote gender equality in project aspects, particularly through employment and community investment initiatives.

3.5.6 Marriage, Divorce and Family Relations Act (2015)

This act consolidates various laws related to marriage including a key provision in terms of recognising the validity of four "same legal status" forms of marriage (civil marriage; customary marriage; religious marriage; and marriage by reputation or permanent cohabitation). Furthermore, this act considers a range of other issues including setting the minimum age for marriage and discussing the rights and duties within marriage.

Applicability to Project

ProjectCo will (where possible) implement measures to ensure community dynamics are not impacted and that issues regarding Gender Based Violence are not exacerbated as a result of the project.

3.6 INTERNATIONAL LENDER STANDARDS AND GUIDELINES

In addition to national legislation, the Project is being developed in line with the standards and guidelines of international finance institutions. These standards and guidelines are intended to complement and reinforce national legislation and ensure the Project is conducted in accordance with international best practice and in a way that minimises risks and impacts.

The Project is considering project finance from international lenders and therefore the Equator Principals (EP) and International Finance Corporation (IFC) Performance Standards (PS) (including the Environmental Health and Safety Guidelines) will have bearing on the project. The applicability of these are discussed in more detail below.

The Equator Principles

The Equator Principles are a set of agreed principles by financial institutions to determine, assess and manage environmental and social risk in project financing. The EPs emphasise that lenders will seek to ensure that the Project is developed in a manner that is socially responsible and reflects sound environmental management practices.

These Principles have been adopted by a wide range of banks and lenders all over the world in order to manage the social and environmental risks associated with their potential investments. The Equator Principles III were adopted in June 2013 and are listed below:

- **Principle 1:** Review and Categorisation;
- **Principle 2:** Environmental and Social Assessment;
- **Principle 3:** Applicable Social and Environmental Standards;
- **Principle 4:** Environmental and Social Management System and Equator Principles Action Plan;
- **Principle 5:** Stakeholder Engagement;
- **Principle 6:** Grievance Mechanism;
- **Principle 7:** Independent Review;
- **Principle 8:** Covenants;
- **Principle 9:** Independent Monitoring and Reporting; and
- **Principle 10:** Reporting and Transparency.

IFC Performance Standards

The IFC applies Performance Standards to manage social and environmental risks and impacts and to enhance development opportunities in the private sector. The IFC PS may be applied by other financial institutions electing to apply them to projects in emerging markets. Together, the eight Performance Standards establish standards that a project is to meet throughout the life of an investment by IFC or other relevant financial institutions. They are as follows:

- **Performance Standard 1:** Assessment and Management of Environmental and Social Risks and Impacts;
- **Performance Standard 2:** Labour and Working Conditions;
- **Performance Standard 3:** Resource Efficiency and Pollution Prevention;
- **Performance Standard 4:** Community Health, Safety and Security;
- **Performance Standard 5:** Land Acquisition and Involuntary Resettlement;
- **Performance Standard 6:** Biodiversity Conservation and Sustainable Management of Living Natural Resources;
- **Performance Standard 7:** Indigenous People; and
- **Performance Standard 8:** Cultural Heritage.

A summary of each PS and an indication of their applicability to the proposed project is provided in *Table 3.1.*

In terms of the categorization of the project in terms of the IFC Policy and Performance Standards on Environmental and Social Sustainability (2012) it is likely that this Project would be categorised as a Category A or B project, more detail on this is provided in the Table below.

Table 3.1 A summary of the IFC Performance Standards and an indication of their applicability to the proposed project

Performance Standards	Objectives & Applicability
Performance Standard 1 –Assessment and Management of Environmental and Social Risks and Impacts Underscores the importance of managing social and environmental performance throughout the life of a project (any business activity that is subject to assessment and management).	Objectives: • Impact identification and assessment: To identify and assess social and environmental impacts, both adverse and beneficial, in the project's area of influence. • Mitigation: To avoid, or where avoidance is not possible, minimize, mitigate, or compensate for adverse impacts on workers, affected communities, and the environment. • Stakeholder engagement: To ensure that affected communities are appropriately engaged on issues that could potentially affect them. • Effective management: To promote improved social and environment performance of companies through the effective use of management systems. Applicability: Due to the scale and the nature of the proposed project PS1 is applicable. The project will require the identification and assessment of impacts, development of mitigation measures, engagement with stakeholders and effective environmental and social management throughout the life of the project.
Performance Standard 2 – Labour and Working Conditions Recognises that the pursuit of economic growth through employment creation and income generation should be balanced with protection for basic rights of workers.	Objectives: • To promote fair treatment, non-discrimination and equal opportunity of workers, and compliance with national labour and employment laws. • To establish, maintain and improve the worker management relationship. • To promote compliance with national employment and labour laws. • To protect the workforce by addressing child labour and forced labour. • To promote safe and healthy working conditions, and to protect and promote the health of workers. Applicability: The project will employ labour during the construction and operational phases and thus PS2 is applicable.

Performance Standards	Objectives & Applicability
Performance Standard 3 - Resource Efficiency and Pollution Prevention Recognises that increased industrial activity and urbanisation often generate increased levels of pollution to air, water, and land that may threaten people and the environment at the local, regional, and global level.	Objectives: • To avoid or minimise adverse impacts on human health and the environment by avoiding or minimising pollution from project activities. • To promote more sustainable use of resources, including energy and water. • To reduce project –related GHG emissions. Applicability: PS3 is applicable for due to the following reasons: • The project will have the potential to cause pollution during construction and through waste management during operations. • The project is a renewable energy project and thus is aligned with the objectives of PS3.
Performance Standard 4 – Community Health, Safety and Security Recognises that project activities, equipment, and infrastructure often bring benefits to communities including employment, services, and opportunities for economic development.	Objectives: • To anticipate and avoid adverse impacts on the health and safety of the Affected Community during the project life from both routine and non-routine circumstances. • To ensure that the safeguarding of personnel and property is carried out in accordance with relevant human rights principles and in a manner that avoids or minimises risks to the Affected Communities. Applicability: PS4 is applicable as the project will have a work force during the construction phase that may impact on the health and safety of the community.
Performance Standard 5 – Land Acquisition and Involuntary Resettlement Outlines that involuntary resettlement refers both to physical displacement (relocation or loss of shelter) and to economic displacement (loss of assets or access to assets that leads to loss of income sources or means of livelihood) as a result of project-related land acquisition	Objectives: • To avoid, and when avoidance is not possible, minimise displacement by exploring alternative project designs. • To avoid forced eviction. • To anticipate and avoid, or where avoidance is not possible, minimise adverse social and economic impacts from land acquisition or restrictions on land use by (i) providing compensation for loss of assets at replacement cost and (ii) ensuring that resettlement activities are implemented with appropriate disclosure of information, consultation and the informed participation of those affected.

Performance Standards	Objectives & Applicability
	• To improve, or restore, the livelihoods and standards of living of displaced persons. • To improve living conditions among physically displaced persons through the provision of adequate housing with security of tenure at resettlement sites. Applicability: The Project site and transmission line wayleave is utilised for farming activities. Land acquisition for the Project will result in economic resettlement and thus PS5 is applicable to the project.
Performance Standard 6 – Biodiversity Conservation and Sustainable Management of Natural Resources Recognises that protecting and conserving biodiversity—the variety of life in all its forms, including genetic, species and ecosystem diversity—and its ability to change and evolve, is fundamental to sustainable development	Objectives: • To protect and conserve biodiversity. • To maintain the benefits from ecosystem services. • To promote the sustainable management of living natural resources through the adoption of practices that integrated conservation needs and development priorities. Applicability: PS6 is applicable to the project as the habitats within the Project site are utilised for ecosystem services.
Performance Standard 7 – Indigenous Peoples Recognises that Indigenous Peoples, as social groups with identities that are distinct from dominant groups in national societies, are often among the most marginalised and vulnerable segments of the population.	Objectives: • To ensure that the development process fosters full respect for the dignity, human rights, aspirations, cultures and natural resource-based livelihoods of Indigenous Peoples. • To anticipate and avoid adverse impacts of projects on communities of Indigenous Peoples, or when avoidance is not feasible, to minimise, mitigate, or compensate for such impacts, and to provide opportunities for development benefits, in a culturally appropriate manner. • To promote sustainable development benefits and opportunities for Indigenous Peoples in a culturally appropriate manner. • To establish and maintain an ongoing relationship based on Informed Consultation and Participation (ICP) with the Indigenous Peoples affected by a project throughout the life of the project. • To ensure the Free, Prior and Informed Consent (FPIC) of the Affected Communities of the IPs when the circumstances described in this Performance Standard are present.

Performance Standards	Objectives & Applicability
	• To respect and preserve the culture, knowledge and practices of Indigenous Peoples. Applicability: As there are no indigenous peoples affected by the proposed project PS7 is not applicable.
Performance Standard 8 – Cultural Heritage Recognises the importance of cultural heritage for current and future generations. Consistent with the Convention Concerning the Protection of the World Cultural and Natural Heritage, this Performance Standard aims to ensure that clients protect cultural heritage in the course of their project activities.	Objectives: • PS 8 aims to protect the irreplaceable cultural heritage and to guide clients on protecting cultural heritage in the course of their business operations. In addition, the requirements of this PS on a project's use of cultural heritage are based in part on standards set by the Convention on Biological Diversity. PS 8 recognises the importance of cultural heritage with an objective to: • Protect cultural heritage from the adverse impacts of project activities and support its preservation; and • Promote the equitable sharing of benefits from the use of cultural heritage in business activities. • The PS requires the Project Proponent to comply with relevant national law on the protection of cultural heritage, including national law implementing the host country's obligations under the Convention Concerning the Protection of the World Cultural and Natural Heritage and other relevant international law. Applicability: No cultural heritage sites have been identified on the Project site.

IFC Environmental, Health and Safety Guidelines

The Environmental, Health and Safety (EHS) Guidelines are technical reference documents that address IFC's expectation regarding the industrial pollution management performance of projects. This information supports actions aimed at avoiding, minimising, and controlling EHS impacts during the construction, operation, and decommissioning phase of a project or facility.

In the context of the proposed project, the most relevant EHS Guidelines to be considered are:

- World Bank Group General EHS Guidelines (2007); and
- World Bank Group EHS Guidelines for Electric Power Transmission and Distribution (2007).

Note that guidelines on solar PV plant development are currently not available.

In terms of the IFC Performance Standards, this would be categorised as a Category A or B project, requiring a full ESIA.

3.6.2 International Conventions

Malawi has concluded or ratified a number of international conventions and agreements relating to industry, development and environmental management. In certain cases, conventions and agreements have influenced policy, guidelines and regulations and therefore are relevant to planning, construction and operation of the Project.

Table 3.2 lists the relevant international conventions and protocols to which Malawi has either ratified or concluded relevant to the Project. Many of these are incorporated into the various World Bank Operational Procedures and the IFC Performance Standards. By conforming to these two sets of standards, the Project will comply with the requirements of the relevant international conventions.

Table 3.2 International Convention and Agreements Concluded or Ratified by Malawi

Year	Name of the Convention / Agreement
2003	The Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (Basel Convention)
2001	The International Labour Organisation (ILO) Fundamental Convention related to forced labour, freedom of association, discrimination and child labour
2000	International Covenant on Economic, Social and Cultural Rights
2000	International Covenant on Civil and Political Rights
1992	United Nations Framework Convention on Climate Change (UNFCCC)
1992	Convention on Biological Diversity (CBD)
1989	African Charter on Human and People's Rights
1989	Montreal Protocol on Substances that deplete the Ozone Layer
1985	Vienna Convention for the Protection of the Ozone Layer
1983	United Nation Convention on the Law of the Sea (UNCLOS), Montego Bay, Jamaica
1975	Convention Concerning the Protection of the World Cultural and Natural Heritage (World Heritage Convention), Paris
1971	Ramsar Convention on Wetlands of International Importance, especially Waterfowl Habitats (Ramsar, Iran)
1968	African Convention on Conservation of Nature and Natural Resources

4 IMPACT ASSESSMENT METHODOLOGY AND OUTCOME OF SCOPING

4.1 IMPACT METHODOLOGY

The impact assessment (IA) methodology follows the overall approach illustrated in *Figure 4.1* and a full description of the methodology is included in *Annex B*.

4.2 OUTCOME OF SCOPING

The scope of the assessment falls under three broad categories:

- Spatial scope (the potential Area of Influence (AoI) as defined in *Section 4.3*);
- Temporal scope (the time periods over which the impacts may be experienced as described in *Section 4.4*); and
- Technical scope (the Project activities and how they interact with potentially relevant environmental and social resources and receptors as described in *Section 4.5)*.

Potential environmental and social issues have been evaluated as part of the scoping exercise in order to determine whether they are likely to give rise to significant impacts and, therefore, the extent to which they should be included in this ESIA. Based on an understanding of the design and location of the Project and the local and regional environmental issues that are likely to be relevant, ERM has identified and reviewed those issues that may be material considerations. These have been 'scoped in' to this ESIA and will form the technical scope of this ESIA. Some impacts have been 'scoped out' of the ESIA and will not be investigated further.

Impact Assessment Process

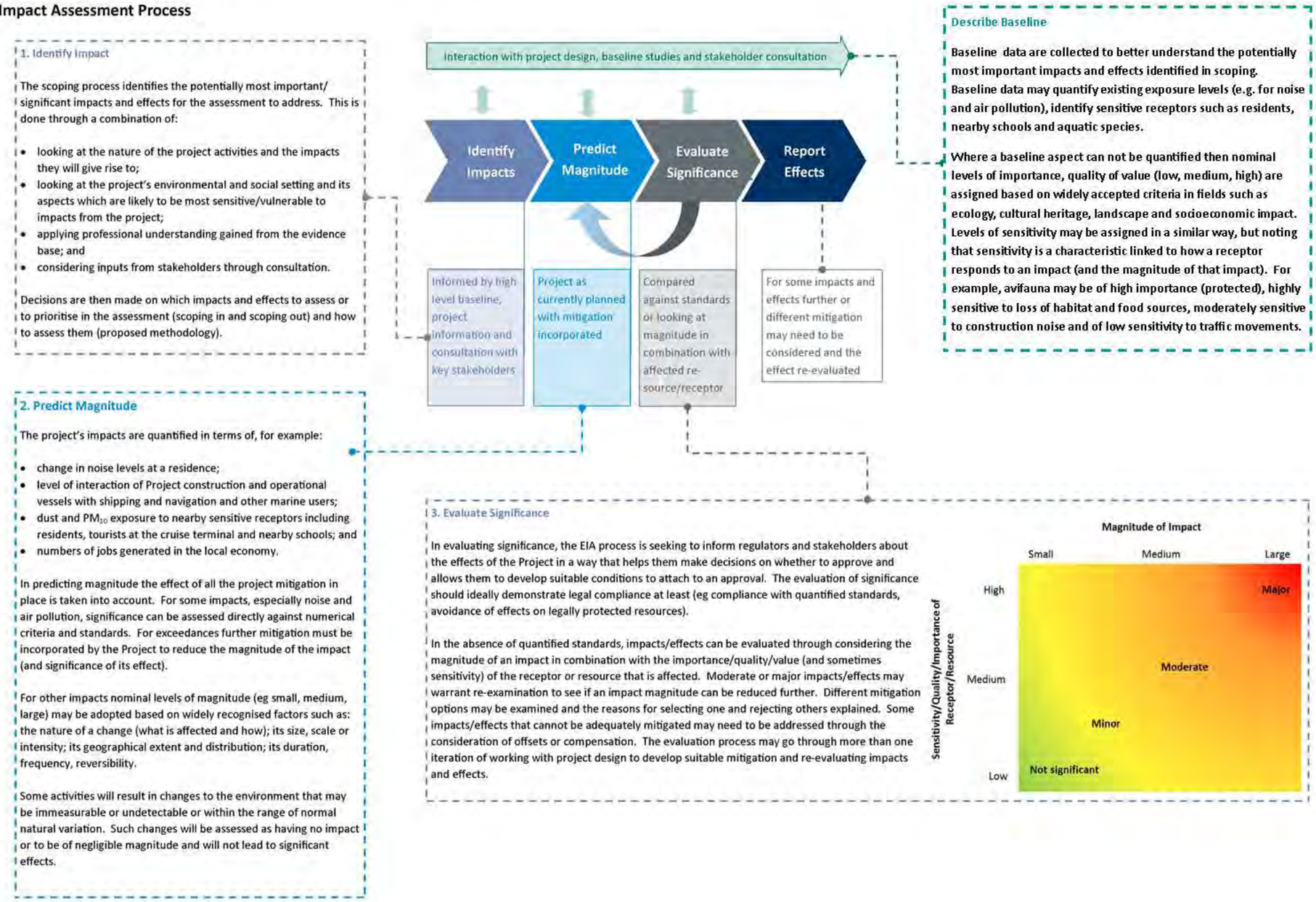

Figure 4.1 Impact Assessment Process (Source, ERM 2012)

4.3 SPATIAL SCOPE (AREA OF INFLUENCE)

For the purposes of this impact assessment, the definition of the AoI given in the Performance Standards is used. The AoI encompasses:

- *'The area likely to be affected by: (i) the project and the client's activities and facilities that are directly owned, operated or managed (including by contractors) and that are a component of the project; (ii) impacts from unplanned but predictable developments caused by the project that may occur later or at a different location; or (iii) indirect project impacts on biodiversity or on ecosystem services upon which Affected Communities' livelihoods are dependent.*

- *Associated facilities are facilities that would not have been constructed or expanded if the project did not exist and without which the project would not be viable.*

- *Cumulative impacts that result from the incremental impact, on areas or resources used or directly impacted by the project, from other existing, planned or reasonably defined developments at the time the risks and impacts identification process is conducted.'*

A description and map illustrating the extent the AoI is included in *Chapter 5.*

4.4 TEMPORAL SCOPE OF THE ESIA

The temporal scope of the assessment generally refers to the time periods over which impacts may be experienced. This will be established for each Project component and environmental and social topics, where appropriate through discussion with the relevant statutory consultees. In general, the following terms will be used:

short-term – the impact is temporary and lasts for up to 12 months
medium-term – the impact occurs for up to 5 years
long-term – the impact remains for a substantial time, perhaps permanently.

The phases to be assessed in the ESIA are those set out in *Chapter 2* of this report, namely:

- site preparation and construction;
- operation; and
- decommissioning.

4.5 TECHNICAL SCOPE OF THE ESIA

The range of environmental and social topics to be addressed in the ESIA is generally referred to as the technical scope. An assessment has been undertaken by specialists for each of the environmental and social topics that

have been scoped in for the ESIA. The environmental and social issues that comprise the technical scope of the ESIA and the reasons for their inclusion are set out in *Figure 4.2).*

Note decommissioning impacts have been assumed to be comparable to construction phase impacts.

Technical Scope

Topic	Phase	Potential source of impact	Scoped in	Scoped out	Potential affected receptors	Actions Required to Assess potential impacts
Air quality	Construction	Road traffic (dust)	✓		Human health (Note: all air quality impacts to ecology receptors have been scoped out.)	Semi-qualitative assessment of potential impacts from construction dust on human health to be included in the ESIA.
	Construction	Earthworks	✓			
	All phases	Road traffic (combustion)		✓		
Noise	All phases	Road traffic		✓	Neighbouring villages	Semi– quantitative assessment of construction noise impacts to be undertaken in ESIA
	Construction	Earthworks and construction of solar plant	✓			
	Operation	Solar plant operation and maintenance		✓		
Ecology	Construction	Site clearance and construction of solar plant	✓		Flora and fauna (Note: no critical habitat present)	Undertake ecological/terrestrial baseline survey to produce a habitat map and species mapping to understand whether are any locally, nationally or internationally important species.
	Operation	Solar plant operation and maintenance		✓		
Water Use	Construction	Site clearance and construction of solar plant (assuming no water use for dust suppression)	✓		Neighbouring villages	Geotechnical and hydrology surveys (outside of ESIA scope) have been commissioned to determine water table and potential water availability . Impact assessment based on this information will be included in the ESIA
	Operation	PV cell cleaning	✓			
Cultural heritage	Construction	Site clearance and earthworks	✓		Neighbouring villages (to be determined)	Map and characterise intangible and tangible sites of importance for cultural heritage through field work and consultation. Develop a chance find procedures for the protection or preservation of cultural sites identified during construction.
Economy and Livelihoods	Construction	Employment and procurement of goods and services	✓		Neighbouring villages and wider district/ regional/national economy	Assess the livelihoods, income sources and commercial activities in the Project Area to determine the possibility for supplying goods and services. Include livelihood restoration measures in the RAP/LRP
Land Tenure and Use	Construction	Primarily land take , and potentially removal of some structures (to be determined)	✓		Land users and community members	Identify project affected people with the support of relevant Group Village/Village Headmen and the District Office. Confirm the land uses in impacted areas.
Community Health and Safety	All phases	Community/workforce interactions (primarily for construction)	✓		Neighbouring villages	Assess the construction impacts of project activities of surrounding communities
Community Cohesion / Population Change	All phases	Land take, and in-migration of job seekers and the construction workforce	✓		Neighbouring villages	Assess the construction impacts on current social networks, traditional structures, social cohesion, security, and economic welfare
Public Infrastructure and Services	All phases	Project use of local/regional services (Primarily for construction), as well as pressure from in-migration	✓		Local/district services	Assess the construction impacts on public infrastructure including roads, clinics, schools and waste services. Ensure communication with existing communities.
Labour and Working Conditions / Occupational Health and Safety	All phases	Presence of a workforce (Primarily for construction)	✓		Workforce	Compare and update (if necessary) Project policies they are in line with Malawian regulations and international best practices.
Waste	All phases	Waste disposal and management	✓		Infrastructure (waste disposal sites), soil and groundwater near sites	The potential for disposal site facilities for the Project will be determined for hazardous and non-hazardous waste. Preparation of a Waste Management Plan for construction and operational activities.
Climate Change	All phases	Greenhouse gas generating activities *(Scoped out as operational emissions will be below 25000 tonnes CO_2e per year.)*		✓	N/A	The Project will only result in temporary emissions during construction
Visual amenity	Operation	Presence of site	✓		Neighbouring villages	High-level landscape and visual amenity assessment, identification of any visual sensitive receptors, if any
Ecosystem Service	All phases	Project activities *(Livelihood and resource use captured under other topic areas.)*	✓		N/A	Ecosystem services assessment to be included in the ESIA.
Traffic	All phases	Project activities	✓		N/A	Qualitative traffic assessment to be included in the ESIA.

Figure 4.2 Technical Scope of the ESIA

The objective of the environmental baseline is to establish the characteristics of the existing biophysical conditions in the Project area. This Chapter presents the baseline conditions in the Project area and serves as the reference point against which changes can be predicted and ultimately monitored.

5.1 AREA OF INFLUENCE

The baseline section presents an overview of the biophysical and socioeconomic characteristics relating to the area in which the development will take place (i.e. within the Project 'footprint') as well as the surrounding areas which may be directly or indirectly affected by the proposed Project. This Area of Influence (AoI) includes the Project sites (land for the solar PV power plant site and transmission line), access roads to the site, the area surrounding the site potentially affected by the Project, and nearby communities.

The IFC Performance Standards require project proponents to identify and manage environmental and social risks and impacts within their Area of Influence (AoI). The AoI is defined in IFC Performance Standard 1 as:

> *The area likely to be affected by: (i) the project and the client's activities and facilities that are directly owned, operated or managed (including by contractors) and that are a component of the project;(ii) impacts from unplanned but predictable developments caused by the project that may occur later or at a different location; or (iii) indirect project impacts on biodiversity or on ecosystem services upon which Affected Communities' livelihoods are dependent.*
>
> *Associated facilities, which are facilities that are not funded as part of the project and that would not have been constructed or expanded if the project did not exist and without which the project would not be viable.*
>
> *Cumulative impacts that result from the incremental impact, on areas or resources used or directly impacted by the project, from other existing, planned or reasonably defined developments at the time the risks and impacts identification process is conducted.*

5.1.1 Direct Area of Influence

In the context of this report, the Direct Area of Influence (DAoI) includes the Project footprint as well as the receiving environment surrounding the site. This encompasses the 12 ha Project site, transmission line route and wayleave, and the surrounding communities likely to be affected by the Project activities during construction, operation, and decommissioning phases.

More specifically, the direct area of influence includes households and communities that may be directly and indirectly impacted by the Project during construction, operation and decommissioning. This includes villages that are impacted by land acquisition and that reside or use land within;

- 500 meters around the solar PV site; and

- 500 meters either side of the centreline at the northern end of the transmission line, extending to 1 km on the western side, to capture the main road, and 500 meters on the eastern side from the centre of the transmission line. This will also act as a buffer for land required for the substation.

This also includes villages that will be impacted by the construction of access roads, health and safety impacts (including disturbance from noise and dust during construction), worker camps and in-migration of job opportunists into the local area. A map of the DAoI is included in *Figure 5.1.*

5.1.2 Indirect Area of Influence

The Indirect Area of Influence (IAoI) includes areas within a wider radius of the Project site, which may be affected by the Project although to a lesser extent. In the context of this Project, villages along and users of the site access road and environment immediately surrounding the DAoI.

The IAoI and DAoI are collectively referred to as the Project area.

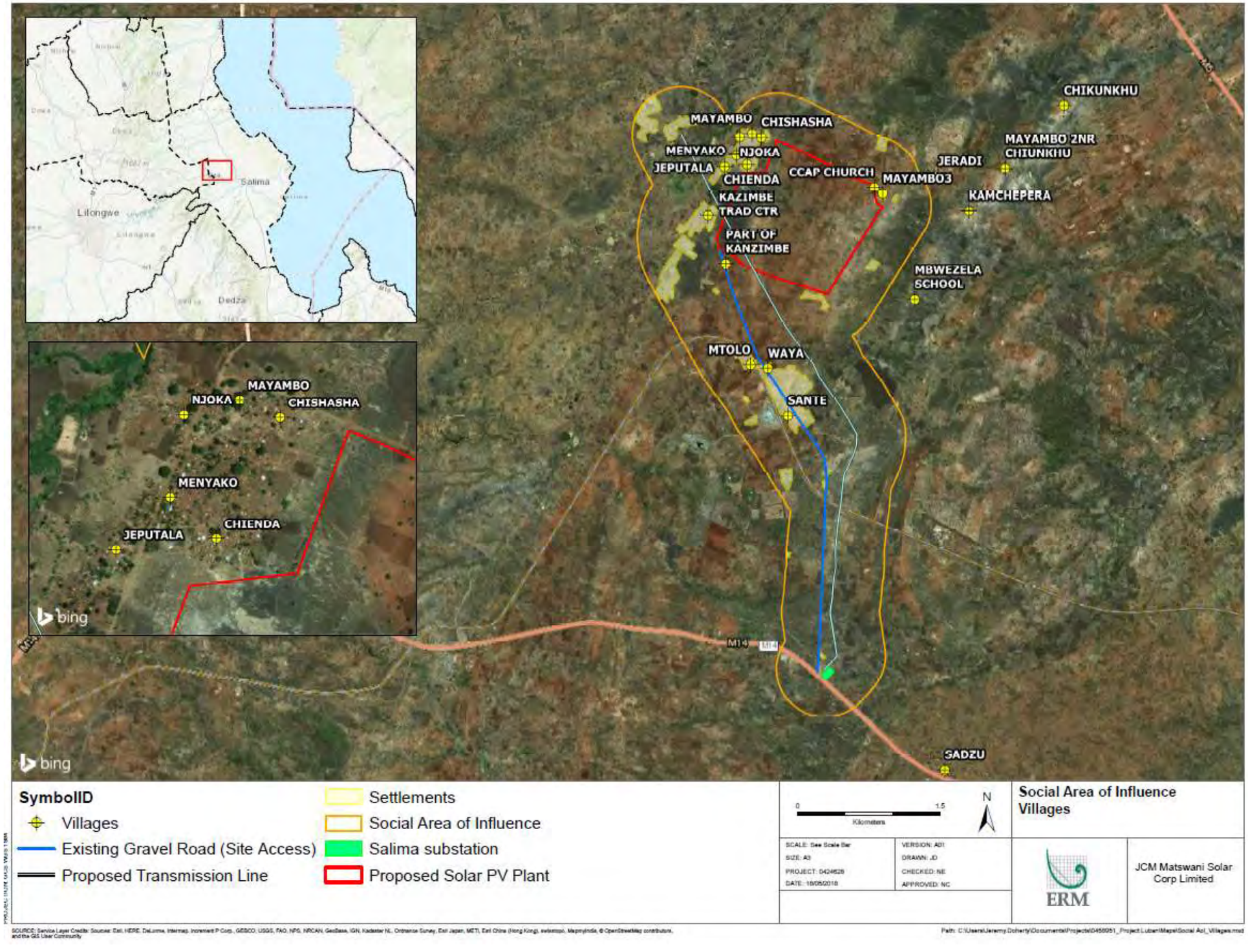

Figure 5.1 Map of the Direct Area of Influence (Source ERM, 2018)

5.2 PHYSICAL BASELINE

This section describes the physical environment of the Project area. The information in this section is based on a desktop review of publicly available information, and specialist on-site studies.

5.2.1 Climate and Meteorology

Malawi has a sub-tropical climate, which is relatively dry and strongly seasonal. The warm-wet season stretches from November to April, during which 95% of the annual precipitation takes place (1). Annual average rainfall varies from 725mm to 2,500mm. The low-lying areas such as Lower Shire Valley and some localities in Salima and Karonga are more vulnerable to floods than higher grounds (2).

A cool, dry winter season is evident from May to August with mean temperatures varying between 17 and 27 degrees Celsius, with temperatures falling between 4 and 10 degrees Celsius. A hot, dry season lasts from September to October with average temperatures varying between 25 and 37 degrees Celsius (3). *Figure 5.2* illustrates the average temperature and rainfall for Malawi. Salima has an average minimum temperature of between 18-20 degrees Celsius and average maximum temperature of 28-30 degrees Celsius. In addition, *Figure 5.3* illustrates the rainfall map for Malawi with Salima receiving on average 1201-1400 mm of rainfall per year.

(1) Department of Climate Change and Meteorology Services (2006), Temperature maps, accessed at: https://www.metmalawi.com/climate/temperature.php
(2) Department of Climate Change and Meteorology Services (2006), Temperature maps, accessed at: https://www.metmalawi.com/climate/temperature.php
(3) Department of Climate Change and Meteorology Services (2006), Climate, accessed at: https://www.metmalawi.com/climate/temperature.php

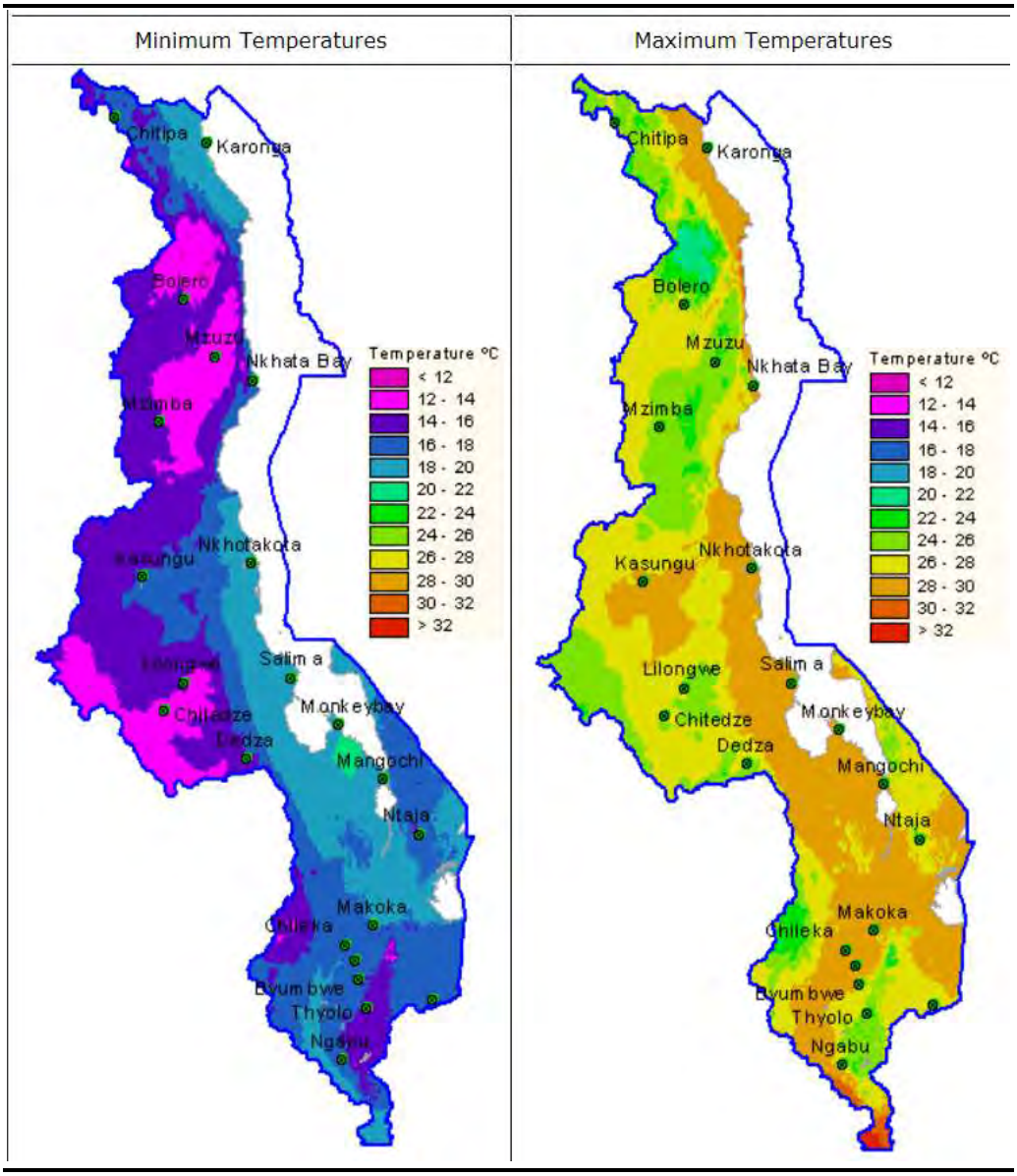

Figure 5.2 ***Annual Temperature for Malawi*** ***(Source Department of Climate Change and Meteorology, 2006)***

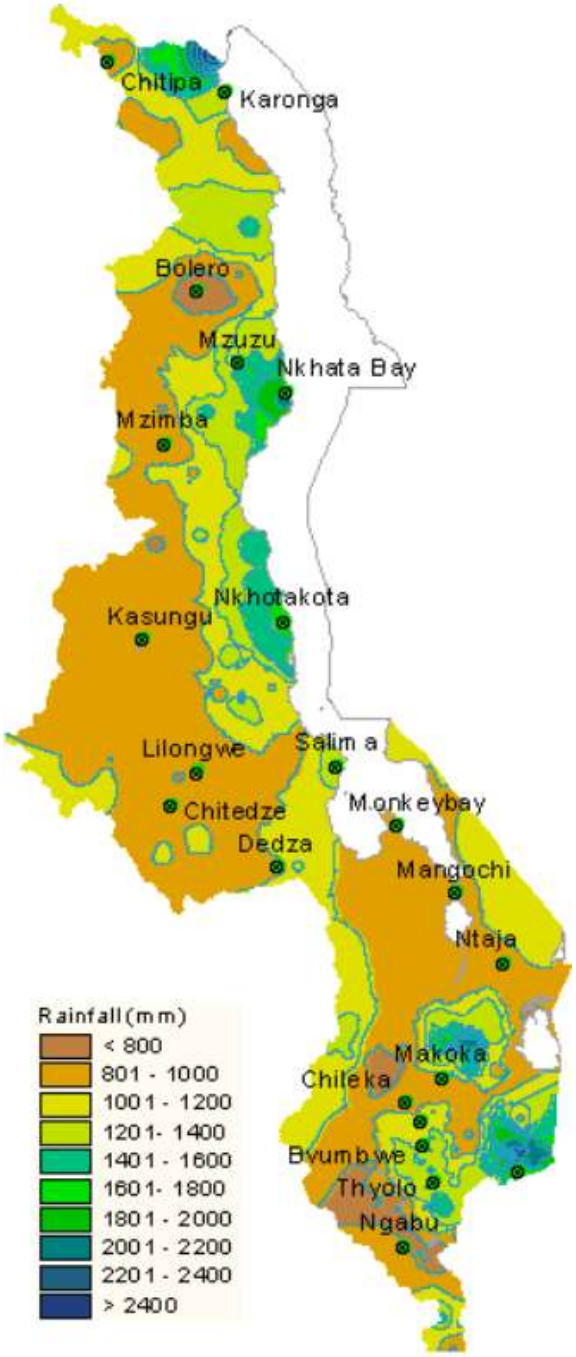

Figure 5.3 ***Annual Rainfall Map for Malawi*** ***(Source Department of Climate Change and Meteorology, 2006)***

5.2.2 Topography, Drainage and Land Use

Lake Malawi is situated approximately 29 km east of the Project Site. The Lilongwe River is located approximately 7 km south of the Project site and the Namanda River is 500 m to the east. The western portion of the Project site is periodically waterlogged in the wet season (*Figure 5.7).*

Figure 5.4 illustrates the remaining drainage lines on the Project site. The drainage of the site moves generally in a north and north easterly direction in line with the topography of the Project site.

Figure 5.1 illustrates a site elevation map for the Project Area. The majority of the Project site falls within the contour 560-580m elevation illustrating that site topography is predominantly flat.

The Project site is predominantly used for agricultural purposes. Crops cultivated in the area include maize, groundnuts, beans, soya and tobacco among others. Trees on the Site include natural and planted, and fruit trees such as mango trees which are harvested for commercial purposes. Within the Project area, residents also rear livestock like cattle, goat and pigs.

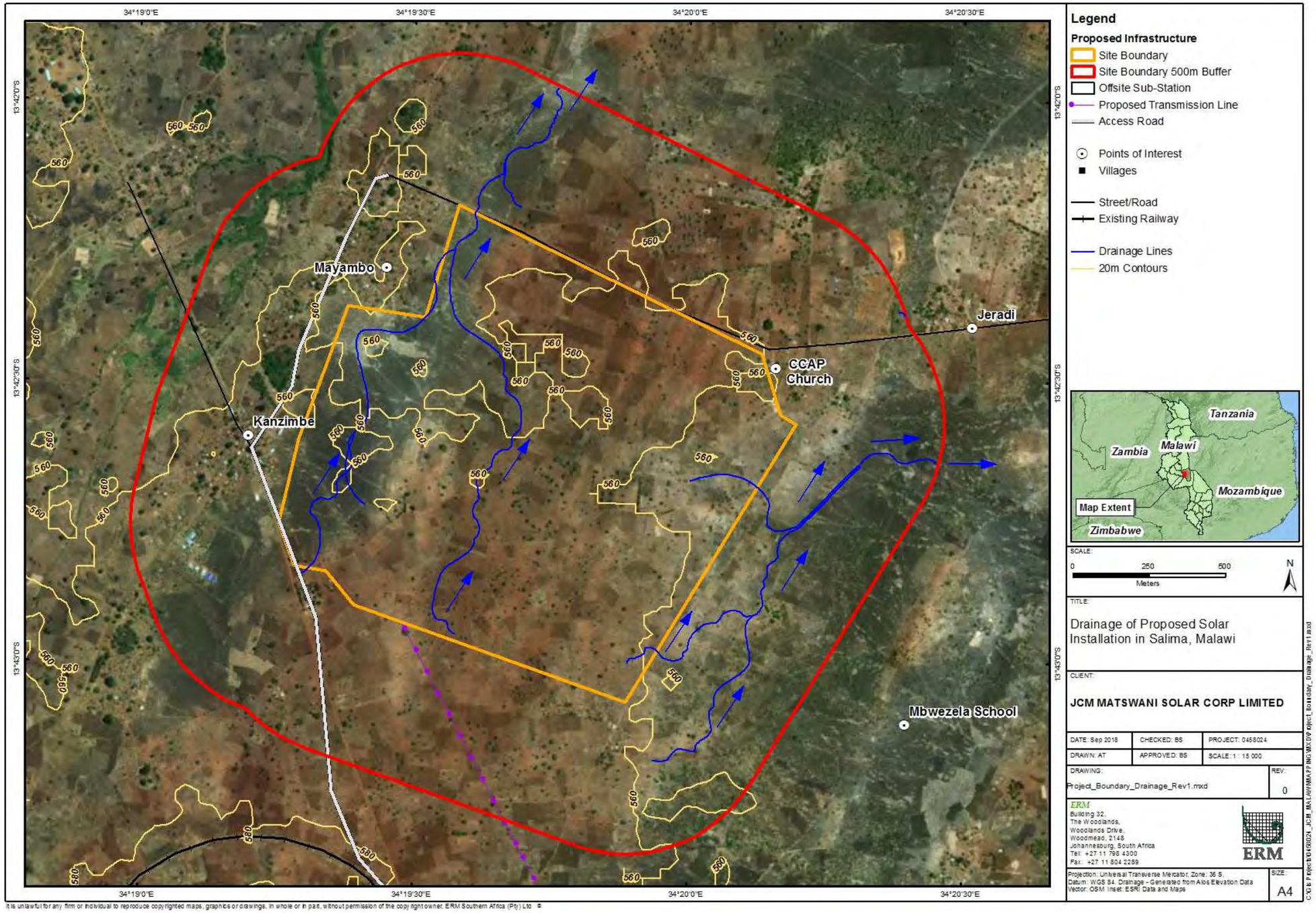

Figure 5.4 Drainage lines within the Project Site

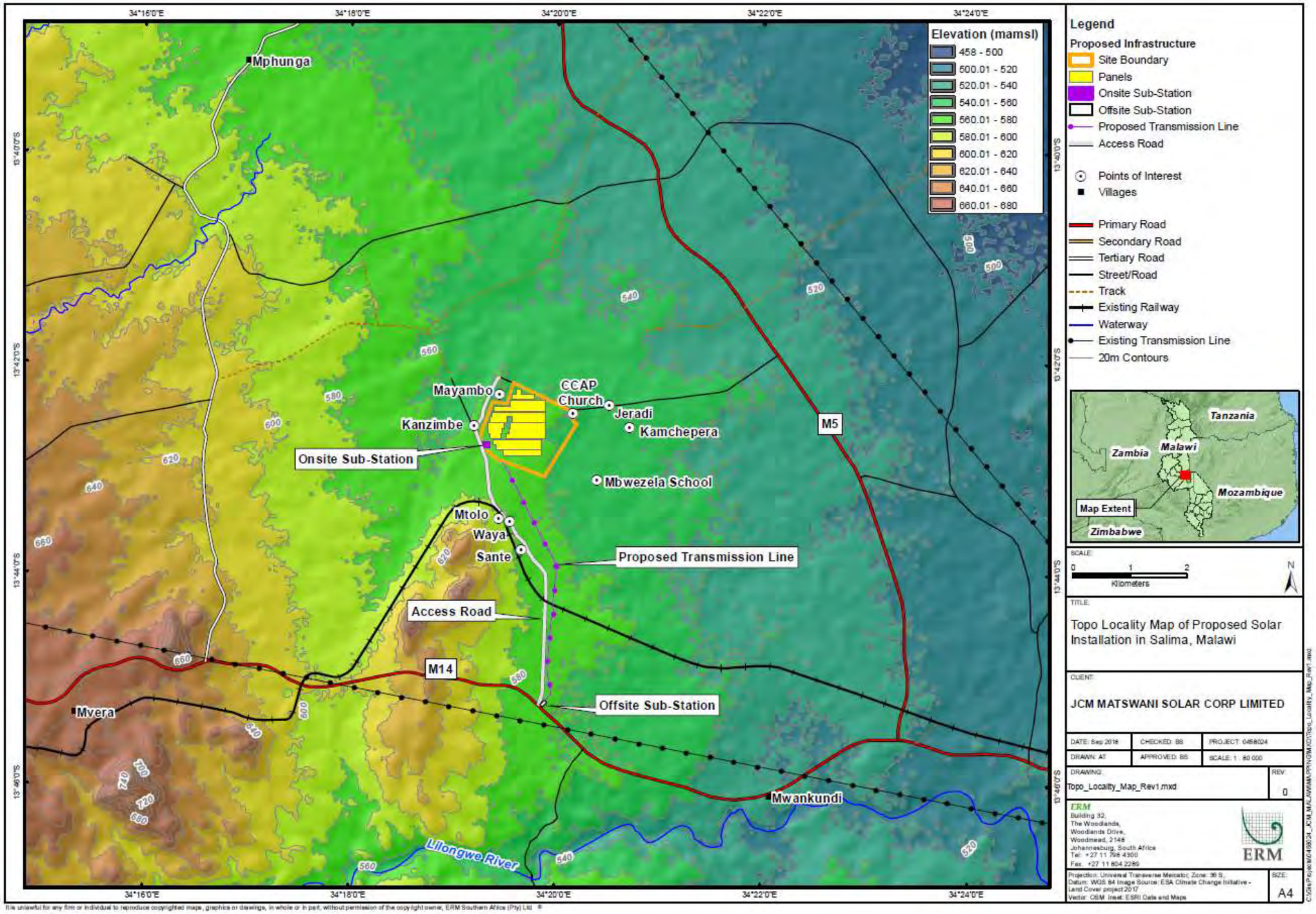

Figure 5.5 Elevation Map of the Project Area

5.2.3 *Air Quality and Noise*

In rural areas indoor air quality is likely to be poor, with rural homes cooking almost exclusively with wood resulting in exposure to elevated respirable particulate matter (PM_{10} and $PM_{2.5}$) [(1)]. However, in rural areas outdoor air quality is not expected to be degraded and air quality is typically affected by dust from roads and periodic burning of land.

There are no notable point source emissions to air in the Project area and there are no major urban or industrial activities near the Project site.

In addition, there are no notable point source noise emissions. The Project site is surrounding by agriculture and there are no major industrial or urban centres near the Project site.

5.2.4 *Geology and Soils*

Geology

The Project site is underlain by a charnockitic suite which has been subjected to gneissic foliation. It specifically consists of banded pyroxene-granulites, gneisses and hypersthene granite [(2)]. The rocks have been affected by orogenic episodes comprising the Ubendian, Irumide and the Mozambican cycles. Only the latter cycle influenced the area where most of the Basement Complex became regionally metamorphosed and migmatized to a greater or lesser extent. Plastic deformation were common and large areas of biotite and hornblende gneisses, charnockitic granulites and gneisses were produced. The latter are expected on the site.

(1) DG Fullerton, S Semple, F Kalambo, A Suseno, R Malamba, G Henderson, JG Ayres and SB Gordon, Biomass fuel use and indoor air pollution in homes in Malawi, *Occupational and Environmental Medicine*, 2009, 66 (11): 777 – 783.
(2) Aurecon (2018), Geohydrological Survey, Pretoria

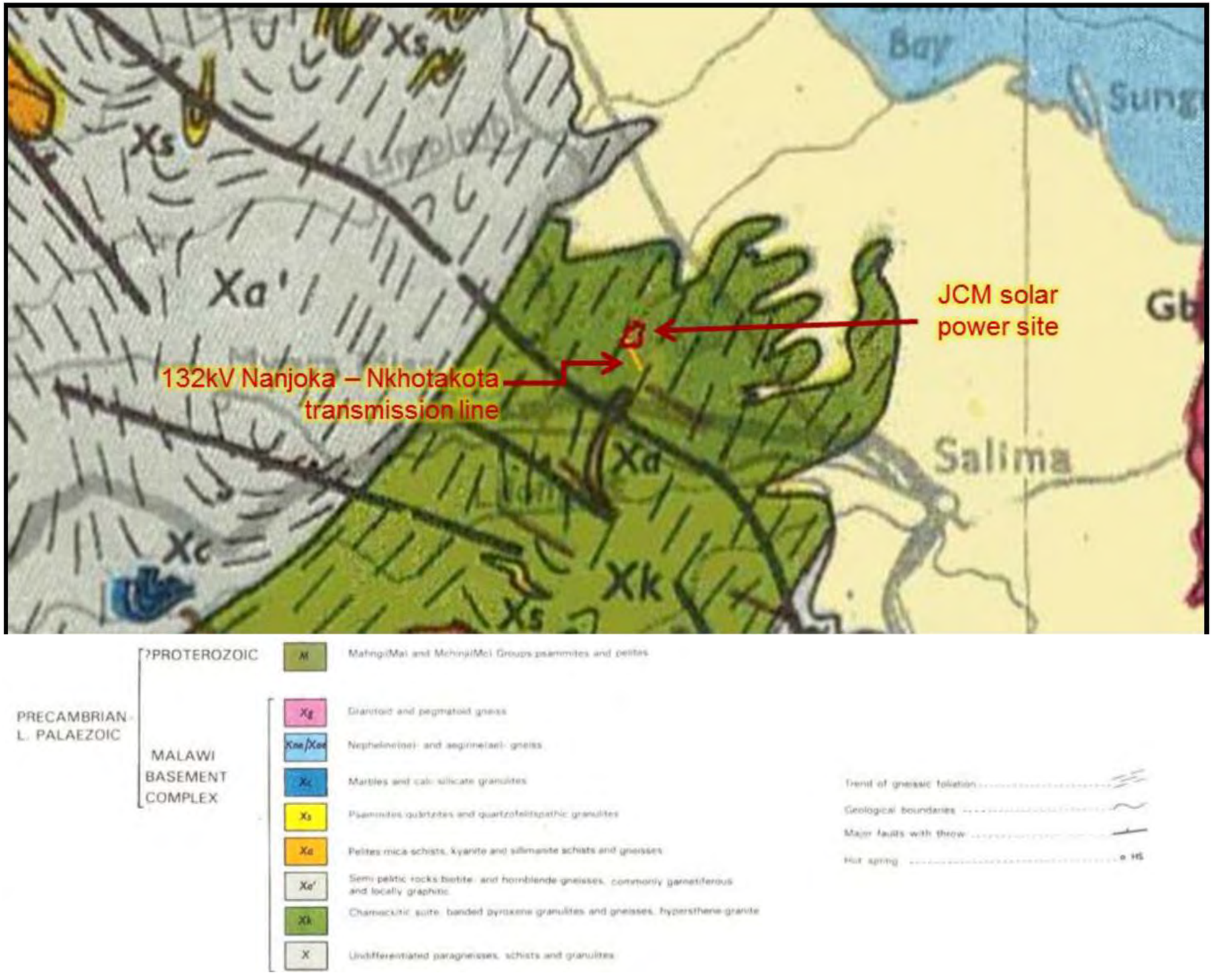

Figure 5.6 Geology of the Project Site (Source Aurecon, 2018)

Soils

A total of 15 test pits were excavated on the Project site in February 2018 to log the soil properties. Based on these results, the proposed Project site can be divided into three Zones; Zone 1, Zone 2 and Zone 3 (*Figure 5.8*). The data on soils and geology is derived from the Aurecon Geotechnical Report [(1)] (*Annex C*).

Zone One

Zone One comprises of a 0.3 m thick top soil which is very moist, dark grey brown and soft in texture. It is also characteristic of sandy clay with roots. The top soil layer is underlain by an approximately 0.9 m thick transported layer, which is also moist, grey brown in colour and has a soft to firm texture with sandy clay. Below the transported horizon is the gneiss layer which is described as moist, grey-brown speckled white in colour and stiff to very stiff in texture. It is also intact and is characteristic of sandy clay with gravel and pebbles.

Zone One lies on the western section of the proposed Project site dominated by the clay layer. This zone was the most difficult to access due to the impermeable clay layer (*Figure 5.7*)

Figure 5.7 Impermeable Clay Layer in Zone One (Source Aurecon, 2018)

*Photo taken on 6 February 2018

(1) Aurecon (2018), Geotechnical Survey, Pretoria

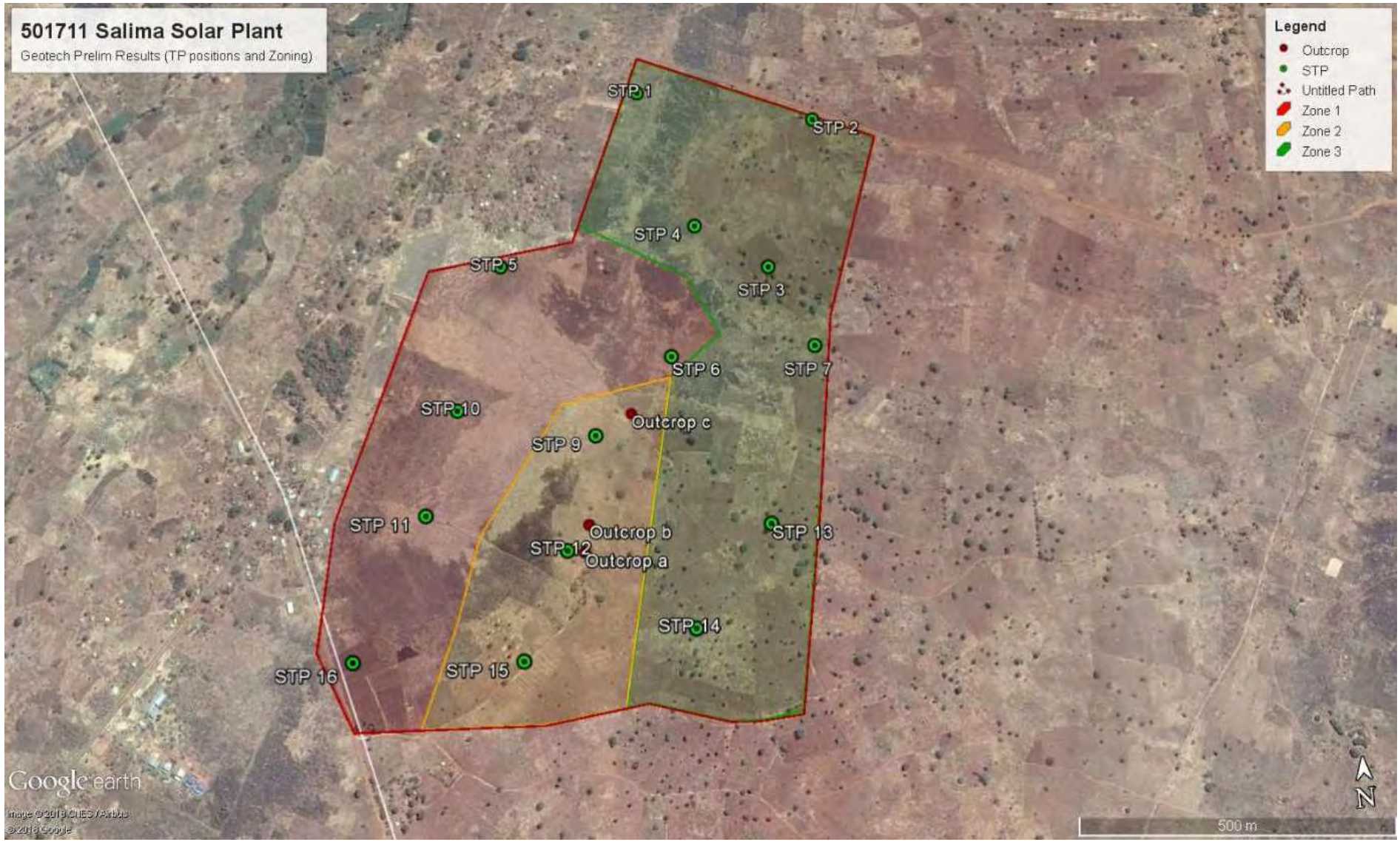

Figure 5.8 The Proposed Project Site is Classified into Three Zones ***Source: Aurecon (2018)***

Zone Two

Zone Two is comprised of a 0.3 m thick topsoil layer which is very moist, dark brown and loose. It has silty sand with roots. This layer is underlain by a transported layer which is attributed by moist, brown, loose to medium, clayey sand. Below the transported horizon lies the residual gneiss layer which is moist, grey/brown speckled white in colour, stiff to very stiff in texture, intact and has sandy clay with ferruginous gravels. This layer is underlain by a pedogenic layer of hardpan ferricrete with a very dense overall consistency. Hard rock gneiss outcrop (
Figure 5.9) was noted on this zone.

Figure 5.9 ***Rocky Outcrop in Zone Two*** ***(Source Aurecon, 2018)***

Zone Three

Zone Three is typical of a 0.3 m thick topsoil layer which is described as very moist, dark grey brown, soft and sandy with clay roots. This layer is underlain by an approximately 0.9 m thick transported layer which is described as very moist, grey brown in colour, firm to stiff in texture with sandy clay. Below the transported horizon lies the residual layer, which is described as moist, grey brown speckled white, stiff to very stiff, intact and has sandy clay with gravel. At the bottom of the test pits is a completely weathered granite gneiss which was excavated as sandy gravel material. The Zone Three test pit is illustrated in *Figure 5.10* below.

Figure 5.10 Test Pit Profile in Zone Three (Source Aurecon, 2018)

5.2.5 Groundwater

Information in the section was derived from the Aurecon Geo-hydrological Report produced for the ProjectCo in February 2018. The full Report is in *Annex C.*

Groundwater Level

Aquifers within the occurring geology consist of secondary fractured aquifers and groundwater occurrence in these mainly charnockitic rocks is generally associated with zones of weathering, and the contact between the weathered and fresh materials [(1)]. Groundwater is commonly first struck near the base of the clays, and usually rises (sometimes by several metres) before static water

(1) Chilton et al (1983), Groundwater Resources of Malawi. Overseas Development Administration Institute of Geological Sciences.

level is found. The saturated thickness of the aquifer will be a critical factor in determining whether sufficient yields can be supplied, even for rural domestic supplies for hand pumps. Where the weathered zone is too thin, or the depth to water is too great (even where there is a deep weathered zone), potential yields are likely to be insufficient. Another important factor is the permeability of the saprolite; even if there appears to be a sufficient saturated thickness of weathered material, a very clay-rich sequence may result in very low permeability and inadequate borehole yields [(1)] .

In the weathered basement aquifers, groundwater is usually struck at a level below the static water level, and it then rises, sometimes by several metres. This is evidence of the semi-confining nature of the surface strata. The extent of the rise in water level reflects the degree of artesian pressure and depends on many factors including the lithology, the topographic position. The depth to groundwater rest level is generally less than 25 m and commonly less than 15 m below surface [(2)].

Groundwater Yield

Groundwater resources are widespread throughout the country. Their occurrence is associated with two types of aquifers [(3)]:

- The extensive, but relatively low yielding weathered Precambrian basement gneiss complex formations, which accounts for about 85 percent of the country's geology, and

- The relatively high yielding quaternary alluvial deposits occurring in the Lakeshore Plains.

According to the BGS Report (IR/10/103) [(4)] , a successful borehole in this fractured aquifer has a potential yield of between 1800 and 7200 l/h. Chilton et al, 1983, reported that in the weathered basement aquifer, yields are generally higher where the saturated thickness of the weathered zone is greatest and the bedrock coarsest. The higher yields are likely to occur where the weathered zone is associated with fractures which commonly allows greater depths of weathering. These zones can sometimes be picked out as lineations on aerial photos.

Groundwater resources within the region of the project site are associated with the weathered zone above fractured bedrock. The aquifer thicknesses are commonly 10 to 25 m. The aquifer is partly confined by an overlying thickness of 5 to 20 m of tightly compacted clays and soils which have very

(1) Chilton et al (1983), Groundwater Resources of Malawi. Overseas Development Administration Institute of Geological Sciences.
(2) Chilton et al (1983), Groundwater Resources of Malawi. Overseas Development Administration Institute of Geological Sciences.
(3) Halle, B and J. Burgess (2006), Country Environmental Profile for Malawi, AGRIFOR Consult, Belgium media/ Publications/ groundwater-quality-information-malawi.
(4) British Geological Survey (2004) Groundwater Quality: Malawi, WaterAid

low permeability (*Figure 5.11)*. Where groundwater is encountered it is commonly near the base of the clays and under pressure, indicating that it is held within a confined aquifer. The fresh bedrock underlying the weathered zone is rarely a significant aquifer, except where it is extensively fractured [(1)]. Hydrogeological parameters for the typical weathered basement aquifer are presented in *Table 5.1.*

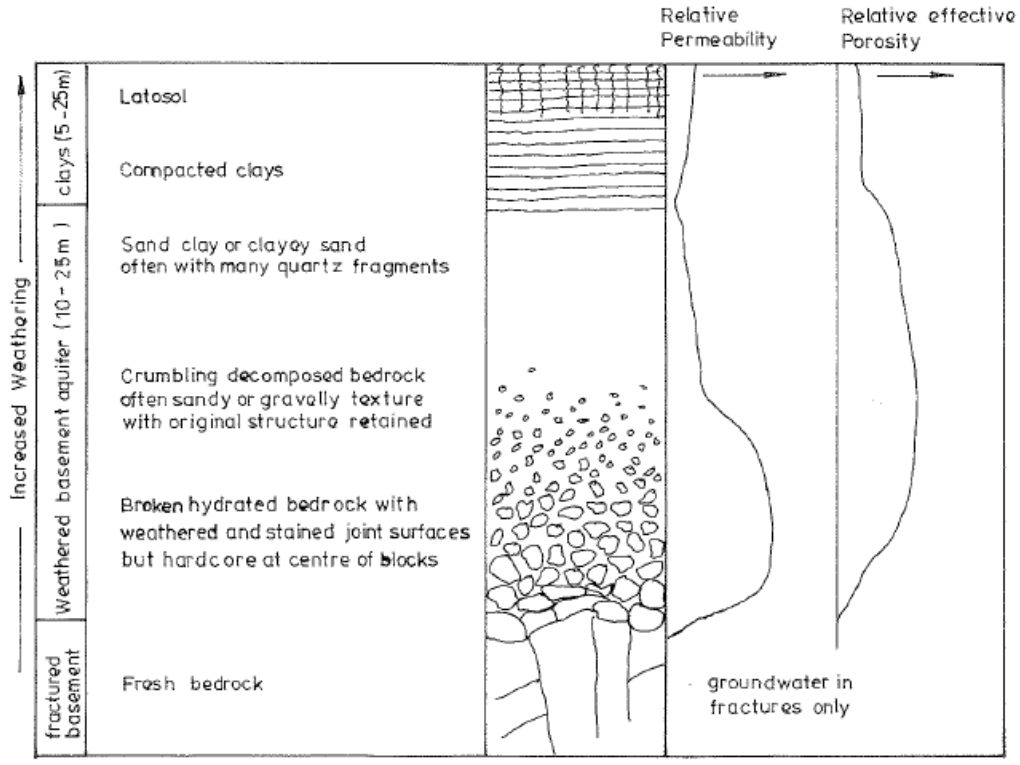

Figure 5.11 Typical Profile of Weathered Basement Aquifer (*Source****: Smith-Carrington, A.K., and Chilton, P.J., 1983)***

Table 5.1 Characteristics of the Weathered Basement Complex Aquifers

Parameter (units)	**Value range**
Borehole yield (l/s)	1 - 2
Hydraulic conductivity (m/d)	0.5 – 1.5
Depth of boreholes (m)	45 - 50
Depth of water table (m)	15 - 25
Transmissivity (m^2/d)	5 - 35
Storage coefficient (-)	$1x10^{-2}$ – $5x10^{-3}$

Source: Ministry of Irrigation and Water Development (2006) in Pavelic, P.; Giordano, M.; Keraita, B.; Ramesh, V; Rao, T. (Eds.). 2012. Groundwater availability and use in Sub-Saharan Africa: A review of 15 countries. Colombo, Sri Lanka: International Water Management Institute (IWMI). 274 p.

(1) Chilton et al (1983), Groundwater Resources of Malawi. Overseas Development Administration Institute of Geological Sciences.

Rural areas in Malawi are highly dependent on groundwater to support their livelihoods. Areas which experience a low stream density groundwater supply play a leading role in terms of servicing the community domestic needs as well as agriculture [(1)]. This is the case for communities in the Project area. The main challenges relating to groundwater in Malawi are the over-exploitation of groundwater resources due to inadequate control measures taken. Secondly, it is the poor quality as a result of pollution caused by cities, industries and agricultural practices [(2)]. The Project area suffers from over abstraction, however quality has not been reported as an issue by community users.

5.2.6 Surface Water

Malawi is endowed with a vast expanse of surface water systems, which include its network of rivers and four major lakes. The Lilongwe River which flows into Lake Malawi is approximately 7 km south of the Project site. Lilongwe is one of the major tributaries of the Linthipe River. The Project site is also located approximately 29 km west from Lake Malawi.

Lake Malawi is approximately 560 km long and 75 km across at its widest point. Maximum depth is around 700 m [(3)]. The Lake experiences marked seasonal variations in wind, temperature and precipitation.

There are no permanent surface water bodies on or near to the Project site, although the Lilongwe River is located approximately 7 km south of the Project site and the Namanda River is 500m to the east. However, the western and central sections of the Site do become waterlogged/flooded during the wet season (*Figure 5.7).*

5.2.7 Aquatic Ecology

Aquatic ecosystems cover about 20 percent of the total surface area of Malawi and are habitats to a diversity of fish and other aquatic fauna and flora. Major aquatic ecosystems in Malawi include lakes (Malawi, Malombe, Chilwa, Kazuni and Chiuta), rivers (Songwe, South Rukuru, North Rukuru, Dwangwa, Linthipe, Shire, Bua River), wetlands and other small water bodies. Lake Malawi and the River Lilongwe are located near the Project site although there are no permanent surface water resources on the Project site supporting aquatic ecology.

(1) Republic of Malawi (2010), Nkhotakota District Social Economic Profile, Nkhotakota District, Nkhotakota
(2) Republic of Malawi (2010), Nkhotakota District Social Economic Profile, Nkhotakota District, Nkhotakota
(3) World Bank (2013), Independent Environmental Impact Assessment for the Upgraded Kamuzu Barrage – Final ESIA Volume 1: Main Report, World Bank

5.3 BIOLOGICAL BASELINE

5.3.1 Regional Context

Terrestrial Ecoregions

The proposed Project site falls within the Central Zambezian Miombo Woodland ecoregion. This is one of Africa's largest Miombo ecoregions, which stretches across Central Africa below the equator and includes much of central and northern Malawi. This ecoregion has the highest plant species richness and diversity within the Miombo biome and has a higher proportion of Miombo woodland types. The soils are highly weathered, well-drained, leached and nutrient-poor, and tend to be acidic with low proportion of organic matter. The canopy is 10 to 20 m tall and is dominated by broad-leaved species of *Brachystegia*, *Julbernardia* and *Isoberlinia* trees. The understory is lush, comprising grasses, broad-leaved shrubs and geophytes.

Although the Project site and transmission line wayleave fall within the Central Zambezian Miombo Woodland ecoregion, these areas are considered Modified habitat. The reasons for this assessment are provided in the sections below.

5.3.2 Vegetation Types in the Project Area

At a finer scale, the proposed Project area and the transmission line fall within a transition zone between two vegetation types (*Figure 5.13*). These are:

- Deciduous Tree Savannah. In Malawi, this vegetation occurs mostly between Lilongwe and Dedza on the central plateau, with an outlying area north-east of Kasungu. The deciduous trees *Pterocarpus angolensis* and various *Combretum* species are dominant, while other important trees are *Pericopsis angolensis*, *Terminalia sericea, Burkeya africana, Xeroderris stulmanniii* and *Acacia* species are dominant.

- Seasonal Valleyhead Wetland. This is a low-gradient wetland, mostly without defined channels. This wetland is located on the low land to the western part of the proposed Project area. It does not provide winter base flows, and is therefore not important for stream flow maintenance. This habitat is dominated with emergent grasses, sedges and aquatic plants such as *Leersia hexandra*, *Cyperus laevigatus* and *Scirpus littoralis* among others.

- Subsistence Agriculture. This primarily occurs along the transmission line wayleave.

5.3.3 Overview of the Field Survey

The Project site covers an area of 168 ha and the transmission line wayleave covers an area of 12 ha. This section focuses on the terrestrial ecology within the Project footprint, which includes the transmission line.

A field survey was undertaken during the late wet season (25-26 April, 2018) to collect biodiversity baseline data, assess sensitive habitats, identify present ecological state of the proposed Project site, and ecosystem services that are found on the site. The fauna, flora, ecosystem services and sensitivity of each habitat are described below.

Ana (*Fiadherbia*) Trees Interspersed with Agricultural Fields on Project Site	Mango Trees and Adjacent Agricultural Fields on Project Site
	
Western portion of the Project Site. It is expected that this area will become water logged or experience some flooding in the wet season.	Baobab Trees Present on Project Site (Baobabs are not considered culturally significant to the Kanzimbe Community)
	

Figure 5.12 Project Site Photos (Source ERM Field Survey, 2018)

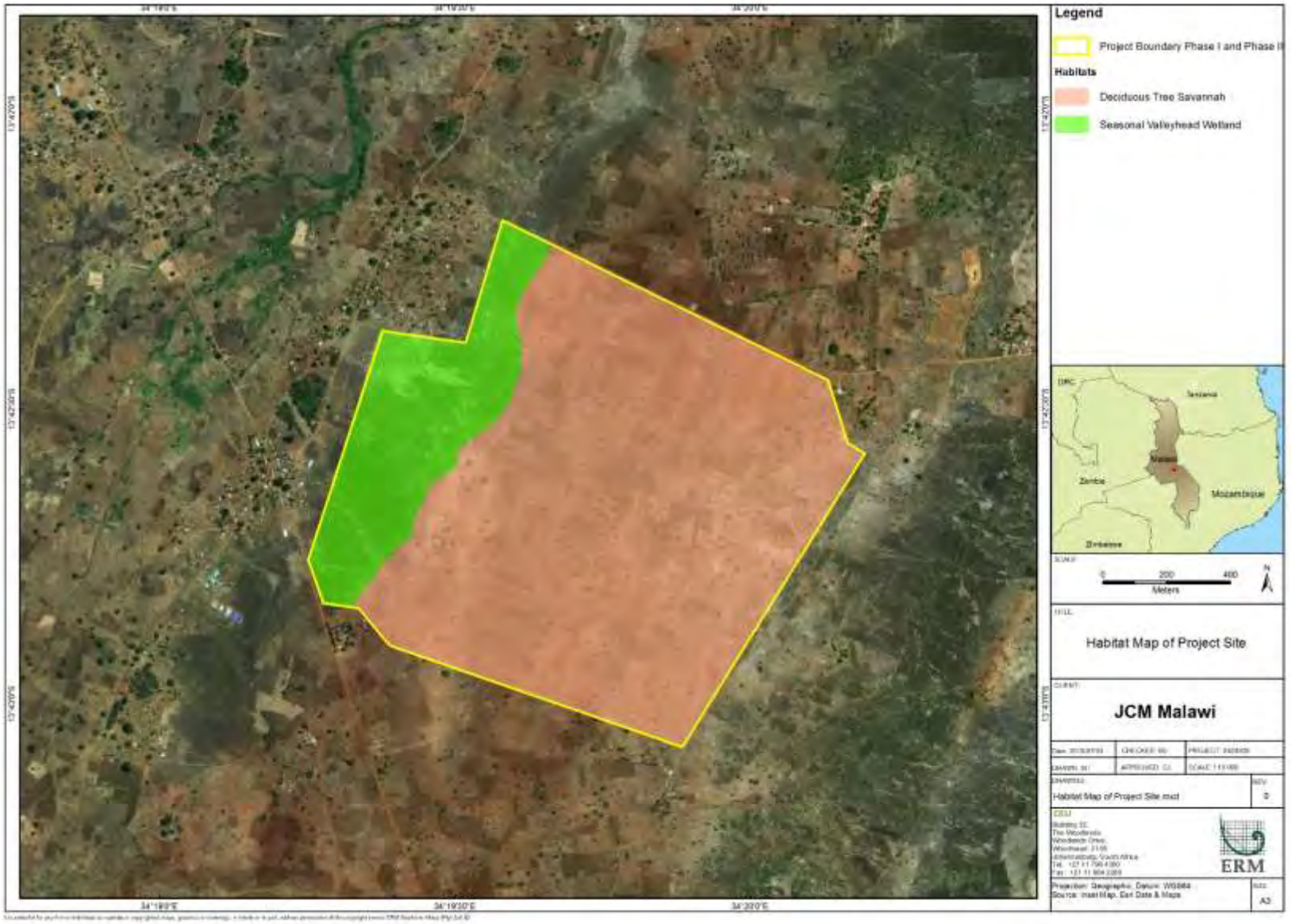

Figure 5.13 Map Showing Habitat Types in Project Site (Source ERM, 2018)

5.3.4 Deciduous Tree Savannah Habitat

The habitat is generally flat land and is predominantly used for subsistence agriculture *(Figure 5.14*). Crops cultivated on the Project site include maize, cotton, sorghum, pumpkins, groundnuts, beans, soya and tobacco among others. Trees on the site include natural, planted and fruit trees such as mangoes which are harvested for consumption and sale.

Figure 5.14 A Portion of the Deciduous Tree Savannah within the Project Site (Source ERM Field Survey, 2018)

Fauna

Avifauna

A total of eight bird species were recorded from the Project site and are indicated in *Table 5.2*.

Table 5.2 Bird Species Identified on the Project Site

Scientific Name	Common Name	Comment
Myioparus griseigularis	Grey-throated Tit-Flycatcher	Common resident bird
Pyconotus barbatus	Common Bulbul	Common resident bird
Streptopelia semiforquata	Cape Turtle Dove	Resident bird
Tauraco corythaix	Kynsna Lourie	Rare bird
Crithagra striolata	Streaky Seedeater	Common resident bird
Euplectes intermedius	Yellow-crowned Bishop	Common resident bird
Eucleptes psammocromius	Mountain marsh Widowbird	Rare bird
Cyanomitra verticalis	Green headed Sunbird	Common resident bird

No alien, threatened or endemic species were recorded during the site survey. All species listed below have an IUCN conservation status of Least Concern (LC).

Mammals

No mammal species were observed on the Project site during the site survey. No large mammal species are expected, however, communities reported that the Project site does harbour some species of small mammals, as presented in (*Table 5.3*).

Table 5.3 Small Mammal Species Reported to occur at the Project Site

Scientific Name	Common Name	Comment
Lophuromys flavopunctatus	Rodent	Common resident mammal in cultivated lands
Praomys delectorum	Rodent	Common resident mammal in cultivated lands
Mus spp.	Mice	Common resident mammal in cultivated lands
Lepus microtis	African Hare	Rare
Epomophorus wahlbergi	Fruit bat	Rare

No threatened or endemic species of mammal were recorded from the Project site during the fieldwork. The IUCN conservation status of the *Lepus microtis* (African hare) and *Epomophorus wahlbergi* (fruit bat) Least Concern (LC) while other remaining species are not threatened. No alien species of mammal was observed or reported to occur at the proposed Project site by the Project affected communities.

Flora

The Project site has been largely cultivated with dryland crops such as *Zea mays* (corn Maize), *Sorghum dochna* (Sorghum), *Arachis hypogaea* (groundnuts), *Gossypium arboreum* (cotton), *Cucumis anguiria* (maroon cucumber), *Citrullus lanatus* (water melon), *Mandifera indica* (Mango), *Glycine max* (Soya bean), *Ipomoea batatas* (Sweet Potato), *Cucumis melo* (cucumber), and *Phaseolus vulgaris* (common bean).

The Project site has both indigenous and planted plant species, including fruit trees. A total of 64 terrestrial flora species were recorded from the Project site and these are presented in *Annex A*. The most abundant species were *Faidherbia albida* (Msangu) and *Combretum* spp. (mswaswa). No endemic flora species was recorded from the Project site during the fieldwork. Two threatened species of flora presented in *Table 5.4* were identified outside the Project site.

Table 5.4 Threatened Species of Flora Recorded from the Deciduous Tree Savannah of the Project Site

Scientific Name	Common Name	National Red List	IUCN Red List
Pterocarpus angolensis	African teak tree or Mlombwa	Vulnerable (VU)	Near-threatened (NT)
Dalbergia melanoxylon	African blackwood or Mphingo	Endangered (EN)	Near-threatened (NT)

The tree density of the Project site is approximately ten mature individual stems per hectare. This indicates that the plant biomass to be lost during the construction of the Solar Power Plant would be negligible and this cannot substantially contribute to local climate change of the area.

One alien invasive species of flora namely; *Gmelina arborea* was recorded on the Project site during the field survey. There were other flora species such as *Moringa oleifera* and *Melia azedarach* that are alien to the Project site but their potential to be invasive has not yet been established.

Sensitivity of the Deciduous Tree Savannah within the Project Site

The continuous cultivation of the proposed Project site by subsistence farmers for agriculture has led to the:

- presence of moderate diversity of taxa (plants and/or animals) relative to diversity expected under natural conditions;
- moderate numbers of locally sensitive taxa such as *Pterocarpus angolensis*, *Dalbergia melanoxylon*;
- moderate reduction in abundance of some or all taxa relative to that expected under natural conditions; a
- presence of alien invasive species such as *Gmelina arborea* including other alien species e.g. *Moringa oleifera, Melia azedarach* and *Senna obtusifolia* – these are non-native origin plant species that have been introduced on the Project site by communities for timber, fuelwood and/or fruits.

Based on the above attributes, the Project site is classified as a ***Modified Habitat***, with limited capacity to support a diversity of fauna and flora species.

5.3.5 Seasonal Valleyhead Wetland Habitat

The habitat is generally a flood plain seasonal valleyhead wetland which is used for grazing livestock such as cattle and goats (*Figure 5.15*). The seasonal valleyhead wetland is part of the Project site and is located on the western portion of the Project site. The area is colonised by seasonal wetland grasses such as *Leersia hexandra* and *Urochloa mossambicensis* among others. There are also scattered shrubby trees on the site and the dominant species are *Combretum spp*. These grasses are also ecologically important as they regulate floods in the area.

Figure 5.15 Part of the Seasonal Valleyhead Wetland of the Project Site (Source ERM Field Survey, 2018)

Fauna

Avifauna

Three terrestrial and one water bird species were recorded from the Seasonal Valleyhead Wetland of the Project site during the field survey. Species recorded from this Project site are indicated in *Table 5.5*. No threatened species

or endemic species were recorded from the Seasonal Valleyhead Wetland during the field work. All species listed above have an IUCN conservation status of Least Concern (LC). No alien species of birds were recorded from or observed in the Project site during the field survey.

Table 5.5 Bird Species Identified on the Seasonal Valleyhead Wetland

Species Name	Local Name	Comment
Myioparus griseigularis	Grey-throated Tit-Flycatcher	Common resident bird and
Crithagra striolata	Streaky Seedeater	Common resident bird
Euplectes intermedius	Yellow-crowned Bishop	Common resident bird
Bubulcus ibis	Cattle Egret	Common waterbird

Mammals

Livestock were the only mammals seen in this habitat. No threatened species or endemic species of mammal were recorded, and no alien mammal species was reported by communities to occur there.

Flora

There were five wetland flora species that were recorded from this habitat during the field survey, as presented in *Table 5.6*. No threatened or endemic wetland flora species was recorded from this habitat during the fieldwork. No alien invasive wetland flora species were recorded from the habitat type during the field survey.

Table 5.6 Flora Species Identified on the Project Site

Scientific Name	Common Name	Comment
Leersia hexandra	Club head cutgrass	Common tree typical of seasonal wetlands.
Cyperus laevigatus	Smooth sedge grass	Common grass, typically seasonal wetlands
Scirpus littoralis	Bulrush	Common grass, typically seasonal wetlands
Sporobolus consimilis	Drop-seed grass	Common grass, typical of seasonal wetland characterising alkaline conditions.
Urochloa mosambicensis	Signalgrass	Grass, typical of dry conditions and seasonal wetlands

Sensitivity of the Seasonal Valleyhead Wetland within the Project Site

Continuous livestock grazing on this habitat by local communities in the Project area has led to:

- presence of moderate diversity of taxa (plants and/or animals) relative to diversity expected under natural conditions;
- moderate reduction in abundance of some or all taxa relative to that expected under natural conditions; and

- alien species may be present as a result of habitat disturbances.

This Seasonal Valleyhead Wetland habitat is classified as a ***Modified habitat***, although it has some potential to support species of biodiversity (fauna and flora).

5.3.6 Subsistence Agricultural Land (Transmission Line)

The habitat along the route of the proposed transmission line is generally flat land and predominantly used for subsistence agriculture (*Figure 5.16*). Crops cultivated along the route include maize, cotton, sorghum, pumpkins, groundnuts, beans, soya and cow peas among others. Trees that were found along the proposed transmission line route include natural and planted.

Figure 5.16 Photo Showing a Portion of the Habitat along the Proposed Transmission Line Route (Source ERM Field Survey, 2018)

Fauna

Avifauna

Seven terrestrial and resident bird species were recorded from the habitat of the transmission line, as presented in *Table 5.7.* None of these are threatened nor endemic. No alien species of birds were recorded or observed from the proposed route of the transmission line in the habitat of during the field survey

Table 5.7 Bird Species Identified from the Proposed Transmission Line Route

Scientific Name	Common Name	Comment
Pyconotus barbatus	Common Bulbul	Common resident bird
Merops pusillus	Little Bee-eater	Common resident bird
Streptopelia semiforquata	Cape Turtle Dove	Resident bird
Tauraco corythaix	Kynsna Lourie	Rare bird
Crithagra striolata	Streaky Seedeater	Common resident bird
Euplectes intermedius	Yellow-crowned Bishop	Common resident bird
Eucleptes psammocromius	Mountain marsh Widowbird	Rare bird
Cyanomitra verticalis	Green headed Sunbird	Common resident bird

Mammals

No mammal species were observed along the proposed transmission line route during the field survey, and no large mammals expected to be encountered. It is however, expected that the area may harbour various rodent species. Spoors of hare were observed during the survey, which indicate that small mammals do occur. Local communities reported four species of small mammals that occur along the route of the proposed transmission line, as presented in *Table 5.8*. None of these mammals are listed as threatened or endemic. No alien species of mammal was observed by the project team or reported to occur at the proposed Project site by the communities.

Table 5.8 Small Mammal Species Reported to occur at the Project Site

Scientific Name	Common Name	Comment
Lophuromys flavopunctatus	Rodent	Common resident mammal in cultivated lands
Praomys delectorum	Rodent	Common resident mammal in cultivated lands
Mus spp.	Mice	Common resident mammal in cultivated lands
Lepus microtis	African Hare	Rare
Epomophorus wahlbergi	Fruit bat	Rare

Flora

The majority of the transmission line wayleave has been cultivated with dryland crops such as corn maize, millet, sorghum, groundnuts, cotton, cucumber, watermelon, mango, soya bean, sweet potato and common bean. The area also has a good number of both indigenous and planted plant species, including fruit trees. The most common species were *Faidherbia albida* (Msangu) and *Combretum* spp. (Mswaswa).

The same threatened tree species observed in the Project site (*Table 5.4*) were found along the proposed transmission line. No endemic flora species were recorded. Two alien invasive plant species, *Gmelina arborea* and *Eucalyptus globules* were recorded from the proposed transmission line during the field survey. Other alien flora species such as *Moringa oleifera* and *Melia azedarach* were observed but their potential to be invasive has not been established.

The tree density along the proposed transmission line route was estimated at about eight mature individual stems per hectare, and suggests that minimal plant biomass will be lost during the construction phase of the Project.

Sensitivity of the Habitats along the Proposed Transmission Line Route

The continuous cultivation of the land traversed by the proposed transmission line by subsistence farmers for agriculture has led to the following observations:

- presence of moderate diversity of taxa (plants and/or animals) relative to diversity expected under natural conditions;
- moderate numbers of sensitive taxa such as *Pterocarpus angolensis*, *Dalbergia melanoxylon*;
- moderate reduction in abundance of some or all taxa relative to that expected under natural conditions; and
- presence of alien invasive species such as *Gmelina arborea* and *Eucalyptus globulus* including other alien species e.g. *Moringa oleifera*, *Melia azedarach* and *Senna obtusifolia* – these are non-native origin plant species that have been introduced on the Project site by communities for timber, fuelwood and/or fruits.

Habitats along the proposed transmission line route were therefore classified as ***Modified.***

5.3.7 Assessment of Ecosystem Services

This analysis assesses ecosystem services in accordance with the approach adopted by the World Research Institute (WRI) (1), which complies with requirements of the IFC Performance Standard 6 (PS6). The WRI approach provides a breakdown of ecosystem services that are classified into Provisioning, Regulating, Supporting and Cultural Services. This list has been adjusted to match the suite of services that are relevant to the areas associated with the Project site, which will be referred to as the Project. The WRI approach provides a simple and logical process to identify priority Ecosystem Services (*Figure 5.17*). The PS6 requires that disruptions to priority ecosystem services are assessed as part of an impact assessment, with mitigation measures developed to address the impacts.

(1) World Research Institute (WRI) approach to assessing Ecosystem Services is available at: https://www.wri.org/sites/default/files/weaving_ecosystem_services_into_impact_assessment.pdf

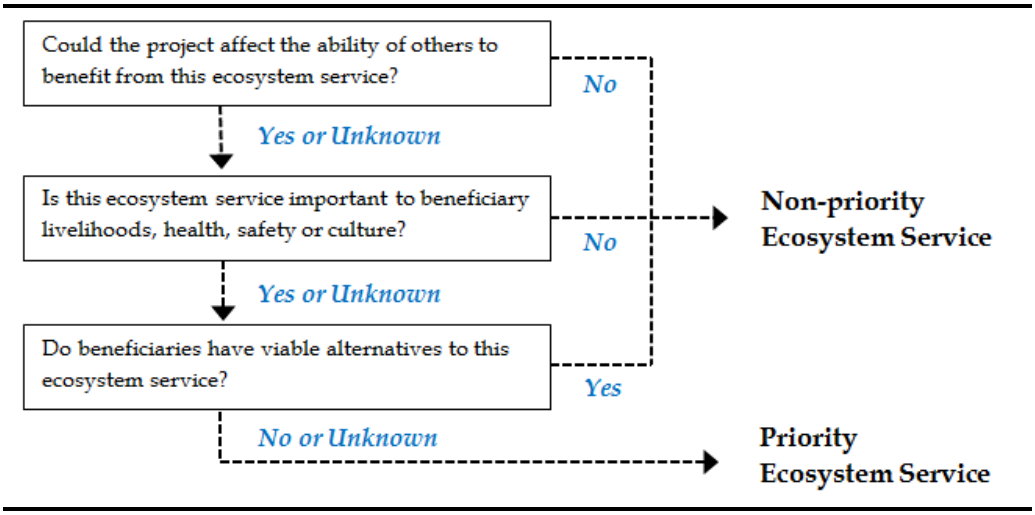

Figure 5.17 ***Logical Approach for Prioritisation of Ecosystem Services Adopted by the World Research Institute***

During the site survey, various ecosystem services were reported by communities and/or observed by the project team. The use of ecosystem services, dependence of local beneficiaries and an assessment of replaceability have been investigated through processes of consultation and incorporating expert opinion.

An overview and description of ecosystem services relevant to the Project area is provided in *Table 5.9,* together with a high-level assessment of the potential impact, dependence of beneficiaries and replaceability of services. These assessments are used to identify priority services based on the logical framework illustrated in *Figure 5.17.*

Table 5.9 Description and Assessment of Ecosystem Services in the Project Area and along the Proposed Transmission Line Route

Ecosystem Service	Description of the Service	Location Relevance	Likely Impact	Importance to Beneficiaries	Replaceability	Prioritisation Result
PROVISIONING ECOSYSTEM SERVICES						
Crops cultivated at the Project site are source of food and income	There are a number of cultivated food crops such as maize, groundnuts, soya bean, cucumber, watermelon, sorghum, cassava and cow peas that are grown on the Project site between December and May each year. These food crops are harvested by subsistence farmers for consumption and income.	Tree Savanna Transmission Route	**Yes** The project will displace cultivated land and impact on peoples' livelihoods	**Yes** Crops cultivated are sources of food and income to farmers	**No** There is a high demand for land, which is leading to a decline in the fallow period, and hence no replacement land available. This assessment is unable to confirm the replaceability of arable land as it is the Chief's responsibility to allocate land for cultivation.	**Priority Ecosystem Service**
Livestock grazing land	Habitat is used for livestock (cattle and goats) grazing. It was reported by communities that the Project site supports over 80 livestock that feed on grasses found on the seasonal wetland.	Valleyhead Wetland Transmission Route	**Yes** The project will displace grazing resources and lead to reduced foraging areas for livestock	**Yes** Livestock are an important source of protein and revenue for communities	**Yes** There are other large seasonal wetlands downstream of the Project site	Non-priority ES
Bush meat	Wild animals that are hunted on the Project site and along the transmission route for bush meat include mice, hare and birds. These animals are sources of proteins to communities.	Tree Savanna, Valleyhead Wetland Transmission	**Yes** The project will reduce people's access to hunting areas leading to a decline in the	**No** Only small animals are hunted and are not a staple protein source for communities.	**Yes** The birds, mice and grasshoppers found at the Project site are also found in other areas nearby	Non-priority ES

			availability of bush meat.			
Fuelwood	Various trees, especially the exotic species are regularly harvested for fuelwood for cooking.	Tree Savanna Transmission Route	**No** The project will not contribute to the impact on scarcity of fuelwood in the area	**Yes** Fuelwood is important, especially to old women and young girls from surrounding villages.	**Yes** There are plenty of trees in adjacent areas of the Project site and more trees for fuelwood can be planted at households.	Non-priority ES
Natural medicine	Some species of flora found on the Project site and along the transmission line route are harvested by communities to be used in traditional medicine which cure various illnesses.	Tree Savanna, Valleyhead Wetland Transmission	**Yes** The project will have impact on people due to loss of some medicinal plants	**Yes** Medicinal plants are used to treat various illnesses at local level	**Yes** Medicinal plant species found on the Project site are also found in other agricultural and woodlands found in the area	Non-priority ES
Thatch grass	The Project site has some thatch grass that communities harvest for thatching their houses and for sale.	Tree Savanna Transmission Route	**Yes** Clearing of grass such as *Hyparrhenia filpedula, Heteropogon contortus, Melinis repens* to pay way for the construction of the project will have impact on people	**Yes** Grass is used for thatching houses and livestock pens, but is also sold for income by villagers	**Yes** Thatch grass is also found on other customary lands found in the Project area and can be alternative source	Non-priority ES
Wild plant fruits	The Project site and TL route are a home to some wild plant fruits such as *Vitex mombasa*, cucumber and *Ximenia americana* which are harvested by communities living around for food.	Tree Savanna Transmission Route	**Yes** The project will have impact on peoples' livelihoods due to turning of agricultural into industrial land.	**Yes** Wild plant fruits such as *Ximenia americana, Vitex mombasae* found at the Project site are source of food to	**Yes** The wild plant fruits can be planted elsewhere and are also commonly found in	Non-priority ES

				communities around	other farmlands and bush areas.	
REGULATING ECOSYSTEM SERVICES						
Regulation of soil fertility	Tree species such as *Faidherbia albida* are retained by farmers as a source of nitrogen in the soil. It was estimated that the Project site has over 70 mature individual species of *Faidherbia albida*. Grass species such as Urochloa mosambicensis and other species regulate soil quality of the habitat.	Tree Savanna, Valleyhead Wetland Transmission	Yes Clearing plants on the Project site and Transmission Line route will have impact on the fertility of soil	Yes Communities depend on soil fertility for crop production.	Yes Alternative means of fertilising soil are possible.	Non-priority ES
Pollination of crops	The Project site and Transmission Line route support a diversity of insects such as butterflies, which pollinate agricultural crops on the Project site	Tree Savanna, Valleyhead Wetland Transmission	Yes Clearing of the Project site will have impact on pollinating insects such as butterflies, bees, but the significance is very low.	Yes Pollinating insects are important for production and productivity of crops	Yes It is possible to replace plants which are homes to insects to be lost during the construction by planting	Non-priority ES
Regulation of water flows	The wetland grasses and sedges found on the western part of the Project site are important in prevention of floods.	Valleyhead Wetland Transmission Route	**Yes** The project will have impact on regulation of water flows especially during rainy season due to clearing of the seasonal wetland	**Yes** The seasonal wetland regulates flow of water so that the water is not flooding which can be detrimental to lives of people and livestock	**No** It is not possible to replace it.	**Priority Ecosystem Service**
Soil erosion control	The Project site has grasses which are important in prevention of floods.	Tree Savanna, Valleyhead Wetland Transmission	**Yes** Clearing of grasses on the Project site will have impact on soil erosion	**Yes** Clearing of grasses from the Project site will not be of any benefit to farmers as	**Yes** It is possible to replace the loss of grasses through planting	Non-priority ES

				fertile soil will get lost		
CULTURAL ECOSYSTEM SERVICES						
Ethical values	The Project site has some trees such as *Faidherbia albida* whch ethically influence peoples' desire to protect them as they fix nitrogen in the soil.	Tree Savanna Transmission Route	**Yes** The project will have impact on ethical values of communities	**Yes** Clearing of plants such as *Faidherbia albida* and other trees that farmers protect because of their social value will have impact on ethical values of the people	**Yes** It is possible to replace them and a lot of similar species are found on cultivated farmlands in the district	Non-priority ES
SUPPORTING ECOSYSTEM SERVICES						
Biodiversity maintenance	The Project site has the potential to support biodiversity such as trees, insects and birds.	Tree Savanna, Valleyhead Wetland Transmission	**Yes** The Project area and Transmission Line route supports habitat which will be impacted through vegetation clearing, installing of transmission lines and faunal disturbance.	**Yes** Biodiversity underpins a host of ecosystem services, many of which are discussed above.	**No** There is no replacement of biodiversity and its capacity to underpin the wide diversity of other ecosystem services that are present.	**Priority Ecosystem Service**

5.3.8 Outcome of the Ecosystem Services Assessment

Table 5.9 reveals there is a wide diversity of ecosystem services present in the Project area, many of which are underpinned by biodiversity and all are important to community well-being in the area. Three of these ecosystem services have been prioritised through an assessment of likelihood of impact by the project, dependence of communities and lack of available alternatives (replaceability). However, this ESIA has been developed covering many different aspects, and disruptions to each of these prioritised ecosystem services is addressed through appropriate mitigation.

5.3.9 Overall Sensitivity Assessment

Habitats in the near vicinity of the Project show considerable evidence of transformation, with the overall floral and faunal species composition showing a divergent change from the natural state. The vegetation is dominated by plant species that provide benefits to local communities, with many non-beneficial species having been eliminated through settlement and cultivation practices. As a result there are many species of non-native origin present. Human activity has substantially modified an area's primary ecological functions and species composition, and the habitats there conform to modified habitats as described in PS6 (paragraph 11).

The Project is not located within the vicinity of protected areas, no highly threatened or range restricted floral or faunal species are considered likely to be present, and no large congregations of species are expected to occur. What remains of the habitats are representative of a widespread vegetation formation, and are therefore not unique. Based on these observations, no critical habitats are expected to occur, and a critical habitat assessment following IFC PS6 is therefore not necessary.

The ecological sensitivity of the Project area is therefore considered to be low. PS6 does not stipulate minimum requirements for developments within modified habitats, but states measures should be taken to minimise impacts on remaining biodiversity and implement mitigation as appropriate.

6 SOCIAL SETTING: SOCIOECONOMIC BASELINE

6.1 INTRODUCTION

This Section provides a description of the current social baseline conditions in the Project direct and indirect AoI. The baseline serves as the reference point against which changes can be predicted and ultimately monitored.

The baseline was determined through review of existing secondary information including published reports and ESIAs. For the social baseline, publicly available information has been supplemented through first-hand observations and interviews conducted during site visits. The current socio-economic baseline conditions at various levels in Malawi including national, regional, district, and community level are described.

6.2 AREA OF INFLUENCE

See *Section 5.1.*

6.3 SOCIO-ECONOMIC ENVIRONMENT

6.3.1 Introduction

This Section describes the current socio-economic context of the DAoI associated with the Project. The information presented in this Section is based on both primary and secondary data sources (eg census data, government reports and online sources). The data used for this baseline includes data gathered for the LACS and CSR feasibility studies (as described in *Chapter 1).*

6.3.2 Primary Data Collection Activities

Primary data was gathered between 15-19 January 2018 as part the LACS studies, and additional data was subsequently collected in June 2018 to ensure a representative sample of data for the ESIA.

Primary data gathering activities included the following:

- **Focus group discussions (FGD):** A sample of FGDs were undertaken with women, men and youth to gather gender differentiated information on project perceptions, gender roles, quality of life, access to public services, health issues, livelihoods etc as well as issues that affect youth (eg education and employment). It should be noted that the LACS FGD data incorporated into this baseline from Kanzimbe and Mayambo included participatory rural appraisal approaches, such as gender matrices and

access and control frameworks to gather more focused information on gender roles, equality and discrimination.

- **Key informant interviews (KII):** KIIs were held with professionals and those with knowledge of specific topic areas and on project perceptions including health workers, teachers, Non-Government Organisations (NGOs) and Savelugu district departments.

- **Village profiles:** Undertaken in a sample of villages to gather village level data on demographics, public infrastructure, livelihoods, cultural heritage etc.

- **Household surveys:** Undertaken in Kanzimbe and Mayambo in January 2018 for the LACS studies, and later in May/June 2018 for Phase II land acquisition activities, to support the development of a LRP. However, as the LRP was in progress at the time of writing this ESIA, only household survey data from the LACS household survey data is included in this baseline where appropriate, covering Kanzimbe and Mayambo only.

Focus groups and village profiles were primarily undertaken in Kanzimbe, Mayambo, Waya and Sadzu as they are spread across the DAoI and are impacted by the land acquisition process.

A full list of meetings is provided in *Annex B*. Pictures of various data gathering activities are presented in *Figure 6.1* below.

FGD with women in Kanzimbe Village

FGD with youth in Santhe Village

KII with a teacher at Namanda Primary School

***Figure 6.1 Pictures of Meetings** (Source ERM Field Survey, 2018)*

6.3.3 Geography and Administrative Structure

Malawi is a landlocked country situated in the southeast of the African continent, bordered by Tanzania to the north, Mozambique to the east, Zimbabwe to the south, and Zambia to the west.

Malawi has three regions; northern, central and southern. It is divided into 28 districts, which are further divided into constituencies that are represented by Members of Parliament (MPs) as well as wards represented by local

councillors [1]. Each district is further divided into Traditional Authorities (TA), and sub-divided into Group Villages, each with its own leader, known as a Group Village Headman (GVH).

The Project is situated in the central region of Malawi, approximately 30 km from the Salima District Centre, and within Kalonga TA. In Kalonga TA, there are 42 GVH [2]. The Group Villages of Kanzimbe and Sadzu are the villages that will be impacted by the Project.

Figure 6.2 shows the institutional structure and the key representatives for each level.

The District Commissioner (DC) is the head of the District Government and has overall authority regarding land, development, and infrastructure. The DC is the first point of call for all project developers requiring land, and to date has been instrumental in the land acquisition and compensation process undertaken to date for ProjectCo.

The Kalonga TA / Senior Chief is custodian of the land in the TA and is responsible for overseeing 42 GVH's. Each GVH is responsible for representing the communities within their Group Village, supported by each village's own individual Headmen. Women are only represented through the Village Development Committees (VDCs) and other Community Based organisations (CBOs), and not in the institutional structure.

(1) Government of Malawi, Health Sector Strategic Plan 11 (2017-2022). Available at http://www.nationalplanningcycles.org/sites/default/files/planning_cycle_repository/malawi/health_sector_strategic_plan_ii_030417_smt_dps.pdf (accessed March 2018)
(2) The number of GVH in Kalonga was reported by the TA during social surveys undertaken for LACS and CSR Feasibility Studies undertaken by ERM in January 2018.

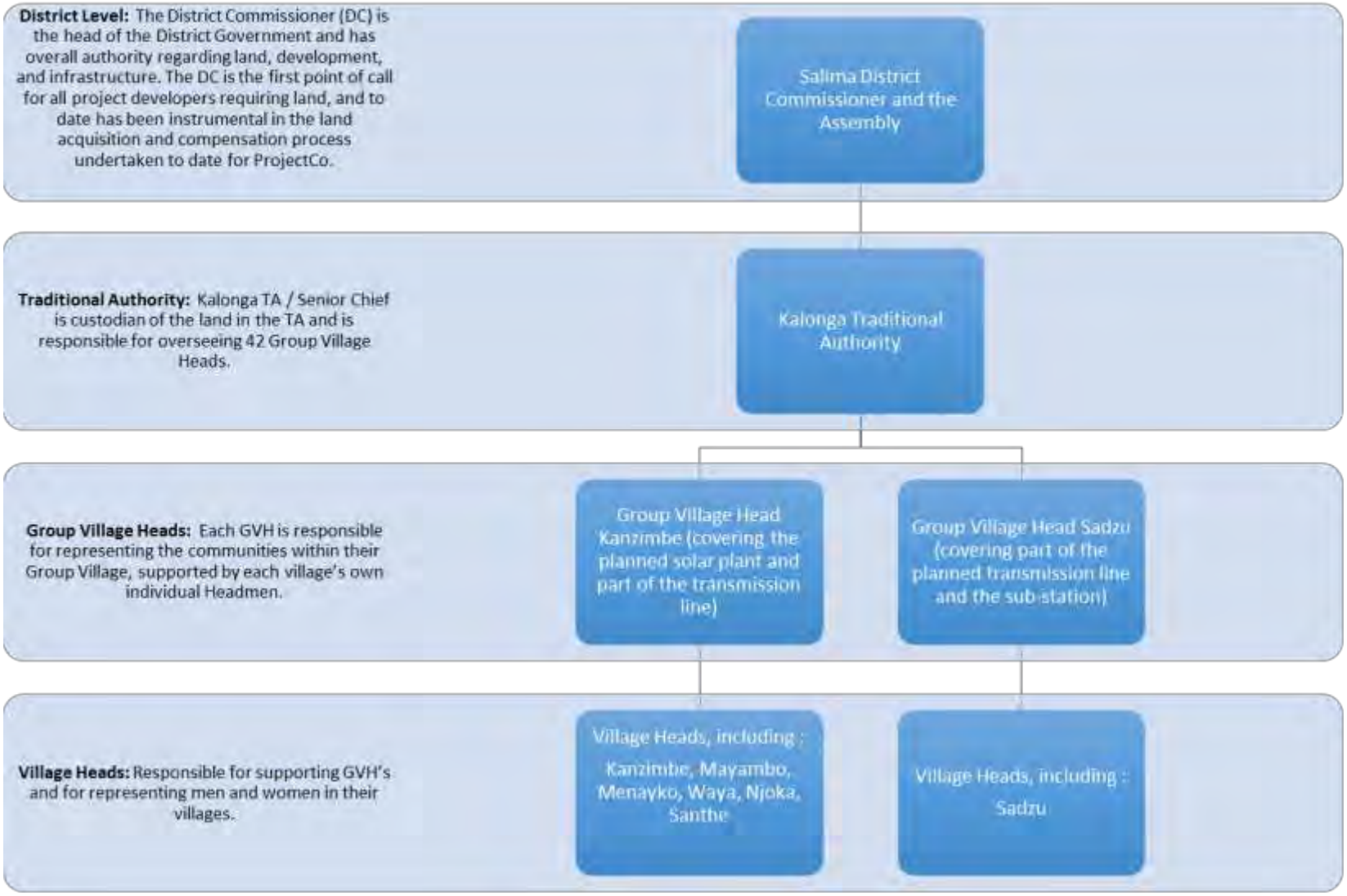

Figure 6.2 Institutional Structure

6.3.4 Demographics

Population

National and District Level

In 2017, the estimated population of Malawi was 17.4 million people, with an average annual growth rate of 2.7% (1). Between 1966 and 2012, the population grew by four million people and is predicted to reach 23 million in 2025 (2). Malawi is predicted to experience an average annual urban population growth rate of 4.2% from 2013 to 2030 (3). This is reportedly due to a decline in the mortality rate resulting from improvements in healthcare and nutrition, and ongoing high fertility rate averaging at six children per family (4). As reflected by the fertility rate, Malawi has a young population with 64% of the total population under the age of 15, 18% under the age of five and only 3% above 65 years (5).

At the time of the 2008 census, the population in Salima District was 337,895 people and on average 4.14 people per household (6). According to the 2015-2016 Malawi Demographic and Health Survey (MDHS) the fertility rate in Salima was 5.6 births for the three year period prior to the survey (7), in comparison to 3.8 in the capital of Lilongwe. This is due to the rural nature of the District in combination with high levels of poverty and low levels of education. The MDHS states that fertility decreases as wealth of the household increases (8).

Local level

At the local level, the population of the villages in the Project area varies. Kanzimbe and Sadzu have the largest population as they are situated in the centre of the GVH's. *Table 6.1* shows the reported population in the villages.

(1) Government of Malawi, Health Sector Strategic Plan 11 (2017-2022). Available at http://www.nationalplanningcycles.org/sites/default/files/planning_cycle_repository/malawi/health_sector_strategic_plan_ii_030417_smt_dps.pdf (accessed March 2018)
(2) Department of Population and Development, Ministry of Economic Planning and Development (nd) Why Population Matters to Malawi's Development. Available at https://assets.prb.org/pdf12/malawi-population-matters.pdf (accessed March 2018)
(3) Government of Malawi, Health Sector Strategic Plan 11 (2017-2022). Available at http://www.nationalplanningcycles.org/sites/default/files/planning_cycle_repository/malawi/health_sector_strategic_plan_ii_030417_smt_dps.pdf (accessed March 2018)
(4) Department of Population and Development, Ministry of Economic Planning and Development (nd) Why Population Matters to Malawi's Development. Available at https://assets.prb.org/pdf12/malawi-population-matters.pdf (accessed March 2018)
(5) Government of Malawi, Health Sector Strategic Plan 11 (2017-2022). Available at http://www.nationalplanningcycles.org/sites/default/files/planning_cycle_repository/malawi/health_sector_strategic_plan_ii_030417_smt_dps.pdf (accessed March 2018)
(6) Malawi Statistics. Available at http://malawi.opendataforafrica.org/# (accessed March 2018)
(7) Government of Malawi, 2015-16 Demographic and Health Survey. Available at https://dhsprogram.com/pubs/pdf/SR237/SR237.pdf (accessed March 2018)
(8) Government of Malawi, 2015-16 Demographic and Health Survey. Available at https://dhsprogram.com/pubs/pdf/SR237/SR237.pdf (accessed March 2018)

Table 6.1 Reported Population in the Project Area

Community	Reported Population	Reported Number of Households	Average Household Size	Gender Ratio (%)	
				Male	Female
Kanzimbe	2,160	360 (108 FHH)	6-7	40	60
Mayambo	475	95 (15 FHH)	5	48	52
Waya	680	100 (25 FHH)	6-7	45	55
Santhe	222	37 (FHH not available)	6	40	60
Sadzu	2,000	400 (30 FHH)	5	40	60

Notes:
The reported population is from the GVH's and the VHs.
FHH refers to female-headed households

Source: ERM Social Surveys, 2018

As shown in the table, the average household size is slightly above the District average, primarily due to the rural context of the villages and lack of contraceptive use. Each household in the Project area has their own house. Additionally, females represent a higher proportion of the population in villages resulting from the matrilineal system in the Project area, whereby men move into the village of their wife. This, in combination with women having a higher life expectancy than men, separations and/or divorces (as reported by women during social surveys) contribute to high proportion of female-headed households in the Project area.

Migration

National and District Level

At the end of 2008, Malawi had approximately 11,600 refugees and asylum-seekers, originating from Rwanda, Democratic Republic of the Congo (DRC) and Burundi (1). However, since then the number of people who have fled to Malawi has risen from almost 17,000 in 2013 to more than 37,000 in March 2018 (2). Most refugees live in Dzaleka refugee camp, near the capital Lilongwe, which has a population of nearly 34,000 people. Additionally, more than 3,000 Mozambican asylum-seekers are in Luwani refugee camp, in the south of the country.

Additionally, changes in weather patterns have influenced migration. For example, in 2015 floods affected 1,101,364 people, displaced 230,000 and killed 106 people (3). Salima was one of the affected districts at the time. According to Malawi's National AIDS Control Program (NACP), male migration is more

(1) World Refugee Survey 2009 – Malawi. Cited on Refworld, available at http://www.refworld.org/docid/4a40d2ac58.html (accessed July 2018)
(2) United Nations High Commissioner for Refugees (UNHCR), Malawi. Available at http://www.unhcr.org/malawi.html (accessed June 2018)
(3) International Organisation for Migration. Malawi 2017, Humanitarian Compendium. Available at https://humanitariancompendium.iom.int/appeals/malawi-2017 (accessed July 2018)

common, however, they also noted that both men and women (adults and youth) are increasingly mobile as they pursue trading activities [1].

In Salima District, at the time of the development of the Socio-Economic Profile 2006, movement of people was generally within the district, keeping the population number steady. However, there may have been some migration to the district from elsewhere in search of land for farming [2].

Local Level

Within the Project area, Kanzimbe and Waya were the only villages with a reported increase in the population resulting from job seekers. In these villages, and also within Mayambo and Sadzu there have additionally been increases due to marriage and childbirth.

Ethnicity, Religion and Language

National and District Level

Although English is the official language in Malawi, Chichewa is the national language spoken by 57% of the population [3]. There are six languages that are spoken in the Salima District. According to 1998 Population and Housing Census (the latest data regarding language), 80% of the people of Salima speak Chichewa, 10% Chiyao, 8% Chitonga, and 2% Chinyanja, Chitumbuka and Ngoni [4]. The primary religion in Malawi and Salima is Christianity followed by Islam.

Local Level

The primary religion in the villages is Christianity. Chewa is the primary ethnicity, with Chichewa as the main language spoken.

6.3.5 Gender Context

National and District Level

High levels of poverty and traditional structures have created high levels of gender inequality and discrimination in Malawi. Additionally, customary law has legitimised practices such as polygamy, early marriage and wife inheritance in both matrilineal and patrilineal communities. These practices have reinforced stereotypes that consider women inferior to men [5]

Table 6.2 shows the key gender indicators. The table shows that there are significant gender equalities in labour force participation (72% of females

(1) International Organisation for Migration. No date. Briefing Note on HIV and Labour Migration in Malawi. Available at https://www.iom.int/jahia/webdav/site/myjahiasite/shared/shared/mainsite/events/docs/Briefing_Notes_HIV_Malawi.pdf (accessed July 2018)
(2) Salima District Assemble, Salima Socio-Economic Profile 2006
(3) The language spoken in Malawi.-study country.com. Available at http://www.studycountry.com/guide/MW-language.htm (accessed November 2017)
(4) Salima District Assembly. Salima Socio-Economic Profile 2006. Available at http://www.malgamw.org/SalimaDistrict_SEP.pdf (accessed November 2017)
(5) FAO (2011) Gender Inequalities in Rural Employment in Malawi. Available at http://www.fao.org/docrep/016/ap093e/ap093e00.pdf (accessed March 2018)

compared to 82% of males), in progression to secondary education (84.4% of females compared to 90.6 males) and in decision making/government positions [(1)]. Additionally, the adolescent fertility rate is also high in comparison to other countries in the region; 141 per 1,000 births in Malawi, compared to Zambia (86), Zimbabwe (105.8), Tanzania (116.6) [(2)]. This is likely to reflect womens' role in decision making where they are least represented in Malawi compared to the same countries, in combination with low levels of education.

Table 6.2 Gender Indicators

Indicator	Females	Males
Labour force participation rate by sex (% of population ages 15+) (2016)	72%	82%
Unemployment rate (% of labour force, modelled International Labour Organisation estimate) (2016)	7.0%	5.1%
Life expectancy at birth (years) (2016)	65.8	60.6
School enrolment, secondary (%net) (2016)	30.8%	32.1%
Progression to secondary school (%) (2000)	84.4%	90.6%
Proportion of seats held by women in national parliaments (%) (2016)	16.7%	-
Proportion of women in ministerial level positions (%) (2016)	22.2%	-
Adolescent fertility rate (births per 1,000 women ages 15-19) (2016)	141.0	-
Fertility rate, total (births per woman)	4.6	-

Source: World Bank Gender Data Portal

Regardless of these figures, Malawi has made steps to address gender inequality and promote women's rights, including ratifying the main gender conventions, including Convention on the Elimination of All Forms of Discrimination Against Women (CEDAW) and the Protocol to the African Charter on Human and Peoples Rights on the Rights of Women in Africa. Malawi also adopted a National Gender Policy in covering the period 2007-2011, focusing on eight key areas including reproductive health, governance and human rights and gender based violence.

Gender Roles

Local Level

In the villages, women are generally responsible for childcare, farming, domestic responsibilities (cooking and cleaning), caring for the sick, gathering and pounding maize meal. Men primarily engage in income generating activities, such as bicycle taxis, selling farm produce or other grocery items and fish trading. Men in Santhe and Waya Villages, however, do not partake in fishing activities as they are far from the main fishing villages.

(1) World Bank Gender Data Portal. Available at http://datatopics.worldbank.org/gender/country/malawi (accessed July 2018)
(2) World Bank Gender Data Portal. Available at http://datatopics.worldbank.org/gender/country/malawi (accessed July 2018)

Men also engage in agricultural activities such as the establishment of new farms, land preparation, irrigation as well as fertilizer and pesticides application.

Access and Control of Resources / Gender Equality

Local Level

Due to the matrilineal system in Malawi, which enables women to own land, they have more control than men. Women also have greater access to credit as they are considered more financially responsible. However, men generally have greater access and opportunity to pursue an education due to their role as the 'bread winner'. Additionally, men have more control over finances and the marketing/sale of produce. This is because women are limited to their domestic role. Additionally, jealousy was reported amongst the men in relation to women leaving the house to access the market and in relation to access to technology, in particular women accessing mobile phones.

Men in Sadzu reported that they have more access to resources than the women. This is a similar situation in Waya and Santhe Villages, where men are dominant in the households. This can be attributed to the difference in the level of education between men and women.

Women in these villages control land and houses however decisions made are a shared responsibility between both men and women. There few instances where women are undervalued at both household and community level.

Table 6.3 provides an overview of the findings from the access and control exercise undertaken during LACS surveys in Kanzimbe and Maymbo Villages.

Table 6.3 Access and Control of Resources

Resource / Village									Comments Raised During FGDs
	Access		Control		Access		Control		
	K	M	K	M	K	M	K	M	
Land	♀	♀	♂	♂	♀	♀	♀	♀	• Even though women own land, women said that men have control. • Men said that women have control, as they move into their wives house after marriage.
Education and training	♂	♂	♂	♂	♂	♂	♂	♂	• As men pay fees, they decide who goes to school. • Girls are constrained by domestic chores. • Culture/ tradition affects girls desire for education; rather they are interested in marriage and children.
Technology	♂	♂	♂	♂	♂	♂	♂	♂	• Due to jealousy, men do not want their wives to have phones. • Men suggest they are more educated than women to use technology.
Cash	♂	♂	♂	♂	♂	♂	♂	♂♀	• Men have more access to paid labour and have the freedom to seek work stay at home. • Men make the final decisions on household income. • Sometimes men spend money on themselves and women are left to feed the children. • Men are more financially literate than women and therefore make financial decisions. • Men in Mayambo said financial decisions are made equally.
Credit/Loan	♀	♂	♂	♂	♀	♀	♂	♂♀	• Women are considered more responsible in paying loans. • Women have good access to loans. • It is easier to trace women for loan repayments than men. • Men control spending of the loan as they are more financially literate.
Marketing/selling	♂	♂	♂	♂	♂	♂	♀♂	♂♀	• Men do not allow their wives to access markets due to jealousy. • Men are more responsible for income generation. • Although men are more involved in marketing, women contribute to the decisions.
Labour / staff	♂	♂♀	♂	♂	♂	♂	♀♂	♂♀	• Women are more responsible when hiring labour. • Men create ghost labourers to finance the purchase of alcohol. • In Kanzimbe, decisions regarding labour are made equally.

Resource / Village	♀				♂				Comments Raised During FGDs
	Access		Control		Access		Control		
	K	M	K	M	K	M	K	M	

Legend:
K=Kanzimbe/ M=Mayambo
♀ = Female / ♂ = Male

Source: ERM social surveys, January 2018

Challenges Faced by Men and Women

Local Level

One of the main challenges faced by women and girls in both villages is gender based violence (GBV), rape and early marriage. This impacts on girls' education as they are forced to leave school due to early pregnancy. Additionally, in Kanzimbe, reportedly girls and women are enticed by men with money and other valuables such as mobile phone in exchange for sex, leading unplanned pregnancies and sexually transmitted diseases including HIV/AIDS. Women also reported that they are sometimes abused by their husbands if they spend too much time fetching water or at the maize mill due to suspicion of their husbands.

Moreover, women in Kanzimbe stated that they have more work than men. Whilst women are doing domestic chores, men are enjoying leisure activities and resting.

The heads of the female-headed households in Waya and Santhe are sometimes ridiculed and viewed as prostitutes by other villagers. This generally leads to them feeling powerless compared to men and is evident in the children's behaviour towards their mothers.

Challenges raised by men were more economic in nature, in particular concerns around customers for their bicycle taxi service were raised. They also complained about the time women spend fetching water.

Generally, domestic violence is a major problem in Malawi. According to the MDHS survey, 47% of women experienced spousal violence in the Central Region (1). Additionally, the survey suggests 60% of married women report that their husband insists on knowing where they are at all times (2), which reflects the situation in the villages in the Project area.

(1) Government of Malawi, 2015-16 Demographic and Health Survey. Available at https://dhsprogram.com/pubs/pdf/SR237/SR237.pdf (accessed March 2018)
(2) Government of Malawi, 2015-16 Demographic and Health Survey. Available at https://dhsprogram.com/pubs/pdf/SR237/SR237.pdf (accessed March 2018)

6.3.6 Governance, Security and Human Rights

Governance and Security

National and District Level

Results from a national crime victimisation survey undertaken in 2012 suggest that the most common crimes in rural areas in Malawi are related to theft of crops (primarily maize) and livestock; 18.3% and 8.8% respectively of survey respondents [(1)]. This is because the majority of the population in these areas rely on subsistence and crop farming. The survey also suggests that the most common crime in urban areas is corruption; 13.1% in urban areas compared to 4.3% in rural areas [(2)]. Burglary and petty crime/theft of personal property is also most common in urban areas due to lower rates of poverty and higher standards of living compared to rural areas.

Local Level

These statistics reflect the information gathered during the social surveys. The community policing committee reported that the most common crimes are livestock theft and burglaries. In Mayambo, women reported that generally the village is safe; however there have been cases of livestock theft when they are out fetching firewood or cutting grass.

Arson was reported in the District recently; however the motivation for this is unknown.

As mentioned in *Section 6.3.5* (Gender), gender-based violence is also common, and the committee reported the rape of a disabled girl.

Human Rights Context

National and District Level

According to the Malawi Human Rights Country Report (2016) [(3)], the main human rights issues prevalent in the country include corruption, child labour, gender discrimination (including GBV), HIV/AIDS stigmatism, child abuse and early marriage. The report also highlights some of the challenges in relation to labour and working conditions, which are detailed in *Box 6.1*. These issues have the potential to pose a risk to the Project therefore they will be incorporated into and managed via the ProjectCo's Environmental and Social Management Plan (ESMP).

(1) Eric Pelser, Patrick Burton & Lameck Gondwe (July 2004) Crimes of Need – Results of the Malawi National Crime Victimisation Survey. Available at https://oldsite.issafrica.org/uploads/CRIMES3PUBLIC.PDF (accessed March 2018)
(2) Eric Pelser, Patrick Burton & Lameck Gondwe (July 2004) Crimes of Need – Results of the Malawi National Crime Victimisation Survey. Available at https://oldsite.issafrica.org/uploads/CRIMES3PUBLIC.PDF (accessed March 2018)
(3) US Department of State. Malawi Human Rights Report 2016. Available at https://www.state.gov/documents/organization/265486.pdf (accessed March 2018)

Box 6.1 Summary of 2016 Human Rights Report Findings in Relation to Labour and Working Conditions

Freedom of Association and the Right to Collective Bargaining: The law allows workers, except for military personnel and police, to form and join trade unions of their choice without previous authorization or excessive requirements. In relation to the formal section, freedom of association and the right to collective bargaining were adequately respected, however informal sector workers organized in the Malawi Union for the Informal Sector (MUFIS) did not have sufficient standing to bargain collectively with employers. According to the *2013 Malawi Labour Force Survey*, of the 7.8 million persons in the working population, 88.7 percent were in the informal sector.

Prohibition of Forced or Compulsory Labour: Although there are fines in place to manage forced labour, the report suggests that children were subjected to domestic servitude and other forms of forced labour, including cattle herding; bonded labour on plantations, particularly on tobacco farms; and menial work in small businesses.

Prohibition of Child Labour and Minimum Age for Employment: The law sets the minimum age for employment at 14, and children between the ages 14 and 18 may not work in hazardous jobs or jobs that interfere with their education. Accordingly, child labour remained a serious and widespread problem and the National Statistics Office (NSO) 2014 *Malawi Millennium Development Goal Endline Survey* found that almost 40 percent of children ages five to 17 were engaged in some form of child labour. This was mainly prevent on tobacco farms, subsistence farms, and in domestic service. Many boys worked as vendors, and young girls in urban areas often worked outside of their families as domestic servants, receiving low or no wages.

Discrimination with Respect to Employment and Occupation: Discrimination in employment and occupation occurred with respect to gender and disability. Despite the law against discrimination based on gender or marital status, discrimination against women was pervasive, and women did not have opportunities equal to those available to men. Women had significantly lower levels of literacy, education, and formal and non-traditional employment opportunities. Few women participated in the limited formal labour market, and those that did represented only a very small portion of managerial and administrative staff. Households headed by women were overrepresented in the lowest quarter of income distribution

Acceptable Conditions of Work:

- ***Minimum wages:*** The minimum wage was 688 MWK ($0.95) per day as of October 2015. The *2014 Integrated Household Survey* estimated 50.7 percent of citizens lived below the poverty line. There was no exception to the requirement of paying the minimum wage for foreign or migrant workers. Official minimum wages apply only to the formal sector and thus did not apply to most citizens, who earned their livelihood outside the formal wage sector. Wage earners often supplemented their incomes through farming activities. No government programs provided social protections for workers in the informal economy.
- ***Working hours:*** The maximum legal workweek is 48 hours, with a mandatory weekly 24-hour rest period. The law requires payment for overtime work and prohibits compulsory overtime. The workweek standards were not effectively enforced, and employers frequently violated statutory time restrictions.
- ***Occupational health and safety:*** Enforcement of health and safety standards was also poor. The law includes extensive occupational health and safety standards, however workers, particularly in industrial jobs, often worked without basic safety clothing and equipment. Workers have the right to remove themselves from dangerous work situations without jeopardy to continued employment.
- ***Worker grievances:*** Workers dismissed for filing complaints regarding workplace conditions have the right to file a complaint at the labour office or sue the employer for wrongful dismissal; however, due to unfamiliarity of such rights and high levels of unemployment, workers were unlikely to exercise these rights. Additionally, workers were not adequately protected.

Source: Extracted from the Malawi Human Rights Report 2016

Child labour is particularly common in rural areas of Malawi due to high levels of poverty. According to the National Child Labour Survey (2015), 47% of children aged 5 to 17 years were reportedly to be involved in economic activities in the last seven days prior to the survey while 52% (2.9 million) of the children were working in the last 12 months [1].

Figure 6.3 shows the distribution of working children aged 5-7 in Malawi.

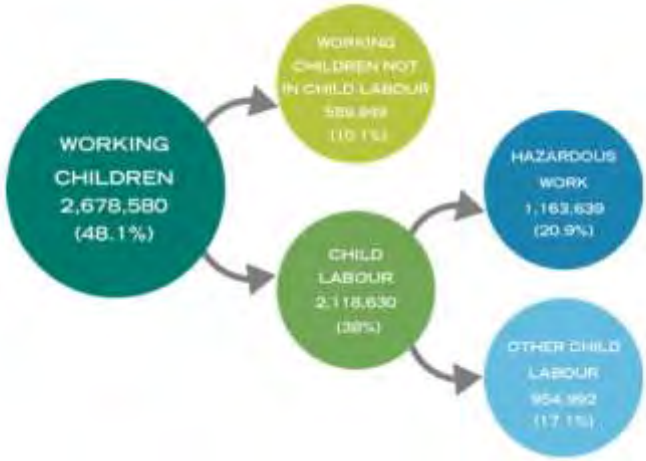

Figure 6.3 ***Distribution of Working Children Aged 5-17 Years in Malawi***

Source: National Child Labour Survey, 2015

As the figure shows, almost 30% of children engaged in child labour are undertaking hazardous work (eg exposure to hazardous chemicals, working in an unsafe environment, long hours, working with dangerous machinery, exposure to sexual abuse, etc). According to the NCLS report, 75% of children in rural areas work in the agriculture, forestry and fishing industry, 2% in wholesale and retail industry, 21% in domestic work with the rest in other industries [2].

6.3.7 Vulnerability

Vulnerability is dependent on the level of resilience of individuals to cope with socio-economic or bio-physical change, or shocks. Resilience is based on having access to the necessary resources (e.g. financial credit, assets such as crops, shelter, etc.) and physical/mental capacity (e.g. strength to relocate, skills to rebuild a business, etc.) to cope and adapt to change in the community. Vulnerable groups are consequently more susceptible to negative projects impacts and are more likely to have a limited ability to take advantage of positive impacts.

(1) International Labour Oganisation. National Child Labour Survey, 2015. Available at http://www.ilo.org/ipec/Informationresources/WCMS_IPEC_PUB_29055/lang--en/index.htm (accessed March 2018)
(2) International Labour Oganisation. National Child Labour Survey, 2015. Available at http://www.ilo.org/ipec/Informationresources/WCMS_IPEC_PUB_29055/lang--en/index.htm (accessed March 2018)

Local Level

Box 6.2 summarises the vulnerable groups in the Project area.

Box 6.2 Vulnerable Groups

Women and girls: Greater lack of financial capital and influence in decision making than men. They also suffer domestic violence and abuse, creating impacts on health (eg mental disabilities, sexually transmitted diseases and physical constraints), as well as and high rates of teenage pregnancy. This is particularly prevent in Mayambo Village. Women may also experience discrimination in relation to economic opportunities and other gender related issues in the workplace.

Female headed households: Higher levels of poverty than men due to more pressure balancing domestic and livelihood activities. All the villages have a high proportion of female-headed households.

Unemployed male youth/adult men: Due to financial pressure as their role as the 'bread winner', they are vulnerable to alcoholism and depression. Additionally, the youth are vulnerable to impacts related to labour and working conditions due to lack of education and high levels of poverty.

Subsistence households: There are high levels of poverty and food insecurity throughout Project area, creating significant household pressures and health issues. These households are particularly vulnerable to impacts related to economic displacement.

People over the age of 60: More limited in terms of their physical ability to engage in livelihood and income generating activities. They also endure high levels of poverty due to low levels on income. Additionally, some may require additional care and support.

Children and orphans: Rely on carers to take responsibility for their economic situation and general wellbeing. Due to high levels of poverty in the Project area, children and orphans are vulnerable to child labour.

Generally, all households in the Project area are considered vulnerable resulting from poor food security, low education levels and low levels of income. As such, livelihood restoration planning and implementation resulting from land acquisition by ProjectCo is crucial in order not to exacerbate vulnerability levels; rather to reduce them and enhance positive impacts.

Community Cohesion and Community Networks

Generally Group Villages have close connections with villages within the group. Any disruption to these may impact on relationships and support networks. This includes the potential for in-migration, impacts related to land acquisition access, and restrictions to access affecting the pathway transecting the planned solar site, which have the potential to disrupt these networks.

Women generally have strong ties with other women in their communities and neighbouring communities, as they rely on each other to support with social events, such as weddings and funerals, community development

initiatives and in some cases, economic activities. Men in most villages suggested that they have ties with neighbouring communities, however these are related to economic activities such as sharecropping, trading and maize milling.

Local Level

Table 6.4 shows community networks in those included in the sample of FGDs undertaken with men and women.

Table 6.4 Community networks in the Project Area

Village	Women	Men
Kazimbe	Communities include Chiyenda, Mayambo, Kanzimbe II and Jephtara. These villages upport each other in community development activities and social gatherings, such as weddings and funerals.	Communities include Chiyenda, Mayambo, and Jephtara. They trade farm produce such as green maize. They also support each other during social events such as funerals.
Mayambo	Communities include Kanzimbe, Chiyenda, and Omenyako. These villages support each other during funerals and other social gatherings as well as for development related issues. Kanzimbe is a few meters away from the village.	Communities include Lifuwu, Namanda, and Mayambo. These villages engage in sharecropping and also take their children to common schools within the area.
Waya	-	Santhe is the main community that the men depend on during social events, such as funerals. They also work together on income generating activities such as quarrying and maize milling services.
Santhe	Communities include Waya, Mtolo and Kanzimbe. These villages hold functions such as wedding celebrations and funerals together.They also work together. They are a few metres away from each other	
Sadzu	Communites include Mvunguti, Elias and Malumbira and Cheratoni. These villages have jopint social functions such as weddings and funerals. They also engage in income generating activities together including trading, as well as share water points. The communities live within walking distance to each other.	The men do not have any strong connections but source casual labour for their farms from Kanzimbe and vice versa.

6.3.8 *Education and Literacy*

Education System

National and District Level

As shown in *Figure 6.4* Malawi has an 8-4-4 education system, which is organized around eight years of primary school, four years of secondary school and four years of tertiary education (1).

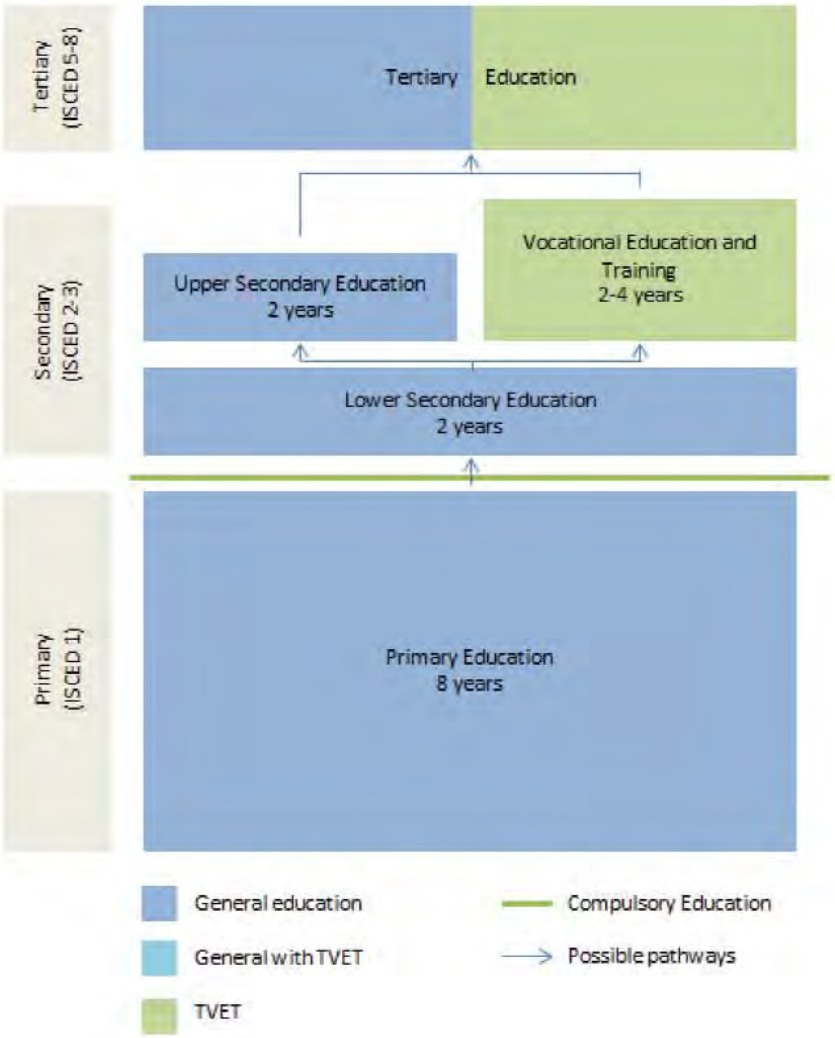

Figure 6.4 Education System (Source: UNESCO-UNEVOC)

There are many technical colleges and training centres throughout Malawi. This is partly because a branch of the national government, the Technical, Entrepreneurial and Vocational Training Authority (TEVTA) is mandated to promote and facilitate such training in order to promote the countrys'

(1) UNESCO-UNEVOC International Centre for Technical and Vocational Education and Training (August 2012). Available at http://www.unevoc.unesco.org/wtdb/worldtvetdatabase_mwi_en.pdf (accessed March 2018)

economic growth [1]. Additionally, there are three main universities in Malawi, including the Catholic University, Mzuzu University, and the University of Malawi.

Access to Education

District Level

Salima is divided into seven education zones namely: Thavite, Matenje, Kaphatenga, Msalura, Katerera, Ngolowindo and Chipoka. At the time of the Salima District Socio-Economic Profile (2006) (SDSEP), there were 58 junior primary schools, 65 primary schools, two conventional secondary schools, 13 approved community day secondary schools (CDSS) and two private secondary schools in the district [2].

The 2006, total enrolment for primary education in Salima was 77,957; 51% females. There were also 779 teachers in the district of which 773 are qualified and 40% female. According to SDSEP, 61% of all pupils travel for more than one hour to get to school [3]. In relation to secondary education, the 2006 enrolment rate shows disparities between males and females; there were 2,818 pupils at secondary schools in the district of which 46% were females [4].

Local Level

Within the Project area the main primary schools are Namanda and Mbwezera. Children in Sadzu also go to Makande, situated approximately 2 km from the village. For secondary education, students in Mayambo and Waya access Kaphirimtiwa Secondary School. Sadzu has the closest Secondary School to the village, located approximately 4 km away. Salima Technical Collage is over 30 km from all the villages in the Project area See *Table 6.5* for details.

(1) Education System in Malawi. Available at http://www.sdnp.org.mw/Education2010/Edu-system.html (accessed March 2018)
(2) Salima District Assembly. Salima Socio-Economic Profile 2006
(3) Salima District Assembly. Salima Socio-Economic Profile 2006
(4) Salima District Assembly. Salima Socio-Economic Profile 2006

Table 6.5 Access to Education

Village	Education Facility	Approx. Distance from the Village
Kanzimbe	Pre-school at Nazarene Church	1 km
	Namanda Primary School	2 km
	Mbwezera Primary School	3 km
Mayambo	Nazareth pre-school	2 km
	Namanda Primary School	3 km
	Mbwezera Primary School	1.5 km
	Kaphirintiwa Secondary School	7 km
	Salima Technical Collage	35 km
Waya	Mbwezera Primary School	1 km
	Kaphirimtiwa Secondary School	7 km
	Salima Secondary School	8 km
	Salima Technical Collage	30 km
Sadzu	Makande Primary School	2 km
	Kaphatenga Secondary School	4 km
	Salima Technical Collage	30 km

Source: ERM Social Surveys, 2018

Namanda School is the oldest primary school in the Project area and was established in 1962. At the time of the social surveys, the school served approximately 1000 children; approximately 550 male and 450 female students, with a reported attendance rate of 90% and 65% respectively. This is reflected in the completion rates where 70% of males complete primary education, compared to 60% of females at the school. At the time of the surveys, 14 teachers working at the school and the main subjects taught included maths, English, Chichewa, life skills (sexual heath, puberty etc), science and technology and arts.

Mbwezera School is a new primary school and was established in 2016. There are 21 villages in the catchment area. Reportedly, in 2016, there were a total of 236 students (124 girls and 112 boys) and at the time of the social surveys the number had almost doubled to 528 students. The school has three blocks, each comprising two classes. The school has seven teachers and the children's ages range from six to 16 years.

In relation to secondary education, according to the SDSEP, there were 84 boys and 53 girls enrolled at Kaphirintiwa Secondary School and 182 and 203 boys and girls respectively enrolled at Salima Secondary School [(1)] . Even though the gender ratio differs at both schools, overall at the district level, as mentioned above, in 2006 there were less girls than boys enrolled at secondary school (46%) [(2)] .

At Salima Technical Collage the main subject taught include mechanics, carpentry/joinery, brick laying, administration, Information and

(1) Salima District Assembly. Salima Socio-Economic Profile 2006
(2) Salima District Assembly. Salima Socio-Economic Profile 2006

Communications Technology (ICT), business studies, accounting, human resource management and community development. Males comprise 70% of technical courses and 50% of business/administrative courses, with females accounting for the remainder. The enrolment rate for the collage is not available.

Literacy Levels

National and District Level

At the time of the 2006 Population and Housing Census, 76.6% of males and 58.8 females between the ages of 15 to 24 in Malawi were literate (1). In Salima the 2006 literacy rate was 52%, which is a significant increase from year 2002 when it was 37.8% (2).

Local Level

Household survey data suggests that the literacy rates in Salima reflect those in Kanzimbe and Mayambo in households surveyed. In Kanzimbe, 40% of females and 55% of males surveyed are literate. In Mayambo, a female and males literacy levels are almost equal; 53% and 50% respectively. However, as males are more educated than women in Mayambo, this may not reflect reality. In other villages in the Project area, the reportedly literacy levels are lower. In Sadzu village, 86% of men and 38% of women are literate. In Waya and Santhe Villages, females and males literacy levels are not equal; majority of men in the village are literate with only 10% of women literate.

Low literacy levels are due to limited access to secondary and further education from teenage pregnancy, financial constraints to pay for uniform and materials, as well as distance and lack of access more generally.

6.3.9 Economy and Livelihoods

Economic Context

National and District Level

Malawi has low human development and is ranked 170 out of 185 (3) on the human development index, which measures average achievements in key dimensions of human development: a long and healthy life, being knowledgeable and have a decent standard of living.

In 2016 Malawi had a per-capita Gross National Income (GNI) of 320 US dollar , one of the lowest in the world (4). Over past decades, the country's

(1) Malawi Statistics, 2017. Available at https://knoema.com/MWMS2011/malawi-statistics-2015?region=1002270-salima&indicator=1003360-literacy-rate (accessed November 2015)
(2) Salima District Assembly. Salima Socio-Economic Profile 2006
(3) UNDP Human Development Index, 2018. Available at http://hdr.undp.org/en/countries/profiles/MWI (accessed March 2018)
(4) Malawi Economic Development document- IMF Country Report. July 5, 2017. Available at https://www.imf.org/en/Publications/CR/Issues/2017/07/05/Malawi-Economic-Development-Document-45037 (accessed March 2018)

development has been negatively affected by both climate-related disasters and governance challenges.

The economy is predominantly agricultural contributing 28% of Gross Domestic Product (GDP) in 2015. Informal employment is high at 89%, and it is estimated that 52% of the population live below the poverty line. Poverty rates are higher in rural areas relative to urban areas (1).

In Salima District, the economy is primarily agriculture-based, engaging approximately 93,397 families over 107,377 ha of land (2). The main agricultural activities carried out in the district include crop production, livestock production and marketing of agricultural produce.

Additionally, in 2006, 57.3% of the population in the district population living on MK16,125 per capita /year ($20) while 25% was living on MK10,029 per capita/ year ($14) against the national standards of 52.4% and 22% respectively. These figures show that the population in the district is living in severe poverty.

Livelihoods Activities and Household Income

Local Level

Housed surveys suggest that 46% of households in Kanzimbe and 53% of households in Mayambo generate monthly incomes of up to 10,000 MWK ($14). Only 28% of households in Kanzimbe and 28% of households in Mayambo report incomes of between 10,000 and 20,000 MWK ($27.55). Lastly, 28% of households in Kanzimbe and 18% of households in Mayambo report incomes above 30,000 MWK ($41). From income generated, between 20% and 27% of households reported income from selling their crop production. A small number of households are also engaged in selling livestock produce, tree products, trading and other activities (including bicycle taxis). Additionally, provision of agricultural labour through '*Ganyu*' is also a source of income for households. Ganyu Labour is described in *Box 6.3* below.

(1) Government of Republic of Malawi (2017) Health Sector Strategic Plan II, 2017-2022. Available at http://www.health.gov.mw/index.php/policies-strategies?download=47:hssp-ii-final (accessed March 2018)
(2) Salima District Assembly. Salima Socio-Economic Profile 2006

Box 6.3 Ganyu Labour

Ganyu labour practices are rooted in cooperative labour practices traditionally undertaken in Central Africa. It includes participation by individuals and families in shared labour, predominantly during times of peak activity in labour-intensive work, such as land-clearance, land-preparation, and harvesting.

The social surveys identified *ganyu* labour as a significant factor in household livelihoods strategies. Men are actively involved in *ganyu* labour however, women and children also participate. Women portrayed involvement by men in a generally negative manner focusing on the withdrawal of crucial labour from the household and the limited income from earnings during protracted absences from home.

Women stated that "*ganyu is the most common activity. Most families work either on other people's farms to earn a little income which is mainly used for household need or their own farms. Men go off to work on some estates (rice) as well.*"

The women attributed this to: "*the fact that (agricultural) inputs are expensive, the men in the village opt to leave behind other programs (i.e. when someone comes to train them on good land management practices) in order to go out and do other works which will bring them cash for buying the farm inputs.*"

The practice of selling labour is deeply ingrained in the social structure of Malawi's rural communities. Payment has traditionally taken the form of mutual labour, shared harvests or most typically a reward of a prepared meal or brewed beer. Socio-economic change and increased mobility, has led to changes in the manner in which labour is exchanged with travelling considerable distances to perform labour in exchange for wages. *Ganyu* is an important source of supplementary income during the hunger period when agricultural reserves are exhausted and there is no significant production.

Studies have attributed rural poverty in Malawi in part to the negative impact of *ganyu* on livelihoods pointing to labour shortages and poor production in communities where the practice is prevalent.

Source: ERM CSR Feasibility Studies Report, May 2018

Many households in Kanzimbe and Mayambo have no sources of cash income at all and rely on subsistence farming; 47% of households surveyed in Kanzimbe and 43% in Mayambo.

The major sources of income in Sadzu, Santhe and Waya include farming, charcoal burning, small businesses such people selling tomatoes, vegetables, small cakes and charcoal production. There are labour sharing groups with their neighbours as farm labours to earn a living. These includes seasonal work such as land preparation, planting and harvesting of crops such as cotton and groundnuts.

Further detail on land-based livelihoods is provided in the following section.

6.3.10 Land Ownership and Use

Land Ownership System

National and District Level

Malawi's 1965 Land Act and the 2002 Land Policy recognise three categories of land, namely:

- Public land;
- Private land; and
- Customary land.

In rural areas, Malawi predominantly has a customary land ownership system whereby chief administer land on behalf of the government. In Salima District, chiefs have the mandate to distribute land to individuals in the Traditional Authority as well as address land disputes and report to the government through the office of the District Commissioner.

Approximately 78% of the land in Salima District is under customary land tenure system (1).Land is mainly used for subsistence farming since most of the people who own the land have some sizeable plots (2). The remaining land is privately or publicly owned; 18% and 4% respectively. These plots are used for developments, such as agricultural estates, hotels or hospitals etc.

Local Level

Land users in Project area have land allocated under the customary land tenure system, which has generally been inherited. However, due to the land acquisition process undertaken by ProjectCo, some farmers in Kanzimbe and Mayambo have already been compensated and have moved to alternative areas within the Kanzimbe Group Village. Alternative land will be identified for those impacted by Phase II of the land acquisition process as part of the LRP.

Generally, there are few conflicts resulting regarding land. However, land disputes that do arise are resolved through the GVH and TA.

Land Use

District Level

More than 75% of land in Salima is used for production of maize, pulses, ground nuts, cotton, cassava, sorghum, sweet potatoes, mangoes and bananas (3).

(1) Salima District Assembly. Salima Socio-Economic Profile 2006
(2) Salima District Assembly. Salima Socio-Economic Profile 2006
(3) Salima District Assembly. Salima Socio-Economic Profile 2006

Local Level

Land in the Project area itself is generally flat and predominantly used for farming purposes. Common crops cultivated in the Project area include maize, cotton, cowpea, groundnuts, beans, soya, rice, vegetables and tobacco. Trees on the land include fruit and forest trees such as mango, masawu, winter thorn and baobab trees, for example. Local communities also rear livestock such as cattle, goat and pigs, and grazing is a common activity on and around the Project site.

Agriculture

Local Level

Women in Kanzimbe reported that of the common crops described above, maize, groundnuts and vegetables were primarily grown for household consumption while soya, rice, cowpea and cotton were for sale. The same crops are grown in Mayambo; however cowpea and groundnuts are the main crops sold.

High levels of subsistence farming across the Project area reflects the low levels of income and high levels of poverty in the villages.

There are a number of challenges associated with agriculture. Pest infestation such as fall armyworms, aphids and cutworm and diseases such as blight (a type of fungus) are common.

Food shortages are common in the communities in the Project area. Women in Kanzimbe stated that shortages are associated with late rains, drought and long dry seasons, soil erosion, insects and pest resistance to eradication efforts had been resulting in declining harvests, and extending hunger seasons. They identified the lack of farm inputs, labour scarcity, water issues and erratic rainfall, poor soil management and the lack of improved seed as key issues. Other challenges that affect productivity include lack of agricultural extension services, lack of mechanised technology, lack of capital, dependence on inorganic inputs and misuse of resources. These challenges are most felt during the key hunger months of December, January and February.

Notably, access to markets was not listed as a limitation. Limited surplus tomatoes and winter maize grown in the *dimbas* are mainly sold at the Kanzimbe Trading Centre but at times at Dowa and Lilongwe; cotton is sold to dealers in the Balaka district. Men from Kanzimbe grow maize and groundnuts for household consumption and cotton to sell to the Great Lakes Cotton Company.

Utilisation of Natural Resources / Forest Products

Local Level

Hunting of bush meat and timber extraction in the form of firewood for domestic consumption ,sale, and charcoal production , and sale in local and

regional markets were identified during social surveys as having an important seasonal role, linked to disposable income for the purchase of food.

Livestock

Local Level

The main livestock reared in the Project area include goats, cattle, pigs and chickens for subsistence. Livestock are mainly kept for income generation and for household consumption.

6.3.11 Health

Healthcare System and Access to Healthcare

National and District Level

Malawi has a three-tier health care delivery system based on three levels of health care, which include Primary, District and Tertiary healthcare, as described in *Box 6.4* (1) below.

Box 6.4 Healthcare System in Malawi

- **Primary health care or community care:** Consists of community initiatives, health posts, dispensaries, maternity units, health centres and community and rural hospitals.
- **District hospitals** constitute the secondary level of health care: Provide specialised services to patients referred from the primary health care level, through outpatient and inpatient services and community health services. These services are enhanced by provision of adequate specialised supportive services, such as laboratory, diagnostic, blood bank, rehabilitation and physiotherapy services.
- **Tertiary health care:** Consists of highly specialised services and provided by central hospitals and other specialist hospitals providing care for specific disease conditions or specific groups of patients.

Source: Africa Health Observatory, 2018

Malawi's Ministry of Health is responsible for healthcare in Malawi, and the majority of services are provided by the Government with Christian Health Association of Malawi (CHAM) providing a large proportion of services in rural areas. The Ministry of Health recognises the role of traditional healers in the delivery of health services. As such, a Traditional Medicine Policy has been developed to guide the practice of traditional medicine in the country (2).

At the time of the SSEP there were health facilities included one hospital, 12 health centres, four dispensaries and 59 outreach clinics. The facilities were run by the Ministry of Health and Population (MOHP), Christian Hospital

(1) Africa Health Observatory. Malawi. Available at http://www.aho.afro.who.int/profiles_information/index.php/Malawi:Service_delivery_-_The_Health_System (accessed July 2018)
(2) Africa Health Observatory. Malawi. Available at http://www.aho.afro.who.int/profiles_information/index.php/Malawi:Service_delivery_-_The_Health_System (accessed July 2018)

Association of Malawi (CHAM), Salima Islamic Association, and some public and private institutions [1] .

The SSEP suggests that Salima District Hospital district hospital serves more than 50,000 people. The hospital provides preventive, curative, rehabilitative and support services to peripheral health units. Facilities include a major surgery unit, dental surgery, labour ward, x-ray, laboratory and voluntary counselling and testing rooms (for HIV testing and support). Furthermore, the hospital also provides out-patient services for the urban population and the surrounding villages.

Local Level

Katawa Health Clinic is the nearest health centre to all the villages in the Project area and Salima District Hospital is the nearest emergency facility. The distance to the facilities are provided in *Table 6.6* below.

Table 6.6 Distance to Healthcare Facilities

Village	Distance to Katawa Health Clinic (km)	Distance to Salima District Hospital (km)
Kanzimbe	1	15
Mayambo	2	15
Waya	1.5	9
Sadzu	4	8

Source: ERM social surveys, 2018

Katawa Health Clinic is an NGO-run facility which caters for 12,000 people across 110 villages. Services available at the clinic include an outpatients care, anti-retroviral therapy for HIV, family planning, youth friendly health services, outreach services, nutrition and provision of water treatment. Although the Katawa Health Clinic can provide basic services it is in need of a maternal health unit and renovation. Pregnant women are currently required to travel to Salima District Hospital to access maternal care, which requires walking long distances or transportation costs.

Health Prevalence Rates

National and District Level

Table 6.7 provides an overview of the World Health Organisation (WHO) health indicators for Malawi [2]. As the table shows, the average life expectancy for men is 61 and 67 for women. This is in line with other countries in the region, but low compared to the rest of the world. Malaria is the most common cause of death among children under the age of 5 (14% of

(1) Salima District Assembly. Salima Socio-Economic Profile 2006

(2) World Health Organisation 2018. Available at http://www.who.int/countries/mwi/en/ and http://www.who.int/gho/countries/mwi.pdf?ua=1 (accessed March 2018)

causes in 2013). Additionally, HIV/AIDS is the leading cause of death among adults (27% of the total causes in 2012) [(1)].

Table 6.7 WHO Health Indicators for Malawi

Indicator	Statistic
Life expectancy at birth m/f (years, 2016)	61 / 67
Under-five mortality rate (per 1000 live births (2013)	68
Maternal mortality ratio (per 100 000 live births) (2013)	510
Deaths due to HIV/AIDS (per 100 000 population) (2013)	256.6
Deaths due to malaria (per 100 000 population) (2012)	59.6
Deaths due to tuberculosis among HIV-negative people (per 100 000 population) (2013)	9.3

Source: World Health Organisation, 2015

Although the above figures are poor, the heath situation is improving due to investment in the health sector and the government's and NGO's aim to achieve related Sustainable Development Goals (SDGs).

The SSEP states that the 10 major diseases in the district are HIV/AIDS, respiratory infection, malaria, diarrhoea, anaemia, malnutrition, meningitis, tuberculosis, obstetric complications, and skin conditions. Of these diseases, the leading causes of hospitalisation in the district for all patients are malaria, upper respiratory infection, anaemia and HIV/AIDS related conditions. For the children under the age of five, malaria, pneumonia and anaemia are main diseases leading to hospitalisation [(2)]. The SSEP recognise that HIV/AIDS is a serious 'pandemic', and various prevention programmes are being carried out in the district to raise awareness and promote behavioural change.

Local Level

At the time of the social surveys, Katawa Health Clinic reported that the top health issues among women and men are malaria, Sexually Transmitted Diseases (STI's) and hypertension. For children, the top three were malaria, diarrhoea and malnutrition. The number of cases of malaria and diarrhoea almost double during the rainy season as they mainly result from poor hygiene and sanitation in villages.

As with Katawa Health Centre, communities in the Project area reported malaria as the most common illness resulting from lack of nets. They suggested that malaria is most prevalent during the rainy season.

Table 6.8 provides an overview of perceived health issues among men and women in the Project area.

(1) World Health Organisation 2018. Available at http://www.who.int/countries/mwi/en/ and http://www.who.int/gho/countries/mwi.pdf?ua=1 (accessed March 2018)
(2) Salima District Assembly. Salima Socio-Economic Profile 2006

Table 6.8 Perceived Health Issues

Village	Health Issues Perceived by Women	Health Issues Perceived by Men
Kanzimbe	1. Malaria due to the lack of mosquito nets. This increases due to the rainy season. 2. Cervical cancer (this is unlikely but it was reported in the FGD) 3. Vomiting blood (reason unknown)	1. Malaria 2. Stomach-ache and diarrhoea problems 3. Some cases of STIs
Mayambo	1. Malaria 2. Flue/Cold 3. Backache	-
Waya	-	-
Santhe	1. Maternal related problems,(neonatal and delivery services) and family planning like tubulisation. 2. Malaria	-
Sadzu	-	1. STIs 2. Malaria 3. Cholera

Source: ERM social surveys, 2018

In Kanzimbe, women reported cervical cancer as the second most common health issue, however this is unlikely and is potentially referring to STI's. Men also suggested that they contract STI's from unprotected sex. Stomach-ache/diarrhoea is also common due to poor sanitation and reportedly from eating green maize during the hunger period.

Women in Mayambo reported that they get flu/colds caused by the smoke from the charcoal burner or firewood. They suggested that backache was also common due to their workload, especially during farming season.

In Santhe and Sadzu both the men and women said that malaria is high in the villages because they are situated close to Lilongwe River and they do not have access to mosquito nets for protection. Women in Santhe also complained that they experience maternal complications as the local clinic does not have a maternal unit. In Sadzu men reported the top health issue amongst them to be due to unprotected sex. Additionally, cholera is common during the rainy season due to poor hygiene.

Women were most open about sexual health during social surveys and said that a number of forms of contraception are available, including the contraceptive implant, pill and condoms. Although condoms are available at the Clinic, the men suggested that they are not commonly used and men do not like to ask for them. As such, as well as STIs, unwanted pregnancies are common.

6.3.12 *Public Infrastructure and Services*

Water Sources

Local Level

The two villages each have one borehole and a hand pump (*Figure 6.5*) as their main sources of potable water supply. People in the village's report that the available water is of good quality and taste. The communities also feel that they are not affected by water related ailments (1).

In Waya, the village has three boreholes for the supply of potable water. However, these boreholes have low water yield which consequently result in more time spent at the water points. Sadzu Village has four boreholes for the supply of potable water. However, the current water supply does not meet the population demands.

In Santhe, the village has two boreholes. Access to safe water for drinking is good such that almost all of the village have access to it without any struggle. Clean water is available and accessible at all the times of the year.

Borehole in Kanzimbe Village

Borehole in Mayambo Village

Figure 6.5 ***Boreholes in Kanzimbe and Mayambo Villages*** **Source: ERM social surveys, 2018**

Regardless of the reliable water supply provided by the pumps, they do not fully meet the demands of the population and women reported that it can take two to four hours fetch water. This is a significant factor that creates time

(1) It should be noted that although boreholes with hand pumps usually provide good quality water to the communities, the water might contain harmful chemicals such as fluoride and arsenic but this can only be determined through water analysis.

poverty for women. For example time that they could use for income generating and other activities.

There are water point committees in the villages which were established before the borehole were provided. The role of these committees is to ensure the villages have access to water by servicing and repairing the water points. These committees receive contributions from all the members of the community.

In terms of irrigation, households in Kanzimbe mainly use water from rivers/streams and use rain fed harvesting.

Sanitation

Local Level

In all the villages in the Project area, the households generally have a private latrine, with few sharing. However, the communities reported that they are constructed from mud or concrete slabs, and can collapse during the rainy season. According to the social surveys, the pit latrines are used for an average period of one to two years. Once the pit latrines are full, they are closed, filled with soil and abandoned, and new latrines are built. However, in some cases, the latrines collapse during the rainy season. During this time households share with their neighbours or use the bush. *Figure 6.6* shows examples of latrines in the Project area.

Covered pit latrine in Mayambo

A mud wall latrine in Kanzimbe Village

Figure 6.6 ***Latrines in Kanzimbe and Mayambo Villages*** ***Source: ERM social surveys, January 2018***

Latrines are typically built generally close to the houses so they are safe to use and are easily accessible for both women and children.

All the villages have a water committee, or a water and sanitation committee, as summarised in *Box 6.5.*

Box 6.5 Water and Sanitation Committees

Water Committees in Kanzimbe and Mayambo were established during the installation of boreholes. In Kanzimbe, the borehole was donated by a local politician in 1998. In Mayambo, the borehole was installed in 2015 by a non-governmental organisation called Assemblies of God. Both committees comprise a chair, secretary, treasurer, and community members. Kanzimbe Water Committee comprises two men and four women, while Mayambo comprises 10 members with an equal gender distribution.

The committees are generally responsible for:

- Maintaining the boreholes. The members have been trained how to fix basic faults;
- Collecting monthly contributions from the community for parts and other maintenance costs; and
- Coordinating villagers for monthly cleaning works at the borehole.

Other than managing the borehole, the water committee is responsible for encouraging the community to maintain high levels of sanitation and hygiene in the villages. However, the main challenge reported by both communities is cooperation from community members to pay their monthly contribution. This can cause delays getting boreholes fixed as and when an issue arises.

In Sadzu and Santhe Village Sanitation Committees are responsible for ensuring all households have pit latrines and are observing good hygiene standards.

Energy Sources

Lighting

The main source of lighting in households in the Project area is torchlight as they are not connected to the national grid. It was reported that the use of battery torches is very expensive. Other sources of lighting include solar home systems and solar lanterns. With the compensation from Phase I land acquisition for the Project, some households have invested in small solar home kits. Additionally, some small business in Kanzimbe Trading Centre use solar for light and power.

Cooking

Firewood is the most common source of energy used for cooking by households surveyed during both the wet and dry seasons. Charcoal is the secondary source of energy. Charcoal is used more in the wet season than in dry season, possibly because it is a dry fuel source. Kerosene is only used in the wet season to burn firewood.

Women cook in confined brick kitchens where these sources of energy can have serious health implications for women and the young children that stay close to their mothers (Additionally, the stoves used by almost all households surveyed are inefficient (in terms of wood/charcoal usage).

Traffic and Transportation

Local Level

Transport infrastructure near the Project site is limited to the national highway that runs from Lilongwe to Salima. This road is paved and has a single lane in

each direction. The remainder of the roads in the Project area are asphalt, gravel and dirt roads. These roads are impassable during the rainy season communities struggle to access basic amenities such as health care and schools.

The main means of transport in communities is walking, bicycles, cars and motorcycle.

Waste

Local Level

Waste generated in the Project area includes food waste. The majority of the households have their own waste disposal pits (all waste). However, in Kanzimbe, Mayambo, Santhe and Waya there are still some people who do not have their own waste disposal pit and either dispose of waste using their neighbour's facility or throw the trash anywhere. In Sadzu, the sanitation committee encourages the community to have their own waste disposal pits.

6.3.13 Development Priorities and Community Needs

During social surveys, Village Heads, women and men were asked about their community needs and priorities that would enable a better quality of life and higher standard of living. The key priorities raised were increased access to boreholes/water to accommodate the population in villages, improved access to health services (in particular maternal care), and improved access to education.

The priorities raised and detailed in *Table 6.9* below, have been considered in the development of mitigation measures and the LRP that will be developed for the Project.

Table 6.9 Community Development Priorities

Village	Village Head	Women	Men	Justification for Priorities
Kanzimbe	1. Loans for businesses and financial literacy training. 2. Good potable water and sanitation facilities. 3. Improved assess to quality healthcare, including well trained health workers, electricity and a maternity wing.	1. Improved access to water. 2. Health centre. 3. Money/ capital.	1. Improved access to water for drinking and irrigation. 2. Improved access to secondary education and education on farming techniques. 3. Electricity.	• One borehole is not enough to accommodate the village and does not allow for irrigation of crops. There is also no back up when it breaks down. • Loans/access to finance would allow women and the broader community to start a business (eg in livestock farming, maize mills etc). • Health facilities require improvement and better access to maternal care. • Electricity would support access to water pumping, improve education and health care (eg preserving drugs). • Education facilities would improve access to jobs and income.
Mayambo	1. Health facility 2. Water (borehole) 3. Irrigation agriculture	1. Access to business loans and opportunities. 2. Access to irrigation 3. 3. Improved health services.	1. Improved water and sanitation . 2. Education. 3. Agriculture interventions (irrigation and extension services).	• There is a need for improved access to maternal care and to reduce the distance to a health facility. • The borehole in the village does not accommodate the population. The Headman suggested that they would like to be connected to solar and have water points installed around the village. • Access to irrigation and extension services will help reduce hunger and malnutrition, as well as create crop diversification and improve productivity, to manage increasing erratic rainfall. • Access to finance to enhance income generation and start small businesses. • Improved water and sanitation would improve health in the village. • There needs to be a reduction in distance to educational facilities.

Village	Village Head	Women	Men	Justification for Priorities
Waya	1. Secondary school. 2. Nursery. 3. Road.	-	1. Agricultural support 2. Improved access to healthcare. 3. Improved access to education.	• There is no secondary school with or nearby villages. A school is required to reduce the distance that children have to walk. • There is no nursery school and children lack good foundation for primary school. • There are no direct roads that connects the village to the main markets. • The village has to share a borehole and requires one of their own. • Improved healthcare is required to improve the ability to work and generate income. Additionally the community requires access to a broader range of services. • Improved agricultural productivity is required to improve income generation.
Santhe	-	1. Improved access to education. 2. Improved access to healthcare. 3. Electricity.	-	• Improved access to education is required to enable better choices in life and to be successful. • Improved health is required to work and the community required improved access to services in the village. • Electricity enables improved economic opportunities.
Sadzu	1. More boreholes. 2. Health centre. 3. More blocks at the school.	1. Water. 2. Improved access to healthcare. 3. Improved access to education	1. Farming equipment. 2. Improved healthcare. 3. Improved education facilities.	• Access to water is a challenge because there are not enough boreholes to accommodate the population. • Katawa Clinic does not provide all the services needed for the community (eg maternal care) and travel to the district is expensive due to transportation costs. • The children learn under trees and when it begins to rain the children are just sent back home. Additionally, there is a need to reduce the distance to secondary school and add classroom to accommodate the number of students. • Farmers lack equipment to support agricultural productivity that enables improved living standards.

NGO Support Received in Villages in the Project Area

Villages in the Project area have received support from a number of NGOs operating in Salima to support with development activities, as detailed in *Box 6.6*.

Box 6.6 NGO Support in Villages

Kanzimbe - Total Land Care (TLC) worked in the village for approximately five years, including providing a solar panel to support irrigation farming. Malawi Lake Basin (MLB) also worked in the village to support an irrigation project. Malawi Interfaith AIDS Association (MIA) is working in the village for the past four years in relation to women's and children's rights. Additionally, Kindle Orphan Outreach (KOO) supported the developed of a health centre.

Mayambo – A government Farm Input Subsidy (FIS) was operating in the village to support farming activities for vulnerable farmers, however this has not been successful. Additionally, Assemblies of God (AoG) installed a borehole for the community in 2017.

Waya – Received support from Feed the Children (FtC) to focus on nutrition and child health. Additionally, KOO has supported orphans in the village. In relation to agriculture, TLC and MLB have focused on the protection of trees and agricultural development support respectively. TLC also provided fuel efficient cookstoves.

Sadzu - KOO have supported orphans in the village and Save the Children (StC) have also been active in the village.

Community Based Organisations (CBOs)

There are a number of community based organisation villages in the Project area. These include village development committees (VDCs), Village Savings and Loans (VSLs) and self-help groups.

Village Development Committees

At the District, TA, and at village level there are development committees:

- District Development Committee (DDC) – comprises district departments who make the overall decision regarding development projects;
- Area Development Committee (ADC) – comprises TAs and other senior representatives that report development needs to the DDC; and
- Village Development Committee (VDC) – comprises the GVH and senior community representatives, including elders and women, who report development needs to the ADC.

The VDC and ADC result from government decentralisation structures to ensure that there is a bottom up approach to achieving community development goals.

At the village level, VDCs are responsible for identifying developmental needs of the community and coordinating development activities. The churches and mosques in these areas support and encourage participation in these developments. In Sadzu, the committee encourages people to take part in activities such as the construction of roads and the moulding of bricks to support local schools. However, this is not the case in Waya as there is no development committee that is religiosly affiliated the existing committee has gradually become less effective.

Kanzimbe Group Village Community Policing

The committee comprises 10 male members drawn from KGV, including Mayambo, Kanzimbe, Dzoole, Mbezela, Chenda, Nanjoka and Sikweya.

The role of community police is to:

- ensure mututal respect between communities;
- protect the communities from harm; and
- maintain law and order.

The community police have received training from the Malawi Police Service.

Village Savings and Loans / Finance Related

There are Village Savings and Loans (VSL) committees in the communities which enable men and women to save income and invest in small businesses.

Womens Groups

Mayambo and Sadzu have active womens' 'Kitchen Top Up Groups', that collectively finance the purchase of kitchen utensils (eg pots, spoons and buckets), as well as meetings to discuss nutrition and hygiene. These groups empower women by teaching them cooking skills and promoting good hygiene habits. Similar groups exists within Santhe and Waya Village, however, very few women partake in them. These women prefer the women's guild groups in their churches, which have similar objectives.

Other groups

Sadzu has a youth association called the 'Katawa Youth Club', which engages in recreation and promotion of sexual reproductive health in the village.

6.3.14 Cultural Heritage

National Level

Malawi has two UNESCO World Heritage Sites, namely Lake Malawi National Park and Chongoni Rock Art Area. Lake Malawi falls within Salima District but it is over 24 km from the Project and is therefore not impacted.

Local Level

Reportedly, whilst there are churches in the villages there are no religious buildings directly on the Project site

In Mayambo Village the community graveyard is located at the edge of the village. In Kanzimbe village there are two gravesites: Kanzimbe 1 and Kanzimbe 2. The graves in Waya and Santhe are located approximately 500 m northeast of the village. The graves for Sadzu Village are located within the community.

Kanzimbe has a traditional dancing shrine, however like the churches, it is not situated directly on the site. Men in Sadzu and Waya do not have any traditional groups and participate in the traditional masquerade dance (Gale Wankulu).

For women, there are cultural groups within the villages that initiate girls into womanhood after the onset of their menstrual cycle.

6.3.15 Indigenous Peoples

IFC Performance Standard 7 recognizes that Indigenous Peoples, as social groups with identities that are distinct from mainstream groups in national societies, are often among the most marginalized and vulnerable segments of the population. In many cases, their economic, social, and legal status limits their capacity to defend their rights to, and interests in, lands and natural and cultural resources, and may restrict their ability to participate in and benefit from development (1) .

In the Project Area Chewa is the primary ethnicity, with Chichewa as the main language spoken. According to 1998 Population and Housing Census (the latest data regarding language), 80% of the people of Salima speak Chichewa, 10% Chiyao, 8% Chitonga, and 2% Chinyanja, Chitumbuka and Ngoni. In addition, the primary religion in the villages is Christianity.

Chewa are the biggest population group in the country and constitute around 90 per cent of people in Central Region (where the Project is located). Nyanja form the majority in the Southern Region and Tumbuka in the Northern Region (2).

Housed surveys suggest that 46% of households in Kanzimbe and 53% of households in Mayambo generate monthly incomes of up to 10,000 MWK

(1) IFC (2012) IFC Performance Standard 7, Geneva Accessed at https://www.ifc.org/wps/wcm/connect/1ee7038049a79139b845faa8c6a8312a/PS7_English_2012.pdf?MOD=AJPERES
(2) Minority Rights Group International (n,d), Malawi Accessed at https://minorityrights.org/country/malawi/

($14). Only 28% of households in Kanzimbe and 28% of households in Mayambo report incomes of between 10,000 and 20,000 MWK ($27.55). Lastly, 28% of households in Kanzimbe and 18% of households in Mayambo report incomes above 30,000 MWK ($41). From income generated, between 20% and 27% of households reported income from selling their crop production. A small number of households are also engaged in selling livestock produce, tree products, trading and other activities (including bicycle taxis). Additionally, provision of agricultural labour through '*Ganyu*' is also a source of income for households. Many households in Kanzimbe and Mayambo have no sources of cash income at all and rely on subsistence farming; 47% of households surveyed in Kanzimbe and 43% in Mayambo.

The major sources of income in Sadzu, Santhe and Waya include farming, charcoal burning, small businesses such people selling tomatoes, vegetables, small cakes and charcoal production. There are labour sharing groups with their neighbours as farm labours to earn a living. These includes seasonal work such as land preparation, planting and harvesting of crops such as cotton and groundnuts.

The primary people in the Project Area are Chewa which is also the dominant national ethnicity. Moreover, livelihoods are based on subsistence farming and pastoral activities. However these livelihood activities are not considered to be part of indigenous cultural norms. Therefore, the people in the Project Area are not considered Indigenous people.

7 PUBLIC CONSULTATION: STAKEHOLDER ENGAGEMENT

7.1 INTRODUCTION

Stakeholder engagement is a two-way process of communication between the developer and stakeholders that may be impacted by the Project, influence Project decisions, or have a specific interest in the Project (e.g. non-governmental organisations) or academic institutions).

Stakeholder engagement for the Project has been undertaken in line with the IFC Performance Standards, based on the key objectives of stakeholder outlined in *Box 7.1.*

Box 7.1 Guiding Principles of Stakeholder Engagement

Ensuring understanding: Provide an inclusive and transparent process of culturally appropriate engagement and communication to ensure that stakeholders are well informed about the planned project.

Build relationships: Through supporting open dialogue, engagement will help establish and maintain a productive relationship between the developed and project affected communities, as well as other key stakeholders.

Facilitate participation: Ensure that all stakeholders participate in decision making regarding the project, regardless of gender, age, ethnicity, status and other socio-economic factors so that they are not adversely impacted and access project benefits.

Engage vulnerable groups: Identify and engage vulnerable groups to enable equal access to project information and a platform for them voice their concerns so that specific measures are included in project design.

Manage expectations: It is important to ensure that the planned project does not create or allow unrealistic expectations to develop amongst stakeholders about potential benefits, such as employment or compensation. The engagement process will serve as a mechanism for understanding and managing expectations by disseminating the correct information in an accessible way.

Ensure compliance: The process is designed to ensure compliance with both local regulatory requirements and international best practice.

Facilitate free, prior and informed consultation: Ensure engagement is free of external manipulation or coercion or intimidation, undertaken in a timely way so that stakeholders are informed prior to the development or implementation of the project, and ensure information is presented in an understandable and accessible way with consideration for literacy and language.

In order to facilitate the stakeholder engagement process for the Project, a Stakeholder Engagement Plan (SEP) has been developed, which provides a detailed engagement framework to minimise social risk, and to enhance relationships between the developer and Project affected communities. The SEP is a 'live' document and will be updated as the Project progress.

7.2 NATIONAL AND INTERNATIONAL REQUIREMENTS

This section provides details of national legislative requirements and international best practice standards, namely the International Finance Corporation (IFC) Performance Standards and Equator Principles.

7.3 NATIONAL REQUIREMENTS

The main stakeholder engagement requirements for development projects are detailed in the Environmental Management Act, 1996 (1). It states that an Environment Impact Assessment (EIS) should be developed in accordance with the requirements set out in the Act. The requirements include the following engagement activities:

"The EIA shall be open for public inspection provided that no except for the purposes of civil proceedings brought under this Act or under any written relating to the protection and management of the environment or the conservation or sustainable utilization of natural resources.

The Director shall invite written or oral comments from the public thereon, and where necessary may –

- *conduct public hearings at such place or places as the Director deems necessary for purposes of assessing public opinion thereon;*
- *require the developer to redesign the project or to do such other thing as the Director considers desirable taking into account all the relevant environmental concerns highlighted in the environmental impact assessment report, any comments made by the public and the need to achieve the objectives of this Act…"*

Additionally, following legislation shown in *Box 7.2* applies in relation to land acquisition, which includes notices to be placed in the *Gazette*.

(1) The Government of Malawi, Environmental Management Act 1996. Available at https://www.malawilii.org/mw/legislation/act/1996/6 (Accessed November 2017)

Box 7.2 Land Acquisition Requirements

- *Land Act, 2016:* The Act is the principal act with respect to land administration and management in Malawi and for all matters relating to land such as land tenure, land transfer, land use and compensation. The Act vests all land in the Republic in perpetuity. The Act has two categories of land, which are public land and private land. Section 7(2) classifies Public land as Government land and unallocated customary land while Section 7(3) classifies private land as freehold, leasehold or customary estate.

- *Electricity Act, 2004:* Notice needs to be published in the *Gazette* or in a paper in general circulation. Notices should include the nature of the work and the name and location of the project. Notice will also be provided to the affected person.

- *Land Acquisition Act, 2016:* The Lands Acquisition (Amendment) Act 2016 empowers the Minister to acquire land in the interest of Malawians.

- *The Customary Land Act, 2016:* Customary land is the land occupied and used by members of a community who live under customary law. Customary land, however, is not communal land. Most customary land is divided into pieces allocated for the use of individuals and their families. Rights to this land are usually well defined, often for exclusive use and transmissible.

  In the case that the Minister intends to transfer customary land for public interest, this is announced in the *Gazette* and sent to the land committee containing the details of the land to be transferred. Contradictory to the Land Acquisition Act, the Minister shall give 90 days' notice for the transfer. However it should be noted that the land acquired for the Project was private land and therefore this requirement does not apply.

Other requirements that need to be observed by the Project are grounded in the Constitution of Republic of Malawi (1995) which focuses on human rights and participation of various groups in society such as women, children and the disabled that may be vulnerable to Project impacts. As such vulnerable groups will require specific measures to ensure they are included in stakeholder engagement activities.

7.4 INTERNATIONAL REQUIREMENTS

This section outlines international best practice requirements stipulated by the IFC and Equator Principles to align stakeholder engagement activities with International Finance Institution (IFI) requirements.

7.4.1 IFC Performance Standards

The IFC defines the objective of stakeholder engagement as being *"the basis for building strong, constructive, and responsive relationships that are essential for the successful management of a project's environmental and social impacts"* (1).

(1) IFC Performance Standard 1: Environmental and Social Risks and Impacts. Available at http://www.ifc.org/wps/wcm/connect/115482804a0255db96fbffd1a5d13d27/PS_English_2012_Full-Document.pdf?MOD=AJPERES (accessed November 2017)

The IFC Performance Standards include specific guidance on conducting stakeholder engagement both during the planning phase as well as throughout the project lifecycle. Stakeholder engagement requirements are contained in *Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts*, as summarised in *Box 7.3*.

Box 7.3 Performance Standards Requirements for Stakeholder Engagement

IFC PS1: Assessment and Management of Environmental and Social Risks and Impacts: Stakeholder engagement is an on-going process that requires stakeholder analysis and planning, disclosure and dissemination of information, consultation and participation, grievance mechanism, and on-going reporting to Affected Stakeholders.

Disclosure of relevant project information: Provide affected stakeholders with access to relevant information on: (i) the purpose, nature, and scale of the project; (ii) the duration of proposed project activities; (iii) any risks to and potential impacts on such stakeholders and relevant mitigation measures; (iv) the envisaged stakeholder engagement process; and (v) the grievance mechanism.

Informed Consultation and Participation (ICP): ICP involves a deep exchange of views and information to inform process decision-making and understand the views of the affected stakeholders on matters that affect them directly, including proposed mitigation measures, the sharing of development benefits and opportunities, and implementation issues.

All consultation should be documented and stakeholders should be informed about how their concerns have been considered.

External Communications: Implement and maintain a procedure for external communications that includes methods to receive and track communications from the public, assess the issues raised and determine how to address them, provide and document responses and adjust the management program. Additionally, clients are encouraged to make publicly available periodic reports on their environmental and social sustainability.

Grievance Mechanism for Affected Stakeholders: Establish a grievance mechanism to receive and facilitate resolution of affected stakeholders' concerns and grievances about the client's environmental and social performance.

On-going Reporting to Affected Stakeholders: Provide periodic reports to the affected stakeholders that describes project progress, on-going risk to or impacts on affected stakeholders, and issues related to the consultation process or grievance mechanism. Consultation and disclosure must continue throughout the life cycle (construction and operation phase) of the project.

Source: IFC Performance Standard 1, January 2012.

7.5 STAKEHOLDER IDENTIFICATION AND MAPPING

A stakeholder is defined in the IFC Performance Standards as:

"Stakeholders are persons or groups who are directly or indirectly affected by a project, as well as those who may have interests in a project and/or the ability to influence its outcome, either positively or negatively. Stakeholders may include locally affected communities or individuals and their formal and informal representatives, national or local government authorities, politicians, religious leaders,

civil society organizations and groups with special interests, the academic community, or other businesses" (1).

The purpose of the stakeholder identification process is therefore to establish which organisations and individuals, including vulnerable groups, may be directly or indirectly affected (positively or negatively) by the Project or have an interest in it.

Stakeholder identification takes into account:

- The expected AoI of the Project, that is the geographical area over which it may cause impacts (both positive and negative) over its lifetime, and therefore the localities within which people and businesses could be affected;

- The nature of the impacts that could arise and therefore the types of government bodies, Nongovernmental Organisations (NGOs), academic and research institutions and other bodies that may have an interest in these issues.

The aim of stakeholder mapping is to understand the stakeholders' needs and expectations for engagement and consultation in order to tailor engagement to each type of stakeholder. Stakeholders should be categorised and mapped according to their influence, impact and influence on the Project.

A list of stakeholders identified to date based on the above methodology, is provided in *Table 7.1.* This list is not exhaustive and will be updated as the Project progresses.

(1) IFC (2007) Stakeholder Engagement: A Good Practice Handbook for Companies Doing Business in Emerging Markets Available at: http://www.ifc.org/wps/wcm/connect/938f1a0048855805beacfe6a6515bb18/IFC_StakeholderEngagement.pdf?MOD=AJPERES (Accessed March 2018)

Table 7.1 Project Stakeholders

Stakeholder Category	Stakeholder	Connection to the Project
National Regulatory Bodies - National bodies are of primary importance in terms of establishing policy, granting permits and other approvals for the Project and monitoring enforcing compliance.	Environmental Affairs Department (EAD)	The Project has to comply with the Environmental and Social Impact Assessment (ESIA) requirements and to develop environmental management and monitoring plans. The Department is responsible for issuing the Environmental Certificate after an ESIA has been approved
	Electricity Supply Corporation (ESCOM)	ESCOM are responsible for the wheeling and distribution of electricity to the consumers. If the affected communities are to benefit from the electricity by way of community investment, ESCOM may have to play a part in the modalities for household connections. Additionally the Project can draw on ESCOM's experience in relation to land acquisition for electricity related projects.
	Department of Lands	The ministry (through the Department of Lands) is a key stakeholder in the Project due to the management of land issues in Malawi. The department is the final approving authority for approving land acquisition related matters. It represents the Ministry of Lands, Housing and Urban Development on all matters to do with compensation and resettlement. As such the department has the authority to issue land leases/ registration certificate to ProjectCo. The Ministry also provides land and housing management services to the general public. It draws its mandate from various statutes and policy instruments such as the land acts.
	Electricity Generation Company of Malawi (EGENCO)	EGENCO are currently the sole generators of electricity in Malawi. The contribution of the Project to the alleviation energy problems will greatly assist EGENCO.
	Malawi Energy Regulatory Authority (MERA)	MERA is the overall regulatory authority for energy in Malawi.

Stakeholder category	Stakeholder	Connection to the Project
National Government Ministries	Ministry of Gender and Social Welfare (MoGSW)	MoGSW has an interest in the social welfare of the people throughout the country. Therefore, they will be interested in how the Project is managing impacts on vulnerable groups, including women.
	Ministry of Education, Science and Technology (MoEST)	MoEST will be interested in any access related constraints resulting from the Project as well as any skills training and education related community investment that the Project may engage in.
	Local Government and Rural Development (LGRD)	LGRD is that the administration is the link between the Project and the communities' communication and consultation shall be done through the Malawian authority.
	Finance, Economic Planning and Development Department (FEPDD)	Formulates economic fiscal policy and manage financial material resources for the Government for Malawi in order to realise balanced and sustainable economic growth to reduce poverty.
	Natural Resources, Energy and Mining Department (NREMD)	The ministry is there to ensure sustainable development, management and utilisation of energy, minerals; and monitoring geo-hazards for socio economic development.
	District Commissioner (DC)	The DC is the overarching local authority for all the development projects being implemented in the district. He is also the authority to issue the Project planning Permit (on behalf of the Department of Physical Planning). Additionally, the DC oversees the compensation process for all projects within the District, including payment of compensation and monitoring activities. The DC's office works hand in hand with the Community Development Officer on matters related to social aspects including community mobilisation and sensitisation on such projects.
	Ministry of Irrigation and Water Development/ Water Department MoIWD)	The Water Department is responsible for provision of water supply services including piped rural water supply schemes and boreholes. The Department will need to be engaged in relation to water use for the project and any water related CSR projects resulting from the Project. . A water abstraction permit will be required from the Water Resources Authority if the Project requires a borehole or abstraction of surface water for construction purposes.
	Ministry of Labour (MoL)	The MoL issues the Workplace Registration Certificate as mandated by the Occupational Safety Health and Welfare Act. It is also responsible for monitoring of workers' health and safety during construction and operation.
Community level	Project affected communities, including residents in surrounding villages and land users	Households and communities that will be directly or indirectly affected by the proposed project activities. This includes people living in the affected land either by direct land take or by social and environmental impacts.
	Chiefs/Traditional authorities Group Village Heads/Village Heads	Local community leaders act as representatives of their local community. Meetings with Traditional Authorities will follow local practices and be held prior to any wider communication in order to respect the political and social structure.

Vulnerable groups	May include: • Women and girls; • Female headed households; • Unemployed male youth/adult men; • Subsistence households; • People over the age of 60; • Orphans.	Vulnerable groups may be disproportionately affected by the proposed Project by virtue of socio-economic status or physical abilities and are therefore less resilient to change. Groups have been identified based on a vulnerability assessment undertaken on households impacted to date. A further assessment will be undertaken on households affected by additional land acquisition.
Civil society groups	Community based organisations (CBOs) and cooperatives	Organisations that may be impacted by the Project or that the Project can work with on livelihood development activities.
Non-Governmental Organisation(NGO)/Institutions/Academic	Includes international, national and local NGOs covering biodiversity/conservation, human rights, gender and child related issues	NGO and academic institutions are able to influence the success of projects through advocacy and negative media attention. The Project is required to identify and engage relevant NGOs and institutions to keep them informed about the Project. They may also act as a partner in implementing livelihood or community investment programmes.
Commerce and Industry	Local businesses / potential suppliers and contractors	Will be interested in procurement opportunities in relation to the Project. They may also create cumulative impacts. As such, the Project is required to identify industries in the local area and aim to collaborate with them where appropriate.

7.6 STAKEHOLDER ENGAGEMENT ACTIVITIES

This Section outlines stakeholder engagement activities that have been carried out to date in support of the Project, and the process required for the ESIA and LRP.

7.6.1 Stakeholder Engagement Activities Undertaken Prior to the ESIA

Stakeholder engagement undertaken in support of the Project so far has primarily been related Phase I of the land acquisition process, and was undertaken by the Salima District Commissioner. However, other engagement has been in relation to the LACS and CSR studies, as mentioned in *Section 1.5* (Project activities carried out to date) above, and included in the following. A summary of the meetings held and key points raised that are considered in the ESIA and land acquisition process for additional land required by the Project (Phase II of land acquisition) are included in *Annex D*.

Initial Engagement

Initial engagement involved meeting Regional and District Lands Officers to gather information on the land acquisition and compensation process in Malawi, and in relation to the Project. Additionally, meetings were held with community leaders and representatives of compensation beneficiaries. A summary of meetings held and feedback from stakeholders is included in *Annex D*.

Social Baseline Engagement for LACS and CSR Studies

As part of the data gathering process for LACS, communities and stakeholders were provided with an overview of the Project and asked if they had heard about it previously. Additionally, information was gathered regarding perceptions on potential Project impacts.

Most stakeholders met during the social surveys reported that they had heard about the Project; however mainly from people that had received compensation from loss of land.

Women in Kanzimbe had incorrectly understood that the Project is being undertaken to supply power in the village resulting from the current lack of ESCOM power/ electricity, when it will be supplied directly to the national grid. In Mayambo, women said that they had been informed about the Project by the government. Men in Kanzimbe and Mayambo stated that they felt they had a good understanding of the Project and mainly heard about it through land valuers. The teacher at Namanda Primary School stated that information regarding the Project had been informally communicated and that they did not have sufficient understanding of the Project.

A summary of the key issues raised is provided in *Annex D*. This feedback has informed the initial scoping of potential impacts that have been considered in the ESIA.

7.6.2 ESIA and LRP Stakeholder Engagement Process

In order to avoid stakeholder fatigue there are three main stages of engagement that form the ESIA and LRP process. These include engaging on the draft scoping report, which incorporates feedback already captured, as well as presenting the Project and gathering feedback from additional communities in the social AoI. Additionally, a third stage of engagement will be undertaken on the draft ESIA/LRP or LRP/ disclosure, which will include consultation on the impacts and associated mitigation identified. Engagement for the ESIA process is presented in *Figure 7.1* below.

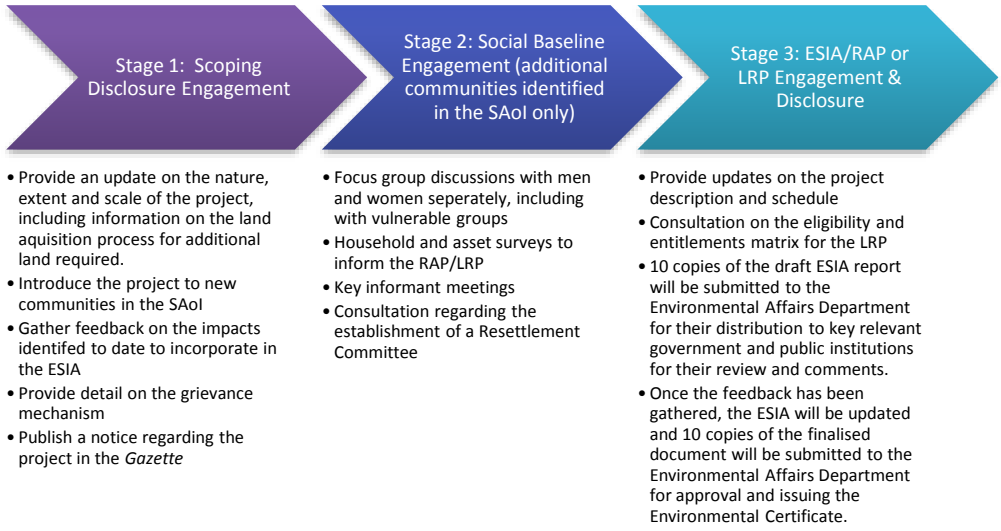

Figure 7.1 ESIA and /LRP Engagement

Stage 1 and 2 of the engagement process has been undertaken and details regarding these are provided below. At the time of writing the ESIA, Stage 3 was pending.

Stages 1 and 2: Scoping Disclosure Engagement, and Social Baseline Engagement – Activities and Outcomes

Stage 1 of the engagement process was carried out between the 23rd and the 27th of April 2018, and Stage 2 carried out between 29th May to 02 June 2018. Stage 1 included meeting with national, district, and local level stakeholders, building on from engagement that has already been undertaken in support of the Project.

Engagement materials developed for this stage of engagement included the following;

- Background information document in English and Chichewa to provide a high level overview of the Project, impacts and contact details for comments/grievances to be submitted;

- Flyers for the meeting in Chichewa were posted in affected communities.

- A pictorial community presentation that illustrated the Project footprint, potential impacts, ESIA and land acquisition process, and provided contact details for comments/grievances to be submitted;

- A technical presentation for the government, NGOs, and other stakeholders; and

- A question and answer guide (Q&A) for community meeting facilitators.

All meetings were documented, including meeting registration, photos and meeting minutes. Additionally, feedback on the meeting process was gathered where appropriate using meeting feedback forms and verbally.

Box 7.4 Meeting Feedback Questions

- Was the meeting useful?
- Was the information presented in a clear manner and do you feel that you have a good understanding of the Project activities and plans?
- Were you able to ask the questions you wanted?
- Was this meeting organised in a way to facilitate your attendance?

Information gathered from the feedback process will help to inform the organisation of future engagements and support monitoring and evaluation requirements, as detailed in the SEP.

Details of the activities and outcomes for this stage of engagement are provided below and the all stakeholder engagement materials and meeting minutes for Stage 1 of engagement are provided in *Annex D.*

National and District Level Engagement

Using the materials described above the Project team arranged and met with the key government departments that play a role in the Project, for approvals or to provide feedback to feed into the ESIA.

A summary of the engagement and photos of the meetings are provided in *Annex D*.

Community Level Engagement

In addition to national and district meetings, meetings were also held with communities covering a number of villages in the Project area. The purpose of the meetings was to provide a more in depth description of the Project that they had received previously, explain the ESIA process, explain some of the key impacts identified during the scoping process and gather feedback to feed into the ESIA. A total of three community meetings were held, representing affected people surrounding the Project Site and along the transmission line wayleave.

Table 7.2 shows the meetings held in each community and the demographics of each meeting. As the figures show, women were well represented in all the meetings held.

Table 7.2 Community Meetings

Date	Location	Villages Represented	Females	Males	Total
24 April 2018	Kanzimbe	Kanzimbe, Kanzimbe 2, Menyako, Maiezi, Mputeni, Jephytala, Malezi	45	40	85
25 April 2018	Mayambo	Mayambo, Njoka, Kanthiti, Chishasha, Kachepela	44	46	100
26 April 2018	Nanjoka	Waya 1, Santhe, Motolo, Sadzu, Malezi, Thangani, Mwape, Malumbula, Michembo, Vonguti, Kuso, Chiwaka	74	54	128
		Total	**163**	**140**	**313**

In addition to community meetings, Stage 2 of engagement involved undertaking focus group discussions and key informant interviews were undertaken to gather gender and topic related information. A full list of meetings is provided in *Annex D*. The outcomes and Project response from all the meetings and photos are also included are included in *Annex D*.

Stage 3: ESIA/RAP or LRP Engagement and Disclosure

Engagement on Cut-Off Date, Asset / Household Survey Mop-Up & Verification and Establishment of the Grievance and Livelihood Restoration Steering Committee/Working Group, June 2018

Following data collection activities, a verification process and mop-up of outstanding households and asset surveys was undertaken to capture those that were not present during the initial survey period. Additionally, at this time the cut-off date was announced. The announcement included submission of a formal letter to the Salima District Commissioner, which was then circulated to the Traditional Authority and GVHs. Additionally, notifications in Chichewa were placed in key meeting areas such as shops, maize mill, schools, churches and trees.

The cut-off date announcement stated that last day of surveys and the cut-off date for claims to land in the Phase II affected area for the Project was **1 July 2018.** All members of the community that use land in the area were encouraged to meet with the Project team members in Kanzimbe, Mayambo, Waya, Santhe and Sadzu Villages to finalise the survey process between **24th June 2018 to 1st July 2018.** The announcement stated that after the **cut-off date of 1 July 2018**, no fixed assets within the demarcated area such as structures, houses, shelters, animal sheds, buildings, crops or trees established after the cut-off date would be eligible for compensation.

Additionally, information was provided regarding selection and establishment of the grievance and livelihood restoration steering committee and working group. This was in order to provide clarity on the various means by which affected persons could report grievances and how they would be represented during LRP implementation.

Engagement Undertaken in August 2018 on Eligibility and Entitlements

Following completion of asset surveys in June 2018, a compensation report and database was issued by MoL representatives. In addition, assessment of potential replacement land sites was undertaken. Further engagement was undertaken in August 2018 with steering committees established for the Project and affected persons to present detail on the draft eligibility and entitlements established and to gather feedback to feed into the final matrix.

LRP / Entitlements Disclosure for Phase II Project Affected Persons, September 2018 (Solar Plant Affected Persons Only)

Following engagement on the draft eligibility and entitlement matrix, updates were provided to affected persons covering Kanzimbe and Mayambo GVH's affected by the planned solar plant, to provide an update on the review of compensation values for land and crops as well as explain the individual entitlements disclosure discussion and agreement process. The meeting was led by the MoL with the support of ERM, WWEC and ProjectCo representatives.

Engagement included community / group meetings and individual negotiations with affected persons. The MoL representative gave an overview of activities to date and then explained how the individual entitlement disclosure meeting would be carried out.

Draft/Final ESIA Stakeholder Engagement

The Draft ESIA Report was submitted to the EAD on the 20 July 2018 and comments on the Draft ESIA from the EAD were received on the 11 September 2018. The comments were addressed and the Final ESIA was submitted to the EAD on the 28 September 2018 and was subsequently approved by the EAD on 23 November 2018.

The approval process of the ESIA is facilitated by The Technical Committee on the Environment (TCE) which is an inter–agency committee established under the EMA. This Committee is set up by the EAD and all ESIA are reviewed by the TCE prior to a decision being made by the EAD. The Committee provides expertise and advice to the Director of Environmental Affair as follows:

The TCE comprises of independent environmental and natural resources management experts, directors of government departments/agencies, experts from relevant universities and national civil society organisation.

The following are agencies/ministries typically form part of the TCE:

- Ministries of Lands;
- Labour, Mines Department;
- Water Resources;
- Gender;
- Parks and Wildlife;
- Health;
- Land Resources;
- Herbarium and Botanical Gardens;
- Malawi Bureau of Standards;
- Forestry Department;
- Malawi Investment and Trade Centre;
- Law Society of Malawi;
- Foreign Affairs;
- Justice;
- Roads Authority;
- Energy;
- Finance;
- Geological Survey;
- Fisheries;
- Antiquities;
- University of Malawi;
- Lilongwe University of Agriculture and Natural Resources; and
- Centre for Environmental Policy and Advocacy.

As key Government stakeholders were engaged as part of the ESIA approval process, these stakeholders were not further engaged as part of the ESIA disclosure activities (1).

On the 12 February 2019 the ESIA was disclosed to the affected communities. Communities were notified of the meeting on the 5th of February 2019. Approximately 100 community members attended the disclosure meeting and

(1) To note, meetings for ESIA disclosure were requested. However it was recommended that as the key government stakeholders were part of the approval process it was not necessary to have addition disclosure meetings with the government stakeholders.

the meeting focussed on the outcomes of the ESIA and in particular the anticipated construction impacts. A copy of the disclosure presentation, photos of the meetings, and attendance registers are included in *Annex D*.

7.6.3 Grievance Mechanism

An effective grievance mechanism allows stakeholders to lodge complaints and/or concerns at no cost, without retribution and with the assurance of a timely response. As part of previous engagement processes, ProjectCo is in the process of establishing a formal grievance mechanism and a grievance committee to enable an accessible and transparent reporting system.

The process will include the following steps:

- Identification;
- Review and record the grievance;
- Acknowledgement;
- Develop a response;
- Communicate response and establish agreement; and
- Close-out process.

A detailed description of the grievance mechanism required for the Project is provided in the Project SEP.

7.6.4 Monitoring and Reporting

In order to assess the effectiveness of the SEP and associated engagement activities, ProjectCo will implement a data management and monitoring process as part of the overall monitoring of ESIA commitments and performance.

All engagement activities, throughout the ESIA, LRP and the life of the Project, will be documented and filed in order to track and refer to records when required and ensure delivery of commitments made to stakeholders. The strategies for documenting and recording ongoing stakeholder engagement are detailed in the SEP.

8 ASSESSMENT OF POSITIVE ENVIRONMENTAL IMPACTS

8.1 GENERATION OF ELECTRICITY

8.1.1 Introduction

This assessment identifies the positive impacts that will occur during the operational phase from the generation of electricity.

8.1.2 Summary of Baseline

Malawi has an installed generation capacity of 363 MW, however there is large reliance on large hydropower. Over 95% of Malawi's electricity is generated from hydropower with the Shire River as the main source. Due to drought and low rainfall electricity generation has been reduced by up to 40% due to dwindling water levels. However, in Malawi there is also high potential for solar energy development.

In addition, the lack of electricity at a household level means that people continue to use wood and charcoal for cooking, which contributes to deforestation across the Country and poor indoor air quality and associated health effects.

8.1.3 Potential Impact: Operation

The Project will generate up to 60 MW of power which will be fed into the national grid for distribution in the Central Region of Malawi. The increased power supply from the facility will enable ESCOM to store additional hydro reserves during the day so that it can be manage the peak demand more efficiently in the evening. It will also reduce the dependency on emergency diesel powered emergency generation sets, which will lower cost to the end consumer and reduce the impact on climate change.

8.1.4 Assessment of Impacts: Operation

The increased power supply to the national grid through the operation of the solar PV facility will be a direct, positive impact. The extent of the impact will be regional, as the power generated by the PV facility will supplement the electricity supply to the Central region of Malawi. The duration of the impact will be long-term, throughout the operation phase, and the Project will boost the national power pool by 60 MW (20%) increase in national generation.

Given the need for additional power supply to the national grid, as described above, the sensitivity of receptors is considered high.

The overall significance of the generation of electricity is rated as *Positive* (*Table 8.1).*

Table 8.1 Impact Assessment: Operational Generation of Electricity

Impact	**Increase in national generation capacity**				
Impact Nature	Negative	Positive	Neutral		
	The generation of electricity is a positive impact.				
Impact Type	Direct	Indirect	Induced		
	It is direct impact as electricity will be fed directly into the national grid				
Impact Duration	Temporary	Short Term	Long Term	Permanent	
	The impact with be experience for the duration of the Project.				
Impact Extent	Local	Regional	International		
	The impact extent is regional as the power from the Project will supplement the regional power supply.				
Frequency	The generation of electricity will be constant throughout the lifetime of the Project. To note that solar technically is not considered base load generation, however the generation is broadly expected to be constant.				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Based on the parameters above, the magnitude is considered positive.				
Resource/ Receptor Sensitivity	Low	Medium	High		
	N/A				
Impact Significance	Considering the magnitude the potential impact *positive* significance.				

8.1.5 Enhancement Measures

The distribution of electricity in Malawi falls under the ambit of ESCOM. As the Project cannot determine the distribution of power there are no further measures are recommended.

8.1.6 Residual Impacts

The residual impact of increased power supply for the Malawian national grid during operational phase will remain a *Positive* impact (*Table 8.2*).

Table 8.2 Residual Impact of Generation of Electricity

Impact	**Project Phase**	**Significance (Pre-mitigation)**	**Residual Impact Significance (Post-mitigation)**
Generation of electricity	Operation	Positive	Positive

8.2 IMPACT ON EMPLOYMENT AND THE ECONOMY

8.2.1 Introduction

This assessment identifies the positive impacts that will occur during the construction and operational phases as a result of employment and 3rd patty services required for the construction and operation of the Project.

8.2.2 Summary of Baseline Conditions

In the villages, women are generally responsible for childcare, farming, domestic responsibilities (cooking and cleaning), caring for the sick, gathering and pounding maize meal. Men primarily engage in income generating activities, such as bicycle taxis, selling farm produce or other grocery items and fish trading. Men in Santhe and Waya Village, however, do not partake in fishing activities as they are far from the main fishing villages.

Additionally, *ganyu* labour as a significant factor in household livelihoods strategies. Men are actively involved in *ganyu* labour, with some women also engaging in such agricultural activities. Ganyu labour involves families working on other people's farms to earn a little income, which is mainly used for household needs. Men also work for periods on rice estates.

Some of the youth near the planned transmission line also engage in quarrying as there is a site near Nanjoka and Santhe.

In relation to education, student mainly complete up to primary school as access to secondary education is constrained by distance and costs for transportation and uniform. Additionally, girls tend to drop out a secondary level due to teenage pregnancy and early marriage. As such, literacy and skills levels are low.

However, Salima has a technical school, where the main subject taught include mechanics, carpentry/joinery, brick laying, administration, Information and Communications Technology (ICT), business studies, accounting, human resource management and community development. These skills would be useful for some of the jobs required during Project construction.

The economy in Salima is primarily agricultural based, with small and medium enterprises (SMEs) running business in the centre, including guesthouses, printing, mobile services etc.

8.2.3 Potential Impact: Construction and Operation

Approximately 200 workers will be required during the Project construction period including skilled and unskilled workers. However, during operation the number will reduce to approximately 20. The number of workers anticipated to come from local communities has not yet been determined.

Communities in the Project area have poor access to education and in combination with high levels of poverty and traditional behaviours, the population generally has low levels of education and literacy levels. Additionally, the high incidence of teenage pregnancy restricts many young women from accessing the employment market. Regardless of this, the youth,

men and women in local communities have very basic skills to undertake semi and unskilled positions available.

Additionally, there are possibilities to engage local small and medium enterprises (SMEs) in Salima with procurement opportunities.

8.2.4 Assessment of Impact: Construction and Operation

Table 8.3 below provides an assessment of potential impacts related to employment and the economy during construction.

Table 8.3 Employment and the Economy

Impact	**Employment and the Economy**				
Impact Nature	Negative		Positive		Neutral
	Job creation and use of local SMEs for supply of goods and services will create a positive impact on some individuals, households and businesses in the local community and in Salima.				
Impact Type	Direct		Indirect		Induced
	The impact will directly have a positive affect where individuals that are hired through ProjectCo or the EPC contractor, and an induced impact on local businesses catering for the needs of the workforce.				
Impact Duration	Temporary	Short Term		Long Term	Permanent
	The impact will only be felt during the construction phase, as the need for workers and goods and services reduces.				
Impact Extent	Local		Regional		International
	The impact will be felt in some households in local communities and small businesses.				
Frequency	Occasional – the benefits will only be experienced pre and during construction, during periods of recruitment and Project resourcing of goods and services.				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	The impact will be small-positive as it will enable some individuals, households and businesses to improve their quality of life.				
Resource/ Receptor Vulnerability	Low		Medium		High
	N/A				
Impact Significance	The impact is positive and it is expected that the impacted will not largely be felt in communities.				

Embedded Controls

ProjectCo are planning to undertake community investment programmes targeting Project affected communities in rural electrification, water and sanitation and agriculture. However, these programmes are yet to be determined. Once implemented, these programmes have the potential to improve access to income generation and the quality of life and standard of living of local communities.

Enhancement Measures

In order to enhance the positive impacts above, the following mitigation measures will be implemented:

- ProjectCo will establish a recruitment strategy for staff required pre and during construction to enable the community to access job opportunities where possible.

- Although recruits will require a basic level of skills prior to recruitment, ProjectCo or the EPC contractor will provide training opportunities and internships to males and females in local communities in order to enhance their skills, increasing employability and career development opportunities at a later stage.

- ProjectCo will source goods and services required for construction and operation in Salima District as much as reasonably possible. Following this, goods and services in Lilongwe and at a national level will be sought prior to sourcing outside of Malawi.

- In addition to the LRP, which will target directly affected communities, ProjectCo will develop and implement a broader gender differentiated Community Investment Strategy (CIS) that will include measures to enhance livelihood, skills capacity and employability in neighbouring communities and surrounding areas. This will be established through a gender focused and participatory needs assessment.

- Preparation of a Gender Development Plan to promote gender equality in relation to job opportunities as well as support the mitigation of gender based violence, and other gender related issues within the workforce and externally (eg in Project affected communities)

Residual Impact Significance

With the mitigation measures included above, the impact significance is expected to be *Positive*.

Table 8.4 Residual Enhancement: Employment and the Economy

Impact	Project Phase	Significance (Pre-mitigation)	Residual Impact Significance (Post-enhancement)
Employment opportunities and the need for the supply of goods and services has the potential to create jobs for the local community and improve income levels.	Construction	Positive	Positive

8.3 SUMMARY OF CSR PROGRAMME

A CSR Feasibility study has been commissioned by the ProjectCo and completed by ERM. These programme options were selected by ProjectCo based on community observations and linkages with solar and livelihood restoration requirements resulting from the economic displacement and compensation process, which took place in 2017.

Based on the assessment, it is recommended that the CSR programme includes all three CSR topic areas with a priority on agriculture to address the impacts of land acquisition and current gaps in the way it was implemented against international lender requirements. Programmes are shown in *Table 8.5* below.

A CSR programme will be implemented, however the exact details of the programme are currently being finalised

Table 8.5 Overall CSR Recommendations

Topic Area	Recommended Programme
	Agricultural improvement programme, including: • provision of improved crop varieties • improved cropping techniques; • sustainable irrigation and • improved value add techniques.
	Kanzimbe: Construction of an additional solar borehole with taps and upgrade of the existing borehole to a solar pump with taps. Mayambo: Upgrade of the existing pump to solar with four taps.
	Holistic gender focused CLTS programme and support for female friendly sanitation hardware at Namanda Primary School and Kanzimbe Trading Centre
	Subsidised Solar Home Kits for each of the HH in the two communities.
	Solar for public facilities (schools, health centre and Kanzimbe Trading Centre)
	Eco-friendly fuel efficient stoves in each HH
Other needs	• Micro-finance & Small-Medium Enterprise (SME) business training • Adult literacy

9.1 AIR QUALITY

9.1.1 Introduction

The assessment of potential impacts to air quality is limited to the assessment of dust generated during construction from both construction traffic movements and earthworks/construction works (See *Figure 4.2*).

9.1.2 Summary of Baseline

Due to the rural nature of the Project area there are no existing continuous air emissions near the Project site. Occasional air emissions result from burning or clearing activities occur in and around the Project area. There are residential communities within 200 m of the Project site.

9.1.3 Potential Impacts: Construction

Dust emissions will arise during construction from the following activities:

- earth moving activities and ground preparation of the Project site and transmission line wayleave;
- traffic and movement of vehicles over open ground and on unpaved roads; and
- material stockpiles from clearance and preparation activities.

Dust emissions may result in nuisance issues at nearby sensitive receptors due to dust soiling and may result in increases in ambient concentrations of PM_{10}. In addition, dust emissions will arise due to traffic along unpaved roads during the construction.

The vehicles used during the construction of the Project will primarily be Heavy Goods Vehicles (HGVs) associated with bringing in materials and equipment. During construction period the primary Project components will be delivered in the following way:

- inverters - eight truck deliveries;
- main Transformer - two specialised abnormal load deliveries ;
- LV/MV Transformers – Eight truck deliveries;
- PV modules – 200 truck deliveries;
- tracker/structure – 300 truck deliveries; and
- miscellaneous – 200 truck deliveries.

9.1.4 Assessment of Impacts: Construction

The construction of the Project will take approximately 9 months and predominantly occur during the last three months of the wet season February to April and thereafter during the dry season. During the wet season (December to April) the conditions within the Project area are not conducive for dust generation. In addition, emissions will not occur constant over the construction period, rather emissions will peak during site clearance and deliver of panels and mounting structures. Therefore, exposure to dust generating activities and associated dust emissions are likely to primarily occur in the dry season and a short period of the construction phase. Kanzimbe and Mayambo are located within 200 m of the Project site, and Nanjoka is located along the Project access road and these communities will have a high sensitivity. The impact duration will be temporary (over 9 months and primarily during the dry season within this period). The impact magnitude is considered medium.

On this basis, the impact on local ambient air quality due to dust emissions on surrounding receptors is considered to be moderate significance for any receptors within 200 m of the source (*Table 9.1* and *Figure 9.*1)

Table 9.1 Impact Assessment: Air Quality - Dust Emissions during Construction

Impact	**Reduction in air quality during construction activities**				
Impact Nature	Negative	Positive	Neutral		
	The potential impacts (dust generation) are negative				
Impact Type	Direct	Indirect	Induced		
	The impact is as a result of the project activities (i.e. construction activities) resulting on an impact on the air quality of the local area.				
Impact Duration	Temporary	Short Term	Long Term	Permanent	
	The impact duration is considered to be short term (less than 9 months)				
Impact Extent	Local	Regional	International		
	Air quality impacts may extend beyond the Project's direct AoI, but will remain within 500 m of the Project site.				
Frequency	During the dry season there is the potential for dust on a daily basis, however, this is less likely during the rainy season (December to April).				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Based on the above the impact magnitude is considered small.				
Resource/ Receptor Sensitivity	Low	Medium	High		
	The sensitivity is considered high due to the small number of sensitive receptors within 200 m of the site (closest being within 20m of the site boundary).				
Impact Significance	Negligible	Minor	Moderate	Major	
	The impact is considered to be of *moderate* significance within 200 m from the Project site and Minor greater than 500m.				

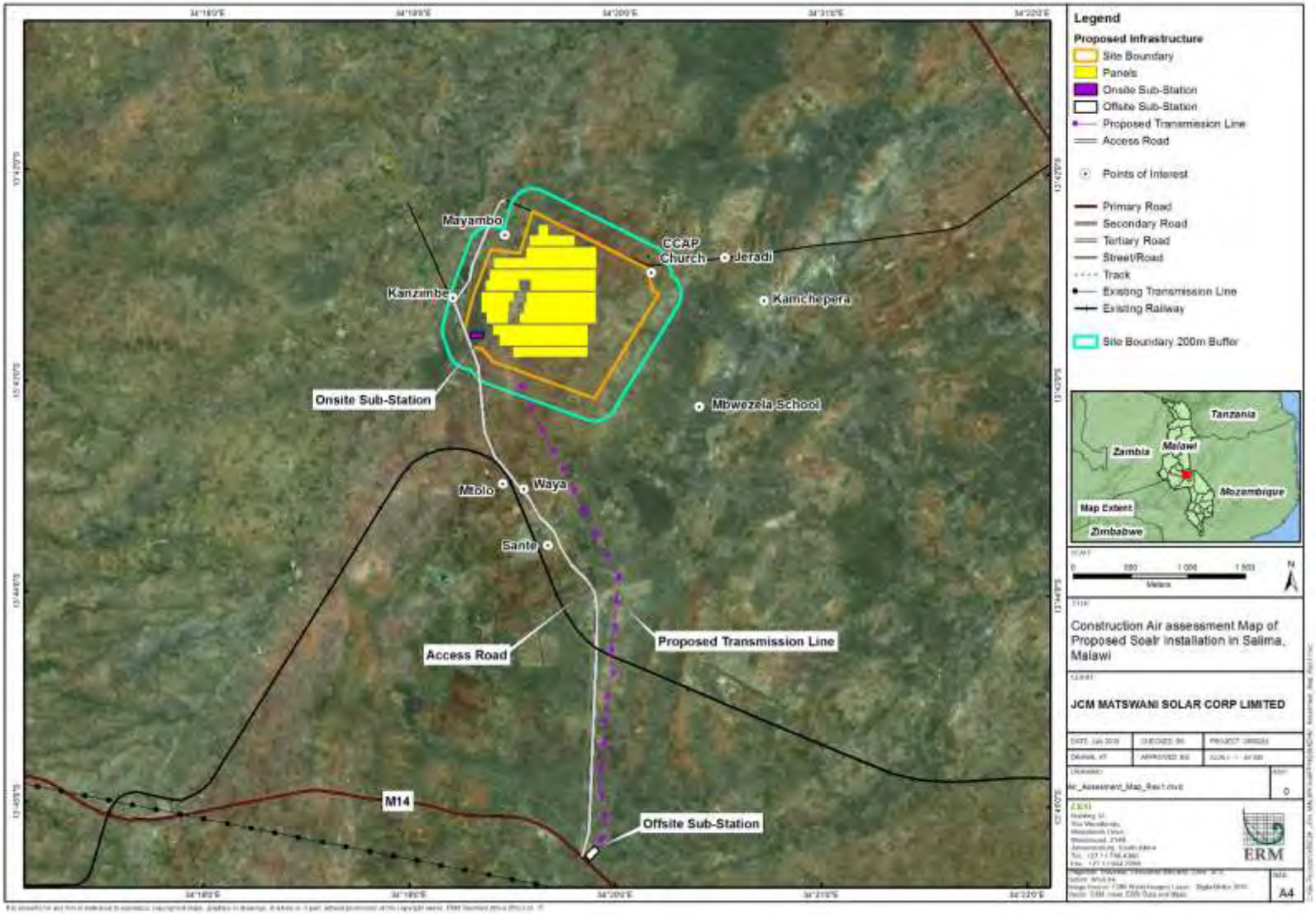

Figure 9.1 Air Quality Assessment Map

9.1.5 Mitigation Measures

The following mitigation measures will be implemented by the ProjectCo:

- restrict the removal of vegetation and soil cover to those necessary for the Project;
- land clearance should be sequential and where ground and earthworks are undertaken the smallest possible area for working will be exposed;
- stripping of topsoil will not be conducted earlier than required (maintain vegetation cover for as long as possible) in order to prevent the erosion (wind and water) of organic matter, clay and silt.
- a speed limit of 30 kph on unpaved surfaces to be enforced and the national speed limits on public roads are not to be exceeded;
- all transported materials must be covered with tarpaulins to prevent fugitive dust;
- where feasible, surface binding agents will be used on exposed open earthworks;
- exposed ground and earthworks where wind generated dust occurs, should be covered as much as possible, for example with sheeting, shade cloth or tarpaulin;
- stockpiles stored longer than six weeks should be vegetated or covered (with sheeting, shade cloth or tarpaulin) to reduce soil loss from wind or storm water runoff;
- stockpiles will be located as far away from receptors as possible and will be covered (with sheeting, shade cloth or tarpaulin);
- wind breaks will be erected around the key construction activities and, if possible, in the vicinity of potentially dusty works, to minimise impacts at the nearby temporary residential accommodation and permanent residential receptors;
- all construction vehicles must be regularly maintained to minimise exhaust emissions;
- when not in use, vehicles will be switched off, unless impractical for health and safety reasons (for example, maintenance of air conditioning); and
- any complaints received from neighbours must be reported to the EHS Coordinator or the EPC Contractor through the Grievance Mechanism.

9.1.6 *Residual Impact Significance*

With the application of the mitigation measures during construction, the residual impact is anticipated to be of *minor* significance (*Table 9.2*).

Table 9.2 ***Pre and Post Mitigation: Air Quality Impacts***

Impact	Project Phase	Significance (Pre-mitigation)	Residual Impact Significance (Post-mitigation)
Air Quality	Construction	Moderate	Minor

9.2 *NOISE*

9.2.1 *Introduction*

This assessment identifies the potential impacts on the local acoustic environment which may arise as a result of the Project's noise emissions. Emissions will occur during the construction phase and arise from construction activities (earth moving equipment, welding, traffic) (See *Figure 4.2*).

9.2.2 *Summary of Baseline*

Due to the rural nature of the Project area there are no existing continuous noise emissions near the Project site. There are residential communities within 200 m of the Project site with closest being within 20m from the Project site.

9.2.3 *Potential Impacts: Construction*

During construction phase the main potential impacts on the acoustic environment are related to the noise emissions from construction machinery and construction vehicles being used for the following:

- *Site preparation*: this includes significant noise-producing activities such as vegetation clearance and minor earthworks. These activities will require heavy construction vehicles and equipment (excavators, dozers, dump trucks).

- *Civil works and installation*: this includes noise-producing activities such as drilling for mounting structure frames, construction of inverter and transformer station foundations and installation of inverter stations, and construction of stores, workshop, and office buildings.

- *Road traffic offsite:* the movement of vehicles for transport of materials and personnel on local roads and/or new access roads close to communities will also generate noise emissions.

All the construction activities mentioned above have the potential to result in an overall increase in the background noise level close to the Project and to potentially disturb occupants at the nearest receptors.

Noise would be generated during the construction phase (and potentially at a lower level during decommissioning). The noise during this phase will generally be of short duration over a total construction period of nine months. Based on UK guidance (BS 5228) if noise levels exceed 65 dB L_{Aeq} at a receptor, the noise this would be predicted to result in significant noise impacts. This assumes that work is carried out during the daytime, and that no noise generating work is required at night.

Traffic associated with construction activities is highly variable through the various stages of construction and depends on the activities taking place. During construction period the primary Project components will be delivered in the following way:

- inverters - eight truck deliveries ;
- main Transformer - two specialised abnormal load deliveries ;
- LV/MV Transformers – Eight truck deliveries;
- PV modules – 200 truck deliveries;
- tracker/structure – 300 truck deliveries; and
- miscellaneous – 200 truck deliveries.

9.2.4 Assessment of Impacts: Construction

Noise impacts from construction activities at the Project site will persist for the construction period and therefore temporary in nature. Emissions will be limited to the AoI and therefore local in nature. Noise emissions associated with construction will be variable in nature and depend on the particular activities being undertaken as well as the number and type of equipment in operation. All construction work and traffic movements will take place during the day therefore there should be no activities with the potential to cause sleep disturbance. In addition, noise emissions will peak during the site preparation and delivery of panels and mounting frames.

The exact location of construction equipment has not been confirmed, but community houses/buildings within approximately 100 m from the nearest construction activities (a backhoe loader with a sound level of up to 84 dB L_{Aeq} at 10 m), a noise level of 67 dB L_{Aeq} will result at the nearest receptor (façade). There are several few houses within 100m of the Project site.

In terms of nearby receptors there are residential communities adjacent to the Project site. The magnitude of the impact is considered small as it will occur over a temporary period and the sensitivity of the receptors are considered high due to the adjacent residential communities within 100 m of the Project site. As a result, the impact significance is *Moderate* prior to mitigation for receptors

within 100m of the Project site. To note, as construction moves from the boundary of the Project site the impact will decrease in significance (*Table 9.3*

Table 9.3 Impact Assessment: Noise Emissions as a Result of Construction Activities

Impact	**Impact nearby receptors from Noise Emissions**				
Impact Nature	Negative	Positive	Neutral		
	Construction activities may increase noise emissions				
Impact Type	Direct	Indirect	Induced		
	Impacts that result from a direct interaction between the Project and local receptors				
Impact Duration	Temporary	Short Term	Long Term	Permanent	
	The impact duration will be temporary (throughout the construction phase and peaking for a short period within the construction phase)				
Impact Extent	Local	Regional	International		
	Impact limited to the AoI				
Frequency	The frequency is considered to be variable of the construction period				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	As the emissions will only occur for a short period of time and they are medium in nature				
Resource/ Receptor Sensitivity	Low	Medium	High		
	The sensitivity of the receptors is considered to be high due to the location of residential communities				
Impact Significance	Negligible	Minor	Moderate	Major	
	Considering the magnitude is small and the sensitivity is high within 100m of the Project site, the impact of noise emissions during construction is considered to be of moderate significance within 100m of the Project site.				

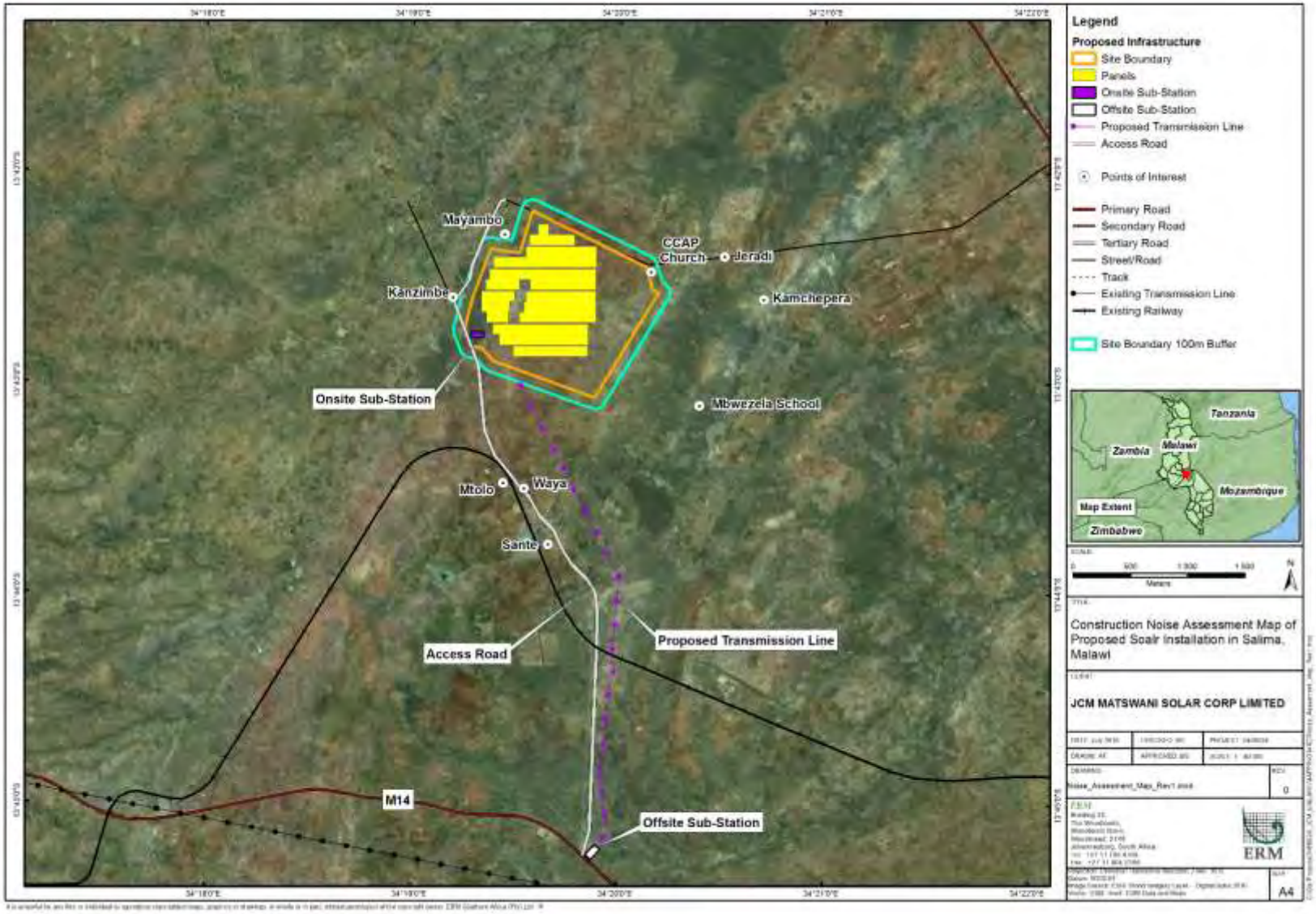

Figure 9.2 Noise Emissions Assessment Map

9.2.5 *Mitigation Measures*

The following mitigation measures will be implemented by the ProjectCo:

- maintain machines and plant equipment in good working condition and inspect regularly;
- selection of equipment and vehicles in accordance with best available techniques for noise reduction;
- minimise vehicle movements within and around the site as much as possible;
- use local screening/site hoardings to screen noise where appropriate; and
- any complaints received from neighbours must be reported to the EHS Coordinator or the EPC Contractor through the Grievance Mechanism.

9.2.6 *Residual Impact Significance*

After the application of mitigation measures the Impact Significance during construction is *Minor* (*Table 9.4).*

Table 9.4 ***Pre and Post Mitigation: Noise Emissions***

Impact	Project Phase	Significance (Pre-mitigation)	Residual Impact Significance (Post-mitigation)
Impact on nearby receptors Noise emissions (within 100m of the Project site)	Construction	Moderate	Minor

9.3 *SOILS*

9.3.1 *Introduction*

This assessment identifies potential impacts to soil resources resulting from the Project. Impacts will occur during construction as a result Project site and wayleave clearance and preparation (See *Figure 4.2*).

9.3.2 *Summary of Baseline*

Soils vary across the Project site and can divided into three zones (*Figure 5.8*).

- Zone one comprises of a 0.3 m thick top soil which is very moist, dark grey brown and soft in texture. It is also characteristic of sandy clay with roots. The top soil layer is underlain by an approximately 0.9 m thick

transported layer, which is also moist, grey brown in colour and has a soft to firm texture with sandy clay.

- Zone Two is comprised of a 0.3 m thick topsoil layer which is characteristic of very moist, dark brown and loose. It has silty sand with roots. This layer is underlain by a transported layer which is attributed by moist, brown, loose to medium, clayey sand.

- Zone Three is typical of a 0.3 m thick topsoil layer which is described as very moist, dark grey brown, soft and sandy with clay roots. This layer is underlain by an approximately 0.9 m thick transported layer which is described as very moist, grey brown in colour, firm to stiff in texture with sandy clay.

In addition, the area is heavily reliant on subsistence agriculture.

9.3.3 Potential Impacts: Construction

Site preparation and construction activities will include earthworks and site clearance (including transmission line wayleave). These activities could lead to the following effects on soils resources within and surrounding the Project footprint:

- loss of topsoil;
- soil compaction; and
- soil erosion from wind and water runoff (and sediment release to land and water).

An area of approximately 168 ha of the Project site will be cleared of vegetation and levelled. In addition approximately 12 ha will be cleared for the transmission line wayleave, although a low level of vegetation along the wayleave will be cleared. Compaction and increased erosion from increased exposure of bare ground to wind and water are likely to cause changes in the soil structure and degradation of soil quality. Erosion may occur when surface water flows comes into contact with areas of bare soil, especially on sloped terrain. Raindrops impacting the exposed soil, speeds up surface run-off and the topsoil which binds the soil together for more stability will have been removed resulting in erosion.

Rainstorms during the wet season can increase the potential for erosion. In addition, the compaction of the subsoils through site grading and levelling, and the presence of heavy vehicles and machinery during construction, will result in lower permeability of the soil and therefore decrease infiltration and increase run-off, altering the natural drainage characteristics of the soil. Without appropriate measures, run-off from hardstanding areas, in addition to exposure to wind and rainfall, may increase erosion.

9.3.4 *Assessment of Impacts: Construction*

Table 9.5 below provides an assessment of impacts related to access restrictions during construction and operation.

Table 9.5 Impact Assessment: Soil Impacts during Construction

Impact	Loss of soil and reduced soil quality				
Impact Nature	Negative	Positive	Neutral		
	The potential impacts are negative.				
Impact Type	Direct	Indirect	Induced		
	The impacts of soil erosion is direct				
Impact Duration	Temporary	Short Term	Long Term	Permanent	
	The impacts are short term, during the construction phase (approximately 9 months).				
Impact Extent	Local	Regional	International		
	Impacts of soil erosion are largely focussed on the Project site and the transmission line wayleave that has been cleared for construction.				
Frequency	The frequency is throughout the construction period with dry season conditions making the soil more prone to wind erosion whilst wet season conditions contribute to physical erosion of cleared land.				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Based on the above the impact magnitude is expected to be medium				
Resource/ Receptor Sensitivity	Low	Medium	High		
	The sensitivity of the resource is expected to be medium due to its current use for agriculture and agricultural land use in the Project area, and the low permeability of the clayey soils across the Project site.				
Impact Significance	Negligible	Minor	Moderate	Major	
	The impact significance is assessed to be *Moderate*				

9.3.5 *Mitigation Measures*

In addition, to mitigation measures listed in *section 9.1.5*, the following mitigation measures will be implemented by the ProjectCo:

- erosion control measures such as intercept drains and toe berms will be constructed where necessary.
- Access roads will be well drained in order to limit soil erosion.

9.3.6 *Residual Impact Significance*

The residual significance of the impact will be negligible during construction with the implementation of the mitigation measures (*Table 9.6*).

Table 9.6 Pre and Post Mitigation: Soil Erosion

Impact	**Project Phase**	**Significance (Pre-mitigation)**	**Residual Impact Significance (Post-mitigation)**
Soil Erosion: loss of soil and reduced soil quality	Construction	Moderate	Minor

9.4 GROUNDWATER RESOURCES

9.4.1 Introduction

This assessment identifies potential impacts to groundwater resources as a result of the Project. Impacts will occur during construction and operations and primarily relates to the use of groundwater resources by the Project (See *Figure 4.2*).

9.4.2 Summary of Baseline

The climate of Malawi is tropical continental and largely influenced by Lake Malawi. There are three main seasons: cool and dry, from May to August; warm and dry, from September to November; and warm and wet, from December to April. Climate records recorded at Salima indicate that the months of April to November have significant numbers of days with no precipitation

Groundwater resources within the region of the Project site are associated with the weathered zone above fractured bedrock. The aquifer thicknesses are commonly 10 to 25 m. The aquifer is partly confined by an overlying thickness of 5 to 20 m of tightly compacted clays and soils which have very low permeability. Where groundwater is encountered it is commonly near the base of the clays and under pressure, indicating that it is held within a confined aquifer.

Rural areas in Malawi are highly dependent on groundwater to support their livelihoods. Areas which experience a low stream density groundwater supply plays a leading role in terms of servicing the community domestic needs as well as agriculture. This is the case for communities in the Project area. Data on village wells is not currently available however it is understood that there is a well located in each of the villages of Kanzimbe and Mayambo (*Figure 9.3*). In addition, there are boreholes located in Waya and Sante.

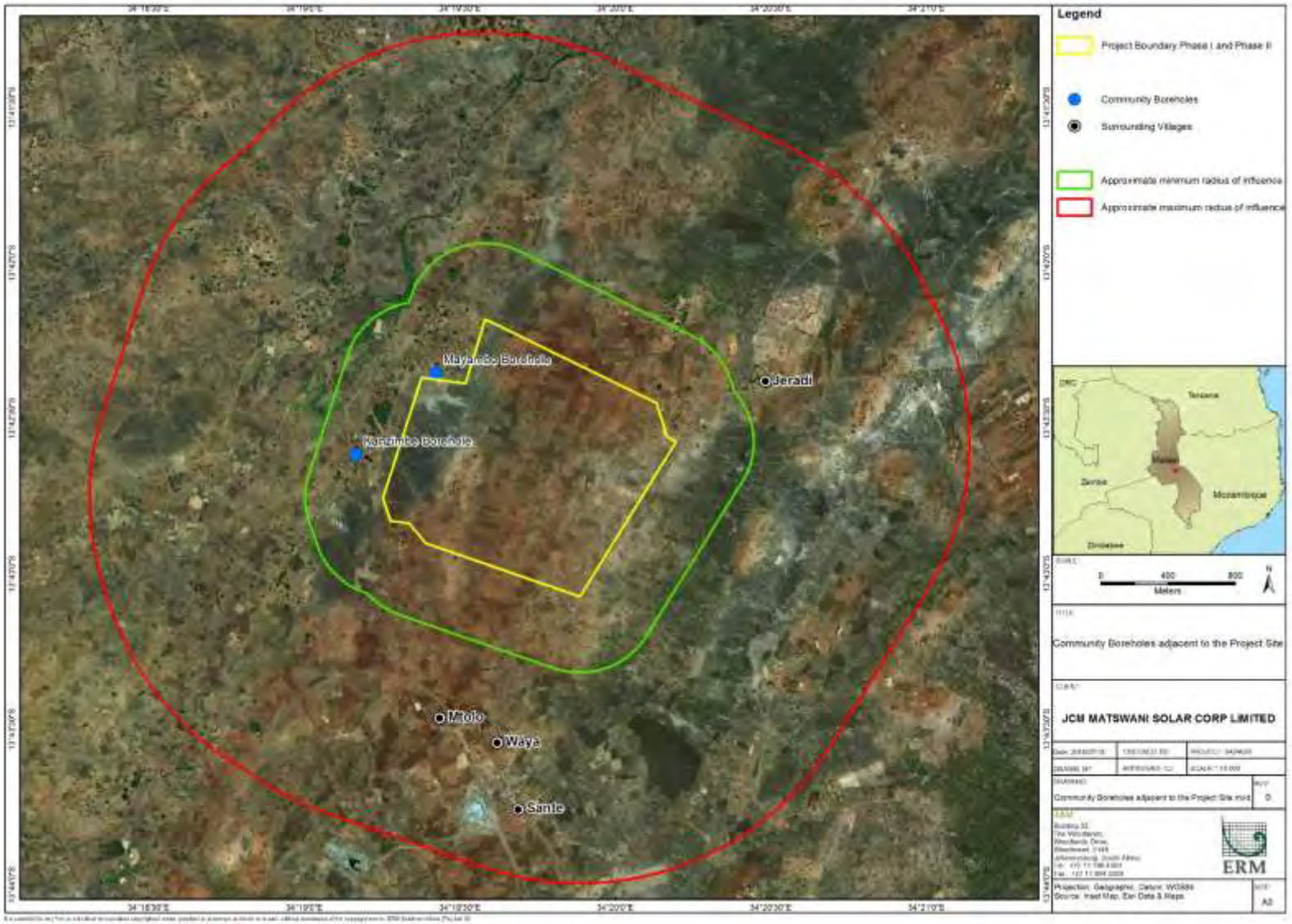

Figure 9.3 Approximate Location of Community Boreholes

9.4.3 Potential Impacts: Construction and Operation

During construction an estimated (maximum) 7,000 m^3 of groundwater will be required. This total volume will be required for the 9 months anticipated for construction. This equates to an average abstraction rate of 26 m^3/day. The location, number and design of abstraction boreholes will be confirmed during once the EPC contractor has been confirmed. Depending on the final location of the borehole(s) and local aquifer conditions, Project abstractions have the potential to result in a lowering of the water level in community wells in the Kanzimbe and Mayambo villages.

The solar PV power plant will be operated on a 24 hour, 7 days a week basis. Operational activities will include cleaning of the modules by trained personnel using high pressure water hoses with water supplied from the borehole(s) installed during construction. An estimated (maximum) 4,000 m^3 per year will be required during operations primarily for cleaning panels. As the climate is seasonally wet and dry, water for cleaning panels is not anticipated to be necessary during the wet season. Consequently, the months where water abstraction is likely to be required is assumed to be from April to November. This therefore equates to an average abstraction rate of 16 m^3/day during the dry season. Depending on the final location of the borehole(s) and local aquifer conditions, Project abstractions have the potential to result in a lowering of the water level in community wells in the Kanzimbe and Mayambo villages.

9.4.4 Assessment of Impacts: Construction and Operation

Assuming that the aquifer used in the Kanzimbe and Mayambo community boreholes is connected to the aquifer proposed for the Project abstraction, it is possible that pumping from the Project well may cause the levels of groundwater in the village wells to decline. This is particularly so at the end of the dry season after a long period of low or no recharge of the aquifer and increasing reliance on it for domestic and other uses. As described in *Section 6.3.12* of the Social Baseline, the communities have reported that the water supply in some boreholes does not meet current demands.

No site-specific groundwater data is available on which to base an assessment of potential impacts. In lieu of these, literature data has been used. According to the hydrogeology of Malawi (1) the site is located on basement aquifer with low to moderate productivity. The Malawian Ministry of Irrigation and Water Development summarise the aquifer characteristics of the weathered basement aquifers as having hydraulic conductivity between 0.5 and 1.5 m/d, transmissivity between 5 and 35 m^2/d and storativity of $5x10^{-3}$ and $1x10^{-2}$ (2).

(1) http://earthwise.bgs.ac.uk/index.php/Hydrogeology_of_Malawi

(2) 2006 data, quoted in Pavelic, P.; Giordano, M.; Keraita, B.; Ramesh, V; Rao, T. (Eds.). 2012. Groundwater availability and use in Sub-Saharan Africa: A review of 15 countries. Colombo, Sri Lanka: International Water Management Institute (IWMI). 274 p.

Applying the above ranges in regional data to the hydrogeological setting within the Project area, the radius of influence of a Project borehole can be estimated as between 450 and 1,680 m via the following relationship:

$$R_0 = \sqrt{\left(2.25 \times T \times \frac{t}{S}\right)}$$

Where R_0 is the radius of influence (m)
T is the aquifer transmissivity (m^2/day)
t is the time since pumping (day)
S is the storativity (dimensionless)

The design of the Project borehole(s) is not finalised and hence it is not known how far it will be from any existing groundwater abstraction wells or boreholes. It is probable, however, that it will be located between approximately 500 and 1,000 m from the village wells.

During installation and pump testing of Project boreholes to test to potential viability, the aquifer parameters will be defined in better detail and the radius of influence can be refined. Additionally, monitoring of water levels within village wells will be undertaken to ensure that there is no potential for significant impact to village supplies from Project activities.

The daily volumes to be abstracted for the Project are not large however over 8-9 months of continuous abstraction there could potentially be a lowering of the water table of the order of a few tens of centimetres at a distance of 500 m which may be significant in village wells running dry at the end of the dry season.

Currently, there is insufficient data to assess the effectiveness of these controls since it is hydrogeologically possible that the Project abstractions will be within the radius of influence of and in hydraulic connection with village abstractions. Consequently, applying the precautionary principal until further information is available: with these controls in place, magnitude of the potential impact is small during both the construction and operational phases and the sensitivity of the impacted resource is considered high. The impact significance is therefore *Moderate* (*Table 9.7*).

Embedded Controls

The following embedded controls will be put in place:

- Monitoring of water levels within existing wells and boreholes will be undertaken during installation drilling and pump testing of Project abstraction boreholes.

- Radius of influence will be recalculated using site-specific hydrogeological parameters. Project abstractions will be located outside the radius of influence if practical.

Table 9.7 Impact Assessment: Construction and Operation Impacts on Groundwater Resources

Impact	Impacts on Groundwater Resources				
Impact Nature	Negative	Positive	Neutral		
	Lowering of the water table within village abstraction wells leading to water shortages for other users.				
Impact Type	Direct	Indirect	Induced		
	Impact as a result of a direct interaction between the Project, i.e. abstraction of water for construction and operational uses.				
Impact Duration	Temporary	Short Term	Long Term	Permanent	
	The impact duration is temporary in that it will only occur during the dry seasons, but long term in that it will occur every year for several months and particularly at the end of the dry season.				
Impact Extent	Local	Regional	International		
	Impact is limited to AoI				
Frequency	Every year during construction and operation				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Magnitude of change is considered small with embedded mitigations in place				
Resource/ Receptor Sensitivity/Value/ Importance*	Low	Medium	High		
	The sensitivity of the groundwater resources is considered high				
Impact Significance	Negligible	Minor	Moderate	Major	
	Considering the impact magnitude is small and the sensitivity is high, the overall significance is considered to be of moderate significance.				

9.4.5 Mitigation Measures

The embedded controls will need to be enhanced if the Project borehole has to be located within the radius of influence and a response is observed in any village wells during drilling and pump testing of the Project borehole.

The following mitigation measures will be implemented by the ProjectCo:

- a further assessment will be done at a later stage with updated information from all community boreholes;

- continuous monitoring of affected village supplies and a cessation of Project abstraction if the groundwater elevation in village water supply wells reaches a pre-agreed level; and

- water storage solutions (eg tanks) for water pumped during the wet season for use during the dry season.

9.4.6 *Residual Impact Significance*

After the application of mitigation measures the impact significance during construction and operation is *Minor (Table 9.8)*

Table 9.8 Pre and Post Mitigation: Groundwater Resources

Impact	Project Phase	Significance (Pre-mitigation)	Residual Impact Significance (Post-mitigation)
Impacts on Groundwater Resources	Construction and operations	Moderate	Minor

9.5 *BIODIVERSITY*

9.5.1 *Introduction*

This assessment identifies potential impacts to biodiversity resulting from the Project. Impacts will occur during construction as a result of Project site and wayleave clearance and preparation (See *Figure 4.2*). The following biodiversity impacts have been identified and will be assessed in the sub sections below:

- Loss of Habitats and Fauna Disturbance
- Loss of Threatened Flora
- Risk of Increased Invasive Aline flora
- Disruption of Ecosystem Services

9.5.2 *Loss of Habitats and Fauna Disturbance*

Potential Impacts: Construction

Construction of the proposed Project will require the removal of vegetation and will impact the associated habitats. These habitats have already been transformed from their original state through many years of cultivation and livestock grazing that has led to extensive alteration of ecological processes.

Excavation and compaction of soils may result in loss of habitats for species of mammals, reptiles and amphibians. This may compromise survival of soil-based micro and macro organisms, and reduce the rate of rehabilitation of vegetation.

Summary of Baseline

The habitats on the Project site and the transmission line wayleave qualify as modified based on definitions provided by the IFC PS6. No plant or tree species of high ecological value are expected to be displaced or lost, and these habitats are therefore considered to have a low sensitivity.

The PS6 states that where modified habitats occur, mitigation is required to address impacts to significant biodiversity values, and the client should minimize impacts on such biodiversity and implement mitigation measures as appropriate.

Assessment of Impacts: Construction

Table 9.9 below provides an assessment of impacts related to access restrictions during construction.

Table 9.9 Impact Assessment: Loss of Habitat and Faunal Disturbance

Impact	**Loss of Habitat and Faunal Disturbance during construction**				
Impact Nature	Negative	Positive	Neutral		
	The loss of habitat is considered negative				
Impact Type	Direct	Indirect	Induced		
	The impact will be the result of a direct interaction between the Project, i.e. construction activities clearance and loss of vegetated habitat.				
Impact Duration	Temporary	Short Term	Long Term	Permanent	
	The impact duration will be permanent as lost habitat will not be restored				
Impact Extent	Local	Regional	International		
	Impact is limited to AoI. An area of approximately 175 Ha of habitat plus near vicinity will be affected				
Frequency	Once off				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Despite the permanent loss of habitat, the natural vegetation to be cleared is patchy because of the cultivation, and the impact is therefore considered to be of Small magnitude.				
Receptor Sensitivity	Low	Medium	High		
	The habitat is classified as modified, which qualifies for a low sensitivity				
Impact Significance	Negligible	Minor	Moderate	Major	
	Considering the impact magnitude of change is small and the sensitivity is high, the overall significance is considered to be of Moderate significance.				

Mitigation Measures

The following mitigation measures will be implemented by the ProjectCo:

- Ensure that vegetation is methodically cleared from the Project site and excavations are undertaken as per designs to avoid unwarranted clearance of vegetation.

- Planning should be conducted in advance to determine the minimum feasible extent required. Predetermined areas should be clearly demarcated on the ground, fenced where appropriate and enforcement measures taken to avoid footprint creep into surrounding areas.

- Provisions that prohibit staff and contractors from engaging in all forms of hunting in the Project area must be included in the Worker Code of Conduct

- Rehabilitation of all disturbed areas (e.g. temporary access tracks and laydown areas) must be undertaken following construction. This must be done in such a way facilitate natural regeneration of vegetation;

Residual Impact Significance

After the application of mitigation measures the Impact Significance during construction is considered to remain *Minor* (*Table 9.10*).

Table 9.10 Pre and Post Mitigation: Loss of Habitat and Faunal Disturbance

Impact	Project Phase	Significance (Pre-mitigation)	Residual (Post-mitigation) Significance
Loss of Habitat and Faunal Disturbance	Construction	**Minor**	**Negligible**

9.5.3 Loss of Threatened Flora

Potential Impact: Construction

Clearing of vegetation for construction of the Project is likely to result in loss of two locally threatened species, namely *Pterocarpus angolensis* and *Dalbergia melanoxylon,* which occur on the Project site and along the transmission line wayleave. This may contribute to the significant reduction of the population size of these species which is already under threat. Both species are listed as scattered within the Project area, and occurring in moderate numbers along the transmission line route.

Summary of Baseline

These species are listed with a threatened status in Malawi, but are not listed as threatened on the IUCN Red List of Threatened Species. Both species are targeted for their wood, with *Pterocarpus angolensis* targeted for timber for furniture production while *Dalbergia melanoxylon* is targeted for wooden carvings. Old specimens of these trees are becoming increasingly rare, although they are able to reproduce at a younger age and specimens of non-commercial value are frequently sufficiently abundant to ensure the survival of the species.

Assessment of Impacts: Construction

Table 9.11 below provides an assessment of impacts related to access restrictions during construction.

Table 9.11 Impact Assessment: Loss of Locally Threatened Plant Species

Impact	Loss of Habitat and Faunal Disturbance during construction				
Impact Nature	Negative	Positive	Neutral		
	The loss of threatened plant species is considered negative				
Impact Type	Direct	Indirect	Induced		
	Impact will be a result of a direct interaction between the Project, i.e. construction activities clearance and loss of plant species.				
Impact Duration	Temporary	Short Term	Long Term	Permanent	
	The impact duration is long term as both plant species are very slow growing				
Impact Extent	Local	Regional	International		
	Impact is limited to AoI - an area of approximately 180 Ha of habitat				
Frequency	One off				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Both species are listed as scattered within the Project area, and occurring in moderate numbers along the transmission line route.				
Receptor Sensitivity	Low	Medium	High		
	The listed species are locally threatened but not at the international scale, therefore it remains a high sensitivity				
Impact Significance	Negligible	Minor	Moderate	Major	
	Considering the impact magnitude of change is small and the sensitivity is high, the overall significance is considered to be of Moderate significance.				

Mitigation Measures

The following mitigation measures will be implemented by the ProjectCo:

- Rehabilitation of all disturbed areas (e.g. temporary access tracks and laydown areas) must be undertaken following construction. This must be done in such a way facilitate natural regeneration of vegetation;

- Ensure that vegetation is methodically cleared from the Project site and excavations are undertaken as per designs to avoid unwarranted clearance of vegetation.

- Planning should be conducted in advance to determine the minimum feasible extent required. Predetermined areas should be clearly demarcated on the ground, fenced where appropriate and enforcement measures taken to avoid footprint creep into surrounding areas.

- Provisions that prohibit workers and contractors from clearing/utilising word and plant species in the Project Area.

Residual Impact Significance

After the application of mitigation measures the Impact Significance during construction is considered to remain *Minor* (*Table 9.14*).

Table 9.12 Pre and Post Mitigation: Loss of Locally Threatened Plant Species

Impact	Project Phase	Significance (Pre-mitigation)	Residual (Post-mitigation) Significance
Loss of Locally Threatened Plant Species	Construction	**Moderate**	**Minor**

9.5.4 Risk of Increased Invasive Alien Plants

Potential Impact: Construction

The Convention on Biological Diversity (CBD) defines an invasive alien species as one that is established outside of its natural past or present distribution, and whose introduction and/or spread threatens biological diversity (1). The IUCN Red List of Threatened Species (2) rates the presence of invasive alien species globally as the second most significant threat to biodiversity, (3) and there is a growing global awareness of the problems associated with alien and invasive species. Alien species can be introduced either accidentally or intentionally. Although only a small percentage of alien species have the potential to become invasive, their impact is marked and usually is irreversible, displacing native species and leading to degradation of habitats.

Site clearance and soil disturbances create opportunities for invasive alien plants to establish. Extensive soil disturbance will occur during the construction phase and creates abundant potential for the establishment of invasive plants. Large infestations can develop, and if not controlled can serve as source populations for the spread into new areas.

Construction vehicles can accidentally gather invasive plant material and disperse seeds through normal movements. Construction equipment and vehicles, landscaping or rehabilitation could potentially introduce Alien and invasive species.

Summary of Baseline

The Baseline assessment revealed the presence of 10 alien species (*Table 9.13*), all are either weeds or are encouraged by communities for various reasons

(1) Convention for Biological Diversity, invasive species page. Available at: https://www.cbd.int/invasive/WhatareIAS.shtml
(2) IUCN Red List of Threatened Species. Available at http://www.iucnredlist.org/
(3) IUCN Website, invasive species page. Available at: https://www.iucn.org/theme/species/our-work/invasive-species

and none of these species is known to cause dramatic loss of resources. Invasive species in the Project area are associated with modified habitats, which have a low ecological sensitivity.

Table 9.13 Invasive and Alien Plants identified in the Project Area

Species Name	English / Local Name	Comment
Acacia polystachya	Wattle	Plant is used as feed for livestock, Origin: Australia
Aschranthes aspera	Burr	Herbaceous species, present as a result of soil disturbances, and invasive in many countries around the world.
Bidens pilosa	Black jack	Introduced annual herb, present as a result of soil disturbances, causes losses to agriculture and livestock
Gmelina arborea	Gmelina	Tree species planted as source of firewood. Widely used in reforestation programs Due to its rapid growth rate.
Pennisetum polystachion	Udzu or Mission grass	Common grass, typically occurring in disturbed land, and vigorous annual or perennial grass growing to over 1 m height, producing large numbers of seeds with limited dormancy
Melia azedarach	Indian lilac tree	Common fast growing tree, growing disturbed land, and serves as a source of wood.
Moringa oleifera	Moringa	Fast growing exotic tree, typical of cultivated land, its leaves and seeds are edible.
Rottboellia cochinchinensis	Udzu (Itch grass)	Common grass, typically occurring in disturbed land, grows up to 4 m or more and is extremely competitive with annual crops
Sida acuta	Wireweed	Annual plant, present as a result of soil disturbances. Originating in central America, this small perennial shrub is tolerant of a wide range of growing condition and has successfully invaded the tropics worldwide, largely as a contaminant in pasture seed.
Tridax procumbens	Tridax daisy	Annual and present due to soil disturbances. Originated in Central America but now occurs throughout the tropics and subtropics. It was reportedly introduced into Nigeria as an ornamental in the early 1900s and later spread to many other tropical countries.

Assessment of Impacts: Construction

Table 9.14 below provides an assessment of impacts related to access restrictions during construction.

Table 9.14 Impact Assessment: Risk of Increased Invasive Alien Plants

Impact	**Risk of Increased Invasive Alien Plants during Construction and Operations**				
Impact Nature	Negative	Positive	Neutral		
	An increase in invasive alien plants is considered negative				
Impact Type	Direct	Indirect	Induced		
	Impact will be the result of a direct interaction between the Project, i.e. construction activities, clearance of vegetation and soil disturbances.				
Impact Duration	Temporary	Short Term	Long Term	Permanent	
	The impact duration is Long Term as invasive plants will gradually disappear				
Impact Extent	Local	Regional	International		
	Impact is limited to AoI :An area of approximately 180 Ha of habitat plus near vicinity will be affected				
Frequency	There will be ongoing risk of increased invasive alien plants				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	A limited diversity of invasive alien plants has been identified, but are already present due to the modified nature of the affected and surrounding habitats.				
Receptor Sensitivity	Low	Medium	High		
	The habitat is classified as modified, which qualifies for a low sensitivity and few of the species are highly invasive				
Impact Significance	Negligible	Minor	Moderate	Major	
	Considering the impact magnitude of change is small and the sensitivity is high, the overall significance is considered to be of Moderate significance.				

Mitigation Measures

The following mitigation measures will be implemented by the ProjectCo:

- Invasive alien plants will be removed from areas controlled by ProjectCo. Manual removal will be favoured over mechanised or chemical control measures to the full extent possible.

- All alien vegetative and/or seed bearing material that is removed through control measures should be contained in a cordoned off area, dried and burnt on site to prevent the distribution of seeds.

- Vehicles and construction equipment should be washed on a regular basis and should be kept clean to minimise distribution of seeds and invasive plant material.

- Source areas such as vehicle parking and construction camps, if required, should be kept clean of invasive plants to minimise the presence of seeds that can be dispersed unintentionally.

- Disturbed areas will be rehabilitated at the earliest opportunity to minimise the establishment of invasive alien plants.

- Regular and ongoing monitoring of the presence of invasive alien plants should be conducted within construction and rehabilitated sites and removal operations implemented according to the results.

Residual Impact Significance

After the application of mitigation measures the Impact Significance during construction is considered to remain *Minor* (*Table 9.15*).

Table 9.15 Pre and Post Mitigation: Risk of Increased Invasive Alien Plants

Impact	Project Phase	Significance (Pre-mitigation)	Residual (Post-mitigation) Significance
Risk of Increased Invasive Alien Plants	Construction and operations	**Minor**	**Negligible**

9.5.5 Disruption of Ecosystem Services

Summary of Baseline

There is a wide diversity of ecosystem services present in the Project area, many of which are underpinned by biodiversity and all are important to community well-being in the area (*Table 5.9*). Three of these ecosystem services have been prioritised through an assessment of likelihood of impact by the Project, dependence of communities and lack of available alternatives (replaceability), namely supporting regulating, and provisioning.

Potential Impacts: Construction

Clearing of vegetation from the Project site for the construction of the Project is likely to result in loss or reduction of biodiversity ecosystem services that occur at the Project site. This may eventually result loss of livelihoods and habitats for fauna, and localised flooding.

Assessment of Impacts: Construction

Table 9.16 below provides an assessment of impacts related to access restrictions during construction.

Table 9.16 Impact Assessment: Disruption of Ecosystem Services

Impact	Disruption of Ecosystem Services during Construction				
Impact Nature	Negative	Positive	Neutral		
	Disruption of Ecosystem Services is considered negative				
Impact Type	Direct	Indirect	Induced		
	Impact will be the result of a direct interaction between the Project, i.e. construction activities and disturbance of ecosystem services				
Impact Duration	Temporary	Short Term	Long Term	Permanent	
	The impact duration is Long Term as biodiversity recovers slowly				
Impact Extent	Local	Regional	International		
	Impact is limited to DAoI :An area of approximately 180 Ha				
Frequency	There will be ongoing risk of disruption of ecosystem services				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	A limited diversity of ecosystem services have been identified				
Receptor Sensitivity	Low	Medium	High		
	As there are priority ecosystems on the site the sensitivity is high.				
Impact Significance	Negligible	Minor	Moderate	Major	
	Considering the impact magnitude of change is small and the sensitivity is high, the overall significance is considered to be of Moderate significance.				

Mitigation Measures

The following mitigation measures will be implemented by the ProjectCo:

- Rehabilitation of all disturbed areas (e.g. temporary access tracks and laydown areas) must be undertaken following construction. This must be done in such a way facilitate natural regeneration of vegetation;

- Maintain ongoing engagement between the Project and local communities, with communities informed in advance of any vegetation clearing to allow pre-harvesting of resources such has wood fuel, mangoes, building materials or other useable resources.

- Piles of woody vegetation cleared for construction activities are to be made available to communities to access it for use as wood fuel or other purposes.

To note mitigation measures for loss of livelihoods as a result of land acquisition are also applicable to this impact (*Section 9.7*)

Residual Impact Significance

After the application of mitigation measures the Impact Significance during construction is considered to remain *Minor* (*Table 9.17*).

Table 9.17 Pre and Post Mitigation: Disruption of Ecosystem Services

Impact	Project Phase	Significance (Pre-mitigation)	Residual (Post-mitigation) Significance
Disruption of Ecosystem services	Construction	**Moderate**	**Minor**

9.6 LANDSCAPE AND VISUAL

9.6.1 Introduction

This assessment identifies potential impacts to the existing visual landscape as a result of the Project. Impacts will occur during construction and operations and primarily relates to the presence of construction equipment, materials, and workers during construction and solar reflection during operations (See *Figure 4.2*).

9.6.2 Summary of Baseline

The Project area is rural in nature and appearance as discussed in *Chapter 5 and 6.* In addition the communities of Mayambo and Kanzimbe are directly adjacent to the Project site.

It has been assumed that once constructed the solar PV panels will be no higher than three metres above the ground and the substation building will be no higher than five metres above the ground

9.6.3 Potential Impact: Construction and Operation

Temporary construction activities for the plant will have an impact on the visual character of the landscape due to the following:

- clearance of vegetation (in particular clearance of trees and removal of crops);
- presence of large construction vehicles and equipment on site;
- fencing of works and restrictions to site access; and
- construction of the plant.

Impacts during the operational phase include the colour change and a massing effect created by the PV panels covering a large area, limited early morning glare and some security lights at night. Generally, the reflection from PV systems is low intensity, similar to the impact from a body of water. Solar glare can have the potential to be hazardous to pilots (typically when panels are located at airports), motorists (when panels are located adjacent to roads), and onlookers.

There are no major transport networks near the Project site so will not be hazardous to aviation or motor vehicle traffic.

9.6.4 Assessment of Impact: Construction

Table 9.18) below provides an assessment of impacts related to access restrictions during construction.

Table 9.18 Impact Assessment: Landscape and Visual Impact during Construction

Impact	**Landscape and visual amenity**				
Impact Nature	Negative	Positive	Neutral		
	The change in visual character through on site presence during construction is considered negative.				
Impact Type	Direct	Indirect	Induced		
	The impact is a result of direct interaction between the Project and surrounding residents and land users.				
Impact Duration	Temporary	Short Term	Long Term	Permanent	
	The impact will be short term during the construction period (9 months)				
Impact Extent	Local	Regional	International		
	The impact extent will be local, affecting both indirect and direct AoI.				
Frequency	The frequency will be continuous during construction activities.				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Based on the above the impact magnitude is considered to be small.				
Resource/ Receptor Sensitivity	Low	Medium	High		
	The receptor sensitivity is considered high given the rural nature of the Project AoI.				
Impact Significance	Negligible	Minor	Moderate	Major	
	The impact significance is considered *moderate*.				

9.6.5 Assessment of Impacts: Operations

The potential impact is direct and negative, will be of a long term nature and the extent of the impact extends beyond the Project area and is regional in nature. The impact magnitude is considered medium as along with the above the panels will be located across the 168 Ha Project footprint.

Figure 9.4 shows that the solar panels will be visible from multiple Key Observation Points (KOP) surrounding the Project. The sensitivity of the KOPs and other receptors is medium. As a result the impact significance is considered to be moderate. It is important to note that over time the visual impact will decrease as receptors become accustomed to the Project.

Embedded Controls

The solar panels that have been selected for the Project are designed to absorb as much solar radiation as possible and therefore solar reflection is minimised.

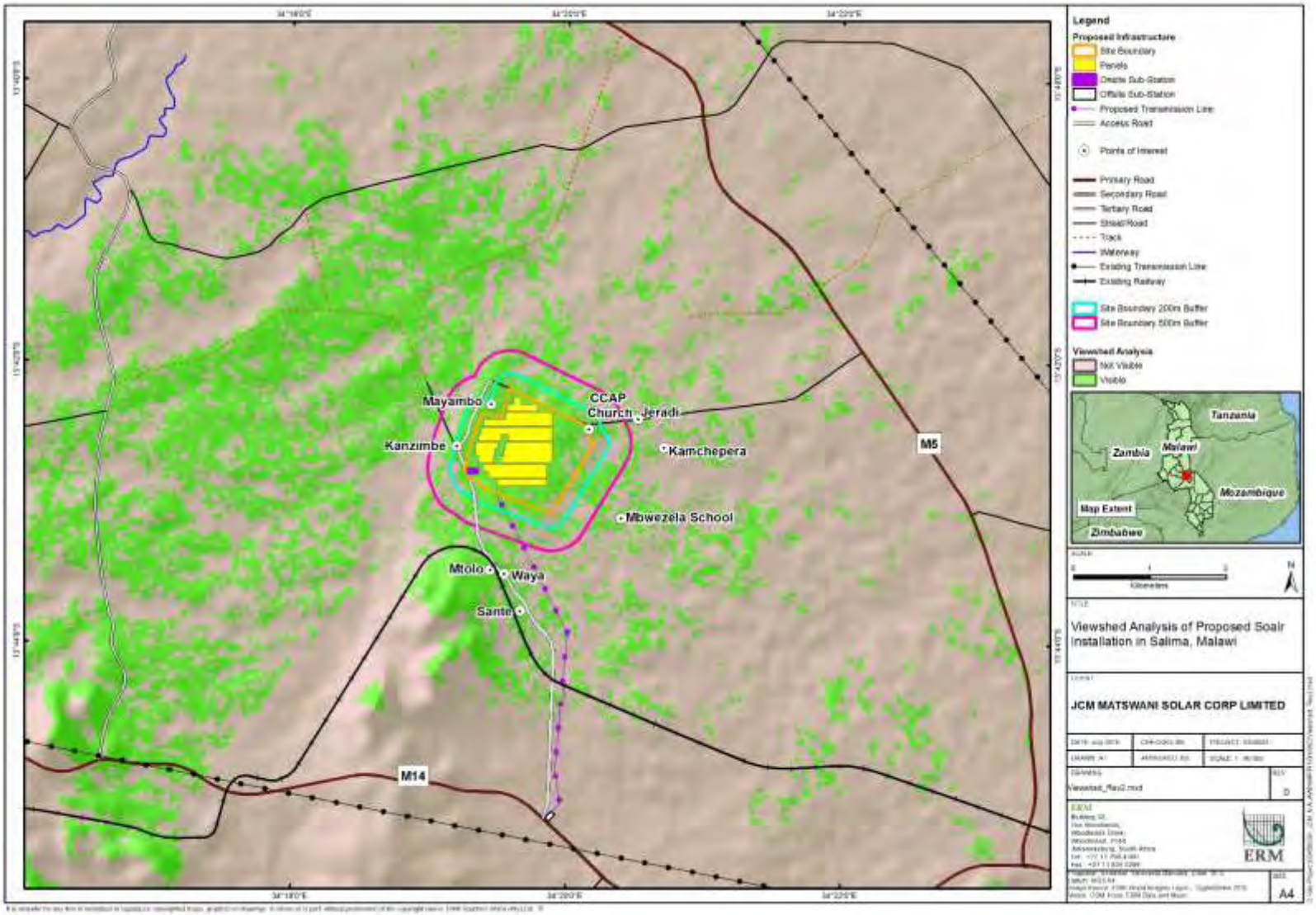

Figure 9.4 View shed of the Project in Relation to Surrounding Receptors

Table 9.19 Impact Assessment: Landscape and Visual Impact during Operation

Impact	Landscape and visual amenity				
Impact Nature	Negative	Positive	Neutral		
	The visual impacts from solar reflection on surrounding residents and land users is negative				
Impact Type	Direct	Indirect	Induced		
	The impact is a result of direct interaction between the project and surrounding residents and land users.				
Impact Duration	Temporary	Short Term	Long Term	Permanent	
	The impact will be short term during the construction period (expected to last no more than one year).				
Impact Extent	Local	Regional	International		
	The impact extent will be local, affecting the Project area (168 Ha Project footprint)				
Frequency	The frequency will be continuous during construction activities.				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Based on the above the impact magnitude is considered to be small.				
Resource/ Receptor Sensitivity	Low	Medium	High		
	The receptor sensitivity is considered medium as the landscape is largely modified as result of agricultural activities, although there are communities nearby the Project site.				
Impact Significance	Negligible	Minor	Moderate	Major	
	The impact significance is considered *Moderate*				

9.6.6 Mitigation Measures

Construction

The following mitigation measures will be implemented by the ProjectCo:

- Ongoing rehabilitation of cleared areas to minimise visual scarring and maintenance clearing will be kept to the absolute minimum and should not extend beyond the Project site boundary;
- Any excavated or cut and fill areas will be landscaped and allowed to revegetate;
- No debris or waste materials will be left at the work sites; and
- Appropriate directional and intensity settings will be utilised on all lighting.

Operations

The following mitigation measures will be implemented by the ProjectCo:

- Rehabilitation of all disturbed areas (e.g. temporary access tracks and laydown areas) must be undertaken following construction. This must be done in such a way facilitate natural regeneration of vegetation; and

- Maintain ongoing engagement between the Project and local communities with regards to potential solar reflection impacts.

9.6.7 Residual Impact Significance

The impact significance can be reduced to *minor* with the implementation of the best practice and relevant mitigation measures *(Table 9.20)* for both construction and operational activities.

Table 9.20 Pre and Post Mitigation: Landscape and Visual Amenity

Impact	Project Phase	Significance (Pre-mitigation)	Residual Impact Significance (Post-mitigation)
Landscape and Visual Amenity	Construction	Moderate	Minor
Landscape and Visual Amenity	Operations	Moderate	Minor

9.7 IMPACTS ON LAND ACQUISITION AND DISPLACEMENT

9.7.1 Introduction

This assessment identifies potential impacts from land acquisition for the Project. Impacts will occur during construction phase and result in a loss of livelihoods for affected people (See *Figure 4.2*).

9.7.2 Summary of Baseline

Affected land users reside in Kanzimbe and Sadzu Group Villages, covering Mayambo, Jeputala, Malezi, Waya, Njoka, Kachepera, Menyako, Chishasa, Santhe, Chikwakwa, Thangani and Sadzu. As shown in the above table, approximately 238 land users are affected: 72 people were compensated by Phase I of land acquisition: 50 people in Kanzimbe Village (24 males and 26 females) and 22 people in Mayambo Village (8 males and 14 females). In Phase II, a total of 166 people are impacted (77 males and 89 females).

All the villages in the Project area rely on subsistence farming for their household food consumption, with some households generating a small cash income from selling crops. Additionally, livestock rearing, particularly of goats and poultry is common. Livestock use the Project area for grazing of crop residue after harvesting.

Farmers generally have land plots that are under one hectare (ha). Small land plots and a lack of rain irrigation, mean that communities often experience food shortages during the dry season. This is especially prevalent in December to February, which is referred to as the 'hunger season'. Additionally,

malnutrition of children is reportedly common in the villages, which impacts on the wellbeing of children and their ability to attend school.

In relation to crops, the most common crop grown in the affected area is maize. Other crops grown include cotton, cowpeas, groundnuts, beans, soya, rice, vegetables and tobacco.

Due to food shortages in communities, the impact of land acquisition and economic displacement has the potential to exacerbate food insecurity and heighten poverty levels. Lack of employment and low literacy levels means that communities rely on subsistence farming and petty trading for their income. As such, land acquisition has the potential to increase vulnerability.

In addition to crops, trees will be impacted as a result of the Project. With the exception of fruit trees (mango), they are used as a source of firewood and to produce charcoal. Firewood is a major source of energy for local communities. Mangos are a major livelihood in the area and a source of income while the sale of charcoal also provides some income.

Figure 9.5 Impacted Structure in the Transmission Line Wayleave

9.7.3 Potential Impacts: Construction

Land acquisition will trigger economic displacement of land users, primarily comprising subsistence farmers. Due to food shortages in communities resulting from inefficient farming techniques, the impact of land acquisition and economic displacement is likely to exacerbate food insecurity and malnutrition, and heighten poverty levels.

The high levels of subsistence farming within the communities in the Project area produces low income levels and high levels of poverty. As such, economic displacement could lead to further impoverishment if not well managed.

9.7.4 Assessment of Displacement Impacts

Table 9.21 below provides an assessment of impacts related to land acquisition and displacement (prior to mitigation).

Table 9.21 Temporary and Permanent Economic Displacement

Impact	**Economic displacement of land users, including subsistence farmers and land for livestock grazing.**				
Impact Nature	Negative		Positive		Neutral
	Considered a negative impact as it has the potential to create food insecurity, increased malnutrition and impoverishment.				
Impact Type	Direct		Indirect		Induced
	Direct impact resulting from land acquisition and land clearance to accommodate land required during construction, including laydown areas, worker camps etc Project infrastructure.				
Impact Duration	Temporary	Short Term		Long Term	Permanent
	Impacts will be experienced during construction.				
Impact Extent	Local		Regional		International
	The impact will be experienced by land users within the direct Project Footprint that reside in Kanzimbe and Sadzu Group Villages. It will also affect the structure that will be used for a small livestock farming business.				
Frequency	The impact will be one-off, pre-construction.				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Based on the parameters above, the magnitude is considered to be medium as the impact is expected to have a major negative impact on affected land users.				
Resource/ Receptor Vulnerability	Low		Medium		High
	Land users are highly vulnerable due to their economic status and lack of education that would allow them to adapt to change.				
Impact Significance	Negligible		Minor	Moderate	Major
	The impact is expected to be *major*.				

9.7.5 Mitigation Measures

As it is anticipated that ProjectCo will divert the transmission line in order to avoid the structure. Therefore, in order to manage impacts associated with land economic displacement, a Livelihood Restoration Plan (LRP) will be developed by ProjectCo that will include the following;

- identification of affected land users;
- census and asset inventory to assess compensation measures for those affected;
- assessment of eligibility and entitlements for those affected;

- Identification of gender differentiated and sustainable livelihood improvement and / or restoration measures (these may include but are not limited to financial literacy training, training on improved farming practices etc);
- provisional implementation budgets;
- roles and responsibilities, including details of an institutional structure / Livelihood Restoration Steering Committee;
- monitoring and evaluation requirements; and
- provisional implementation schedule.

It should be noted that at the time of writing this ESIA, the LRP was under development and is expected to be finalised by mid-October 2018. A participatory consultation approach is in the process of being undertaken to support the development of the LRP, ensuring that those affected will be involved in decision making processes required for implementation.

9.7.6 Residual Impact Significance

Provided the above mitigation measures are implemented, the residual impact related to land acquisition and displacement to *minor* significance levels (*Table* **9.22**).

Table 9.22 Pre and Post Mitigation: Physical and Economic Displacement

Impact	Project Phase	Significance (Pre-mitigation)	Residual Impact Significance (Post-mitigation)
Economic displacement of land users, including land for grazing, and displacement of one structure	Construction	Major	Minor

9.8 IMPACTS ON ACCESS ROUTES, INCLUDING ACCESS TO FARMLAND

9.8.1 Introduction

This assessment identifies potential impacts from land acquisition for the Project. Impacts will occur during construction and operation phase and result in a loss access routes to crop areas surrounding the Project site (See *Figure 4.2*).

9.8.2 Summary of Baseline

Villages in the Project area have close ties and bonds created mostly by farming activities. The villages also gather during community events such as

weddings and funerals. There are a number of pathways that transect the planned solar site that may be impacted during construction and operation, potentially restricting access to villages and farmland.

9.8.3 Potential Impacts: Construction and Operation

During construction, safety fencing, security and equipment may block access to the pathway extending the distance that people in communities have to travel to neighbouring villages. Additionally, restrictions may also affect access to farmland. Additionally, during operation, the solar site will be fenced, blocking access to pathways through the site.

9.8.4 Assessment of Impact: Construction and Operation

Table 9.23 below provides an assessment of impacts related to access restrictions during construction and operation. Figure

Table 9.23 Impact Assessment: Access Restrictions

Impact	**Occurrence of restricted access villages and farmland during construction and operation**				
Impact Nature	Negative		Positive		Neutral
	Considered a negative impact due to disruptions to community network and access to farmland during construction and operation.				
Impact Type	Direct		Indirect		Induced
	Direct impact resulting the presence of construction equipment during construction and the solar site during operation.				
Impact Duration	Temporary	Short Term		Long Term	Permanent
	Impacts will be experienced during construction and operation as users will have to use access routes around construction areas and the solar site.				
Impact Extent	Local		Regional		International
	Access will restrict local communities that use land in the pathway through the planned solar site.				
Frequency	Restrictions will be experienced permanently.				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Based on the parameters above, the magnitude is considered to be *medium* as the communities have close ties and frequently use the pathways transecting the site.				
Resource/ Receptor Vulnerability	Low		Medium		High
	Due to the reliance on land for subsistence farming and pathways for community support networks, access restrictions could heighten the vulnerability of communities.				
Impact Significance	Negligible		Minor	Moderate	Major
	The impact could affect farming activities and community support networks, therefore the impact is considered moderate.				

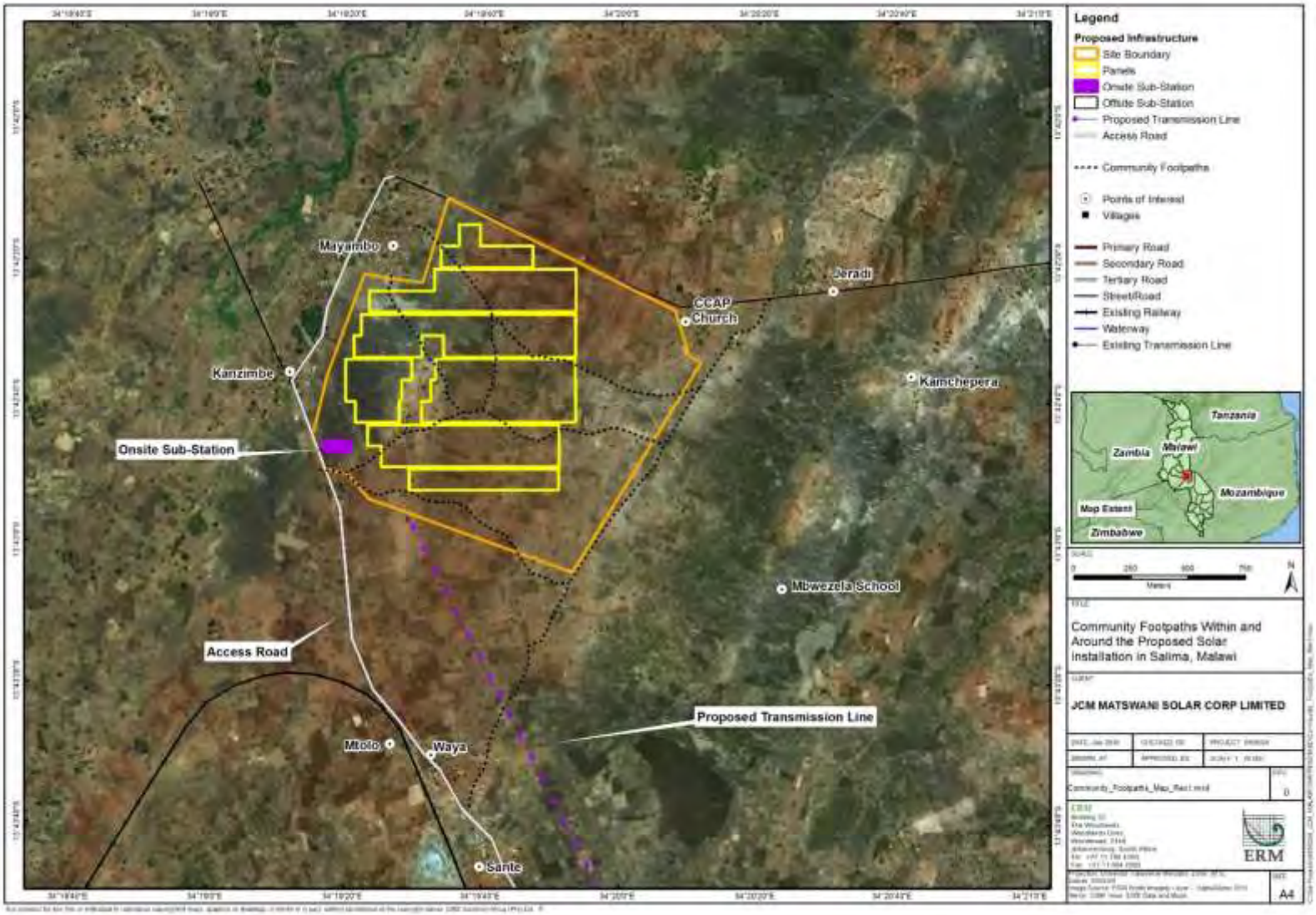

Figure 9.6 Access Routes in the Project Area

9.8.7 *Mitigation Measures*

The following mitigation measures will also be implemented by the ProjectCo

- Undertake consultation with communities using farmland in areas affected during construction to establish the best alternative routes and measures that the Project should put in place to minimize impacts related to access restrictions without compromising the design of the facility.

9.8.8 *Residual Impact Significance*

With the mitigation measures included above, the impact significance is expected to be *Minor* during construction and operations *(Table 9.24).*

Table 9.24 Pre and Post Mitigation: Access Restrictions

Impact	Project Phase	Significance (Pre-mitigation)	Residual Impact Significance (Post-mitigation)
Access restrictions resulting from the presence of construction activities and equipment.	Construction	Moderate	Minor
Access restrictions resulting from the presence of the solar farm.	Operation	Moderate	Minor

9.9 *IMPACTS ON VECTOR BORNE OR COMMUNICABLE DISEASES*

9.9.1 *Introduction*

This assessment identifies potential impacts on communities in the Project area as result of vector borne and/or communicable diseases. Impacts will primarily occur in the construction phase and result in increased health risks for communities in the Project area (See *Figure 4.2*).

9.9.2 *Summary of Relevant Baseline Conditions*

Malaria is the most prevent illness experienced by men, women and children in the Project area due to poor sanitary conditions in villages. It is particularly prevalent during the rainy season as pools of rain water accumulate in low lying areas. Reportedly, it is common for latrines to collapse during the rainy season that exacerbates such conditions, resulting in open defecation and poor hygiene practices. Gastric illnesses such as diarrhoea, colds and other illnesses can spread if proper sanitation and hygiene is not effectively managed.

Additionally, poor cooking methods such as cooking in confined spaces and use of firewood and charcoal impact on women's health, creating respiratory infections.

9.9.3 Potential Impacts: Construction

Communicable diseases are caused by viral, bacterial, parasitic and fungal pathogens that are airborne or that are transmitted through an infected person, animal or environmental source. Communicable diseases include malaria, tuberculosis, measles and bacterial infections such as colds, gastric infections (eg diarrhoea) and alike.

It is anticipated that during the construction period the workforce will comprise up to 200 people, skilled and unskilled, some of which may be from the local area and others from elsewhere. Although it is not planned to place a temporary construction camp at the site, a mobile office with waste and sanitation facilities is required. The biggest risk associated with this impact is workers from outside the local area being more susceptible to communicable diseases or bringing communicable diseases into the area that are currently not prevalent. Additionally, in combination with community-worker interaction, inadequate hygiene and waste management controls at the construction site could also enable the increased transmission of communicable diseases.

Additionally, in the event of an outbreak of an airborne (eg TB) or food-borne illness among the workers, the home communities of the local workers, and any of those visited by the Project workforce may also become susceptible to these infectious diseases.

Moreover, due to the existing high prevalence of malaria, increased transmission due to Project activities is considered to be unlikely but could result if new breeding grounds for mosquitoes are created. This includes creation of wheel ruts from traffic or pools of water in and around land clearance or laydown areas.

Furthermore, construction activities have the potential to exacerbate existing high rates of respiratory infections due to dust emissions. Women in the communities often suffer from respiratory infections due to traditional cooking practices, such as use of firewood and charcoal in confined spaces. This situation may be exacerbated during construction due to higher levels of dust emissions and also vehicle emissions. Additionally ground preparations and land clearance may create dust particles. This is most likely to impact the western portion of the site situated adjacent to Kanzimbe and Mayambo Villages (as described in *Section 9.1* Air Quality) excavation activities and construction traffic. Although dust suppression measures will be implemented, additional dust may be associated with any real (or perceived) increase in such diseases.

During operation only 20 workers will be required with minimal traffic. As such no impacts are expected during this period.

9.9.4 Assessment of Impact: Construction

Table 9.25 below provides an assessment of potential impacts related to an increase in vector borne and communicable diseases during construction.

Table 9.25 Increase in Vector Borne and Communicable Diseases

Impact	**Increase in vector borne and communicable diseases**				
Impact Nature	Negative		Positive		Neutral
	Construction activities may exacerbate existing high rates of malaria, respiratory illness and gastric illnesses.				
Impact Type	Direct		Indirect		Induced
	Direct impact resulting the presence of construction equipment and activities in combination with the workforce, in particular community-worker interaction.				
Impact Duration	Temporary	Short Term		Long Term	Permanent
	Impacts are likely only to be experience during peak construction periods, when the number of workers and activities is at the highest.				
Impact Extent	Local		Regional		International
	Impacts are only likely to affect a small portion of neighbouring villages, where the majority of construction activities are occurring.				
Frequency	Occasional – The risk for increased vector or communicable diseases will be constant throughout the construction. However, it is likely to occur occasionally.				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Based on the parameters above, the magnitude is considered to be *small* as the workforce will not be residing on site and construction activities will occur in phases,				
Resource/ Receptor Vulnerability	Low		Medium		High
	The communities are vulnerable to an increase in vector borne and communicable diseases as presence levels are already high.				
Impact Significance	Negligible		Minor	Moderate	Major
	The impact has the potential to affect a small proportion health of neighbouring villages such as Kanzimbe, Mayambo and others situated adjacent to the site.				

9.9.5 Mitigation Measures

The following mitigation measures will be implemented by the ProjectCo:

- Provide workforce training on communicable diseases, disease prevention and treatment to raise awareness.

- Establish a worker Code of Conduct that includes guidelines on worker-worker interactions, worker-community interactions and development of personal relationships with members of the local communities (refer to mitigation provided in *Section9.11)*.

- Provide workers with appropriate gender considerate sanitary facilities which are appropriately designed to prevent contamination.

- Develop a robust waste handling system to avoid the creation of new vector breeding grounds.

- Establish measures through environmental controls which reduce the presence of standing water onsite during the site preparation phase to avoid the creation of new breeding grounds.

- Ensure that working areas, such as site office areas are kept clean and free from any accumulation of wastes as well as supplied with clean potable water. This includes ensuring appropriate food preparation and monitoring measures are in place.

- Have a first aid point on site to avoid adding pressure on local health facilities. However, arrangements will be made with nearby hospitals so sick Project workers who cannot be fully treated at the Project first aid point be referred for treatment.

- In line with best practice requirements regarding the health of the workforce, develop and implement pre-employment screening measures to ensure that workers are fit for work, as well as identify any pre-existing conditions. Individuals found to be suffering from communicable diseases will need to seek treatment prior to mobilisation to site. However, no one should be denied employment on the basis of their health status as long as they are able to undertake the required duties (following treatment if relevant).

9.9.6 Residual Impact Significance

With the mitigation measures included above, the impact significance is expected to be *negligible (Table 9.26).*

Table 9.26 Pre and Post Mitigation: Vector Borne or Communicable Diseases

Impact	Project Phase	Significance (Pre-mitigation)	Residual Impact Significance (Post-mitigation)
Increase in vector borne or communicable diseases resulting from the presence of the workforce and resulting from construction activities.	Construction	Minor	Negligible

9.10 IMPACTS ON SEXUALLY TRANSMITTED INFECTION (STIS) / HIV TRANSMISSION RATES

9.10.1 Introduction

This assessment identifies potential impacts on communities in the Project area as result of STI's and HIV transmission. Impacts will primarily occur in the construction phase and result in increased health risks for communities in the Project area (See *Figure 4.2*).

9.10.2 Summary of Baseline Conditions

Health workers and men reported STI's as one of the most common health issues in the Project area. Additionally, at the time of the Salima Social-Economic Profile 2006, HIV/AIDS was emerging as a serious 'pandemic' and programmes were being carried out in the District to raise awareness and promote behavioural change to prevent an increase.

In combination with this, men admitted that they have unprotected sex and that they do not like to ask health workers for condoms. Women also highlighted that unwanted pregnancies are also common resulting from lack of contraceptive use.

Additionally, one of the main challenges reported by health workers and women during the social surveys is gender based violence (GBV), rape and early marriage. This impacts on girls' education as they are forced to leave school due to early pregnancy. In Kanzimbe, reportedly girls and women are enticed by men with money and other valuables such as mobile phones in exchange for sex, leading to unplanned pregnancies and STIs. This suggests that young women are vulnerable to impacts relating to STI/HIV transmission.

Gender based issues was one of the key concerns raised during the engagement process for the ESIA.

9.10.3 Potential Impact: Construction

The presence of the workforce and expectations regarding job opportunities creating influx has the potential to create an increase in STI/HIV prevalence due to worker-community interactions with young women seeking to better their lives through income generation, or relationships with the workforce (expatriates or Malawians). Additionally, high prevalence of sexual abuse and gender based violence in the Project area could be exacerbated resulting from increased jealousy and accusations of women interacting with outsiders or from tension from perceptions that the community has not benefitted from the Project. (eg in relation to employment for example)

9.10.4 Assessment of Impacts: Construction

Table 9.27 below provides an assessment of potential impacts related to an increase in STIs/HIV transmission during construction.

Table 9.27 Assessment of Impacts: Increase in STI/HIV Transmission

Impact	**Increase in STI / HIV Transmission**				
Impact Nature	Negative	Positive	Neutral		
	The presence of the workforce and the potential for influx has the potential to influence an increase in STI / HIV transmission.				
Impact Type	Direct	Indirect	Induced		
	The impact is likely to be induced by an increase of people in the Project area in combination with young women perceiving this increase as an economic opportunity. Additionally, high vulnerability of women in the Project area may trigger sexual abuse or GBV leading to unprotected sex.				
Impact Duration	Temporary	Short Term	Long Term	Permanent	
	Impacts are likely only to be experience during the during construction phase				
Impact Extent	Local	Regional	International		
	Impacts are only likely to affect the local community.				
Frequency	Occasional – The risk for increased STI/HIV transmission will be occasional to rare.				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Based on the parameters above, the magnitude is considered to be *small* as the Project is not expected to create a significant increase to the population and the workforce will not be accommodated on site where there is increased potential for worker-community interactions.				
Resource/ Receptor Vulnerability	Low	Medium	High		
	Young women and women generally are highly vulnerable due to high rates of sexual abuse and GBV, in combination with high poverty levels that have the potential to create an economic opportunity.				
Impact Significance	Negligible	Minor	Moderate	Major	
	The impact has the potential to affect a small proportion of the population.				

9.10.5 Mitigation Measures

The following mitigation measures will be implemented by the ProjectCo:

- Develop and implement an STI management plan that should include, among other things, the following measures:
    - STI and HIV prevention training to all employees, through workshops, posters and informal information sessions;
    - Medical examinations to determine level of health. Workers should also be encouraged to determine their HIV status;
    - Supply of condoms at the construction site;

- Development of a Code of Conduct / rules for worker-community interaction and on-site behaviour;

- Provide support to workers and the community to access treatment for STIs and in particular HIV/AIDS through existing health facilities or NGO campaigns or programmes;

- During the construction phase support a women's NGO that is addressing gender and GBV issues in Salima and in Project affected communities, to raise awareness of such issues and to encourage prevention. This should also include monitoring of GBV and sexual abuse issues.

9.10.6 Residual Impact Significance

With the mitigation measures included above, the impact significance is expected to be *negligibl*e *(Table 9.28).*

Table 9.28 Pre and Post Mitigation: Increase in STI / HIV Transmission

Impact	Project Phase	Significance (Pre-mitigation)	Residual Impact Significance (Post-mitigation)
Increase of STI / HIV transmission resulting from worker-community interaction and sexual interactions between communities through economic opportunities or sexual abuse / GBV	Construction	Minor	Negligible

9.11 IMPACTS ON COMMUNITY SAFETY AND SECURITY

9.11.1 Introduction

This assessment identifies potential impacts of the Project on Community, Health, and Safety. Impacts will primarily occur in the construction phase and result in increased safety risks for communities in the Project area (See *Figure 4.2*).

9.11.2 Summary of Relevant Baseline Conditions

Security incidents in the Project Area are infrequent and mainly comprise of burglaries and livestock theft. Arson in a nearby village was a recent occurrence that was reported, however the reasons for this are unknown. In addition, gender based violence incidents, sexual abuse, and early marriages are common in the villages and were reported during the social baseline studies.

9.11.3 Potential Impacts: Construction and Operation

Generally, security incidents in the Project area are infrequent and mainly comprise petty crime and livestock theft.

Additionally, Project safety hazards may arise from the presence of construction equipment and activities, construction infrastructure (e.g. mobile offices) including from construction traffic. Moreover, the presence of such equipment and facilities may trigger risk/temptation of theft due to high levels of poverty in communities in the Project area.

Incidents may also arise as a result of worker-community interactions with security guards or other staff, influx and perceptions that other people are benefitting from the Project more than others causing tension among communities.

During operation, security risks are potentially associated with the presence of the Project and the transmission line which could pose a threat to trespassers encroaching into the solar farm to steal panels or that try to connect to the transmission line.

9.11.4 Assessment of Impact: Construction

Table 9.29 below provides an assessment of potential impacts related to risks associated with community safety and security during construction.

Table 9.29 Community Safety and Security – Construction

Impact	**Community Safety and Security**				
Impact Nature	Negative		Positive		Neutral
	Safety risks associated with construction activities and the presence of the workforce in combination with tensions between communities with others are perceived to be benefitting from the Project more than others.				
Impact Type	Direct		Indirect		Induced
	The impact will be direct, impacting the communities within the Project area				
Impact Duration	Temporary	Short Term	Long Term	Permanent	
	The risk of safety and security impacts will be during construction due to the presence of construction traffic, equipment, the workforce etc.				
Impact Extent	Local		Regional		International
	The impact will be experienced by local communities				
Frequency	Occasional - the number of incidents that occur are likely to be occasional.				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Based on the parameters above, the magnitude is considered to be small.				
Resource/ Receptor Vulnerability	Low		Medium		High
	The most vulnerable in communities that are likely to be subject to such impacts are women, children the youth and elderly.				
Impact Significance	Negligible		Minor	Moderate	Major
	The impact is expected to be moderate				

Mitigation Measures

The following mitigation measures will also be implemented:

- ProjectCo will train security personnel in safeguarding of the community in high tension situations such as community protests and community conflicts resulting in human rights abuses. This will include training the existing community policing function to provide support and engage the GVH's and TA when required.

- ProjectCo security will comply with Malawian laws and regulations as well as the requirements of the Voluntary Principles for Security and Human Rights. The security will include, among other things, selection of personnel based on a careful background screening, and monitoring of performance.

- ProjectCo will put in place security measures to minimise safety risks and the possibility of theft in construction camps, storage areas etc.

- ProjectCo will establish clear and visible signage in construction areas to warn the community of any risks and hazards.

- ProjectCo will establish a community engagement programme to provide information about safety hazards and raise awareness of how these are being managed. This includes visits to all neighbouring communities and local schools.

- ProjectCo will raise awareness to communities regarding their Grievance Mechanism to deal with community concerns and issues in a timely manner to avoid issues escalating. This will include the use of the Community Liaison Officer who will be present around the Project Site pre and during construction.

9.11.5 Assessment of Impacts: Operations

Table 9.30 below provides an assessment of potential impacts related to risks associated with community safety and security during operation.

Table 9.30 Community Safety and Security: Operation

Impact	Community Safety and Security				
Impact Nature	Negative		Positive		Neutral
	Security and safety risk are associated with the presence of the solar farm and the transmission lines, which pose a risk to opportunities trespassing onto the site or attempting to illegally connect to the transmission line.				
Impact Type	Direct		Indirect		Induced
	The impact will be induced as a result of high levels of poverty and lack of access to electricity in neighbouring communities.				
Impact Duration	Temporary	Short Term		Long Term	Permanent
	The risk will remain throughout the life of the Project.				
Impact Extent	Local		Regional		International
	Incidents are likely to occur locally.				
Frequency	Occasional - the number of incidents that occur are likely to be occasional-rare				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Based on the parameters above, the magnitude is considered to be small.				
Resource/ Receptor Vulnerability	Low		Medium		High
	The most vulnerable in communities that are likely to be subject to such impacts are the youth and farmers.				
Impact Significance	Negligible		Minor	Moderate	Major
	The impact is expected to be minor				

9.11.6 Mitigation Measures

The following mitigation measures will be implemented by the ProjectCo:

- Fence the solar farm and have security personnel present at all times to avoid trespassers entering the site to access solar panels.
- Security will comply with Malawian laws and regulations as well as the requirements of the Voluntary Principles for Security and Human Rights. The security will include, among other things, selection of personnel based on a careful background screening, and monitoring of performance.
- Establish clear and visible signage in hazardous areas to warn the community of any risks and hazards.

9.11.7 Residual Impact Significance

With the mitigation measures included above, the impact significance during construction and operations is expected to be *negligible (Table 9.31).*

Table 9.31 Pre and Post Mitigation: Community Safety and Security

Impact	Project Phase	Significance (Pre-mitigation)	Residual Impact Significance (Post-mitigation)
Safety and security risks may arose from the presence of the solar farm and the transmission line.	Construction	Moderate	Minor
Community safety and security incidents arising from the presence of the workforce (including security personnel) and construction activities.	Operation	Minor	Negligible

9.12 IMPACT ON LABOUR AND WORKING CONDITIONS

9.12.1 Introduction

This assessment identifies potential impacts on workers from the working conditions they will experience. Impacts will occur in the construction and the operation phase and result in increased health and safety risks for workers. Please note that occupational health and safety issues are also covered in this section.

9.12.2 Summary of Relevant Baseline Conditions

According to the Malawi Human Rights Country Report (2016) (1), the main human rights issues prevalent in the country include corruption, child labour, gender discrimination (including GBV), HIV/AIDS stigmatism, child abuse and early marriage. The report also highlights some of the challenges in relation to labour and working conditions, including:

- rights in relation to establishing unions and collective bargaining, in the informal sector;
- forced labour;
- child labour; 2014 *Malawi Millennium Development Goal End line Survey* found that almost 40 percent of children ages five to 17 were engaged in some form of child labour (2) .
- discrimination in employment and occupation occurred with respect to gender and disability; and

(1) US Department of State. Malawi Human Rights Report 2016. Available at https://www.state.gov/documents/organization/265486.pdf (accessed March 2018)
(2) Cited in US Department of State. Malawi Human Rights Report 2016. Available at https://www.state.gov/documents/organization/265486.pdf (accessed March 2018)

- acceptable conditions of work, including minimum wages, working hours, occupational health and safety and management of worker grievances.

Regardless of these instances, Malawi has ratified all eight of the core International Labour Organisation Conventions, listed in *Box 9.1* below (1).

Box 9.1 Ratified ILO Conventions

- C029 - Forced Labour Convention, 1930 (No. 29), 19 Nov 1999
- C087 - Freedom of Association and Protection of the Right to Organise Convention, 1948 (No. 87), 19 Nov 1999
- C098 - Right to Organise and Collective Bargaining Convention, 1949 (No. 98), 22 Mar 1965
- C100 - Equal Remuneration Convention, 1951 (No. 100), 22 Mar 1965
- C105 - Abolition of Forced Labour Convention, 1957 (No. 105), 19 Nov 1999
- C111 - Discrimination (Employment and Occupation) Convention, 1958 (No. 111), 22 Mar 1965
- C138 - Minimum Age Convention, 1973 (No. 138), Minimum age specified: 14 years, 19 Nov 1999
- C182 - Worst Forms of Child Labour Convention, 1999 (No. 182), 19 Nov 1999

Enforcement of labour laws and the ILO conventions is the biggest challenge in relation to labour and working conditions.

9.12.3 Potential Impact: Construction and Operation

Issues regarding labour and working conditions in Malawi include long working hours, inappropriate salaries, gender discrimination and child labour. As such, if not properly managed, these issues could affect the workforce, mainly during construction, and the local communities within the Project area who are highly vulnerable due to low levels of education and high levels of poverty.

Additionally, workers have the ability to protest if they perceive working conditions to be unsatisfactory, which could create delays to the Project, reputational risk and poor worker relationships.

Additionally, poor occupational health and safety can cause injury and fatalities if not managed as well affect relationships with the workforce. During construction these activities will involve the operation of heavy equipment and trucks, working at height, working in confined spaces, construction traffic, use of electrical devices, handling of hazardous materials and other hazardous activities. Due to the nature of the activities being undertaken during construction phase, worker H&S is a key risk with the potential for accidents that may result in injuries and fatalities as well as lost man-hours.

(1) International Labour Organisation. Available at https://www.ilo.org/dyn/normlex/en/f?p=NORMLEXPUB:11200:0::NO::P11200_COUNTRY_ID:103101 (accessed July 2018)

Hazardous activities during the operation phase and regular maintenance activities will include, but not be limited to; the operation of heavy equipment and trucks, working on electrical devices including high voltage, working at height, maintenance of high pressure pipework and vessels and handling of hazardous materials. During these activities the workers will be at risk for accidents and injury.

9.12.4 Assessment of Impact: Construction and Operation

Table 9.32 below provides an assessment of potential impacts related to risks associated with labour and working conditions during construction and operation.

Table 9.32 Impact Assessment: Labour and Working Conditions

Impact	**Labour and Working Conditions**				
Impact Nature	Negative	Positive	Neutral		
	Discrimination and non-compliant labour and working conditions has the ability to create delays to the Project, cause reputational risk and create poor worker. Additionally, poor occupational health and safety can cause injury or fatalities.				
Impact Type	Direct	Indirect	Induced		
	The impact will have a direct effect on the workforce.				
Impact Duration	Temporary	Short Term	Long Term	Permanent	
	The risk will remain throughout the life of the Project.				
Impact Extent	Local	Regional	International		
	Incidents are likely to occur locally.				
Frequency	Constant – the risks associated with poor labour and working conditions could be constant.				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	The workforce will comprise up to 200 people during construction and 20 during operation. Therefore the magnitude of the impacts is considered small.				
Resource/ Receptor Vulnerability	Low	Medium	High		
	The most vulnerable in communities that are likely to be subject to such impacts are the youth, women and children.				
Impact Significance	Negligible	Minor	Moderate	Major	
	The impact is expected to be moderate.				

9.12.5 Mitigation Measures

The following mitigation measures will be implemented by the ProjectCo:

- Develop a Human Resources Policy, which includes a Labour and Employment Plan and Worker Grievance Mechanism. These will also be developed and reflected in sub-contractor contracts. Key issues within Human Resource (HR) management and contracts will include, but not be limited to the following:

- Provision of clear and understandable information regarding rights under national labour and employment law, and any applicable collective agreements, including those related to hours of work, wages, overtime, compensation, etc.
- Provision of reasonable working conditions and terms of employment.
- Provision of adequate accommodation (where relevant).
- Provision of employment, compensation/remuneration and working conditions, including working hours, based on equal opportunity and fair treatment, avoiding discrimination on any aspects.
- Non-discrimination in all aspects of labour recruitment, management and exit.
- Provision of adequate welfare facilities on site.
- Implementation of a Grievance Mechanism for Project workers (including sub-contractors).
- Adoption and implementation of a sexual harassment policy.
- Freedom of association.

- Ensure that contracts will make explicit reference to the need to abide by Malawian law and international standards (in particular IFC PS 2) and the ILO conventions ratified by Malawi relating to health and safety, labour and welfare standards.
- Ensure that as part of any contractor and supplier selection process, performance with regard to worker management, worker rights, health and safety as outlined in Malawian law and international standards will be managed and reported on.
- Support contractors in adhering to labour and working conditions that are in line with Malawian legislation and IFC PS 2 through awareness raising and information provision, as necessary.
- Undertake regular checks of contractors to ensure the relevant labour laws are adhered to at all times.
- A health and safety programme will be developed that includes risk assessments (such as working at heights, confined space machine guarding), work permit systems and a H&S management system, in line with industry best practice, including worker performance safety tracking

(safety observations) to assure worker safety. All workers will receive induction and continuous training regarding this system.

- Establish a hiring mechanism to ensure no employee or job applicant is discriminated against on the basis of his or her gender, marital status, nationality, ethnicity, age, religion or sexual orientation.

- Ensure that all workers (including those of contractors and subcontractors) will, as part of their induction, receive training on worker rights in line with Malawian legislation and international standards.

- Ensure that all workers (including those of contractors and subcontractors) will have contracts which clearly state the terms and conditions of their employment and their legal rights. Contracts will be verbally explained to all workers where this is necessary to ensure that workers understand their rights. Contracts must be in place prior to workers leaving their home location, if applicable.

- Ensure that a fair and transparent worker Grievance Mechanism is in place that will be accessible to all workers, whether permanent or temporary, directly or indirectly employed. The grievance mechanism shall be open to the EPC Contractor and subcontractor workforce in the event that their grievance is not adequately resolved by their direct employer.

- Ensure that all workers (including those of the contractor and subcontractor) will have access to training on communicable diseases, STI's and community interactions in general. This training should be developed in collaboration with local health institutions and local NGO's where practical.

9.12.6 Residual Impact Significance

With the mitigation measures included above, the impact significance is expected to be *Minor (Table 9.33).*

Table 9.33 Pre and Post Mitigation: Labour and Working Conditions

Impact	Project Phase	Significance (Pre-mitigation)	Residual Impact Significance (Post-mitigation)
Poor labour and working conditions has the ability to delay the Project, create reputational risk and cause injury and facilities.	Construction and operation	Moderate	Minor

9.13 UNPLANNED EVENTS

9.13.1 Introduction

The following *Section* presents the assessment of impacts resulting from unplanned or non-routine events and those which are a result of accidents. These are different to impacts that would reasonably be predicted to occur in the normal course of activities (including the application of in-built control measures) during construction and operation.

The evaluation of impacts for unplanned and accidental event takes into account the likelihood of the event occurring into the impact magnitude. Likelihood is determined as unlikely, possible, or likely based in professional judgement and quantitative information (statistical frequency) where available.

Given the nature of Project activities, unplanned and accidental events are limited to potential accidental spills of fuel and oils, improper storage or disposal of waste, and vehicle traffic accidents. If these were to occur, there could be effects on the biophysical and social environment. The following potential risks of likely unplanned or accidental events are described in this *Section*:

- Impacts on soil and groundwater from spill events and improper disposal of waste; and
- Traffic accidents

9.13.2 Soil and Groundwater from Spill Events/Improper Disposal of Waste (Land Contamination)

Potential Impacts

Spills and improper disposal of waste have the potential to affect terrestrial environments and could lead to the deterioration of soil, water and sediment quality. This could lead to knock on effects for flora and fauna and local community users.

During construction there is the potential for spills of fuels and oils during construction activities, fuelling, maintenance of machinery and vehicles as well as improper waste storage and disposal. Spills/improper disposal of waste could occur within the Project footprint resulting in soil and groundwater degradation.

During operation of the Project, there is the potential for improper waste storage and disposal (for example of broken panels).

Summary of Relevant Baseline Conditions

See *Section 9.4.2*

Assessment of Impacts

Incidental spills of fuels are likely to be infrequent, but have the potential to occur; most frequently due to malfunction of handling systems, poor practice of workers and *force majeure*. Spills are most likely to occur during refilling and transportation of substances. There is no large-scale storage of fuels or chemicals on the Project site. Large releases of hazardous materials would therefore be rare and it is considered unlikely that a spill would occur of emergency scale. Improper disposal of waste can occur throughout the construction phase if appropriate disposal measures are not put in place.

Table 9.34 and Table 9.35 below provides an assessment of impacts related to access restrictions during construction and operation.

Table 9.34 Impact Assessment for Unplanned Events for Spills/Improper Disposal of Waste to Soil

Impact	**Accidental Spillages on Soil/ improper disposal of waste**				
Impact Nature	Negative	Positive	Neutral		
	Reduction in local soil quality as a result of spillage during maintenance of machinery, improper storage of hazardous materials, spillage during transfers of fuel, improper disposal of waste and general construction activities.				
Impact Type	Direct	Indirect	Induced		
	Impact is a result as a direct interaction between project activities soil resources in the AoI and Project Footprint				
Impact Duration	Temporary	Short Term	Long Term	Permanent	
	The impact is long term due to remediation time expected for contaminated soils				
Impact Extent	Local	Regional	International		
	The impact will be limited to AoI				
Frequency	Not Applicable				
Likelihood	Possible				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Based on the above the impact magnitude is considered medium				
Resource/ Receptor Sensitivity	Low	Medium	High		
	The land use surrounding the project footprint is largely agricultural and therefore the sensitivity is medium.				
Impact Significance	Negligible	Minor	Moderate	Major	
	Considering the impact magnitude is medium and the sensitivity is medium the overall significance is considered to be *moderate.*				

Table 9.35 Impact Assessment for Unplanned Events for Spills/Improper Disposal of Waste to Groundwater

Impact	**Accidental Fuel Spills on groundwater**				
Impact Nature	Negative	Positive	Neutral		
	Reduction in local soil quality as a result of spillage during maintenance of machinery, improper storage of hazardous materials, spillage during transfers of fuel, improper disposal of waste and general construction activities				
Impact Type	Direct	Indirect	Induced		
	Impact is a result as a direct interaction between project activities surface water resources along the wayleave and construction areas				
Impact Duration	Temporary	Short Term	Long Term	Permanent	
	The impact is long term due to remediation time expected for remediation				
Impact Extent	Local	Regional	International		
	The impact will be limited to groundwater in the AoI				
Frequency	Not Applicable				
Likelihood	Unlikely				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Based on the impact magnitude is considered medium				
Resource/ Receptor Sensitivity	Low	Medium	High		
	Groundwater use is prevalent in the surrounding communities, therefore the sensitivity is considered high.				
Impact Significance	Negligible	Minor	Moderate	Major	
	Considering the impact magnitude is medium and the sensitivity is high the overall significance is considered to be *major*				

Preventative Measures

The following management measures will be implemented by the ProjectCo:

- The Project will develop a Hazardous Spill Response Plan (HSRP) and maintain spill clean-up and response capability adequate for addressing spills for all phases of the Project. All spills will be immediately contained and cleaned up. Contaminated areas will be remediated.

- The Project will develop and implement a Waste Management Plan.

- Refuelling of equipment and vehicles will be carried out in designated areas on hard standing ground to prevent seepage of any spillages to ground. Collection systems will be installed in these areas to manage any spills, fuels will be collected and either reused, or removed by a local contractor. Drip trays must be used when refuelling and servicing vehicles or equipment, where it is not on a hardstanding surface.

- Hazardous material storage will be on hard standing and impermeable surface and the storage facility will be bunded. The Project will restrict storage and handling of hazardous materials and fuels to bunded areas of sufficient capacity to contain a release.

Residual Impact Assessment Conclusions

With the implementation of preventive measures and development of a Hazardous Spill Response Plan, the residual impact is reduced to acceptable levels.

9.13.3 Traffic Accidents

Potential Impacts

Increased traffic and presence of heavy vehicles on local roads as a result of Project development increases the risk of road traffic accidents involving members of the community. For the construction of the Project a considerable number of trucks will be needed to transport construction equipment (materials, sand, soil, waste) and solar PV components to and from the construction site. Operational traffic movements will be very low.

Summary of Relevant Baseline Conditions

See S*ection 2.6*.

Assessment of Impacts

The increased traffic volumes as result of the Project will increase the risk of potential vehicle accidents. The likelihood is *possible* due to the increase in traffic volume and the current poor state of roads in the area. However, the EPC will upgrade the site access road to cater for construction traffic.

Considering also the settlements along the roads and the current uses of the road, proximity of community activities and buildings to the roads, the sensitivity of receptors is considered to be high, and the consequence of a potential accident is *severe* due to the potential for injuries or fatalities.

Table 9.36 below provides an assessment of impacts related to access restrictions during construction and operation.

Table 9.36 Impact Assessment for Unplanned Events for Vehicle Accidents

Impact	Vehicle Accidents				
Impact Nature	Negative	Positive	Neutral		
	Increased traffic and presence of heavy vehicles on local roads as a result of Project development increases the risk of road traffic accidents involving members of the community during construction and operation.				
Impact Type	Direct	Indirect	Induced		
	Impact is a result as a direct interaction between project activities and community members and other road users.				
Impact Duration	Temporary	Short Term	Long Term	Permanent	
	The impact is long term due to remediation time expected for remediation				
Impact Extent	Local	Regional	International		
	The impact can occur along construction and delivery routes				
Frequency	Not Applicable				
Likelihood	Possible				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Based on the impact magnitude is considered medium				
Resource/ Receptor Sensitivity	Low	Medium	High		
	Sensitivity is high due to the communities along the road network				
Impact Significance	Negligible	Minor	Moderate	Major	
	Considering the impact magnitude is medium and the sensitivity is medium the overall significance is considered to be *major*.				

Preventative Measures

The following Mitigation measures will be implemented:

- Traffic Management Plan, driving codes of conduct and enhanced driver safety awareness will be implemented.
- Site access road will be upgraded to ensure it is suitable for construction traffic volumes.
- Plan traffic routes to limit road use by the Project during high traffic periods (including pedestrian traffic) and in sensitive areas such as near schools in order to reduce interaction with public road use.
- Assess local road conditions and discuss road maintenance during Project construction to minimise traffic risks associated with roads deteriorated from Project activities.
- The Project will provide driver training to promote safe and responsible driving behaviour. The training will also target contractors and subcontractors.
- Engage with local communities and authorities to inform them about plans and procedures
- Implement awareness campaigns recording traffic and road safety in communities along the transport corridor.

- Work with the relevant local and regional government to ensure the roads used by Project vehicles are well maintained, and that potential problems or hazards are communicated to the relevant authority timeously.

Residual Impact Assessment Conclusions

With the implementation of preventive measures and development of a Traffic Management Plan, the residual impact is reduced to acceptable levels.

9.14 CUMULATIVE IMPACTS

The aim of this *Section* is to assess the Cumulative Impacts following the guidance of the IFC document Good Practice Handbook (GPH) on Cumulative Impact Assessment and Management: Guidance for the Private Sector in Emerging Markets, published in 2013.

9.14.1 Defining Cumulative Impacts

IFC Performance Standard 1 defines Cumulative Impacts as those impacts that:

"*result from the incremental impact, on areas or resources used or directly impacted by the project, from other existing, planned or reasonably defined developments at the time the risks and impacts identification process is conducted*."

Cumulative impacts are generally considered to be impacts that act with impacts from other projects such that:

- The sum of the impacts is greater than the parts; or
- The sum of the impacts reaches a threshold level such that the impact becomes significant.

The types of cumulative impacts that may be relevant are the following:

- **Accumulative**: the overall effect of different types of impacts at the same location. An example would be fugitive dust emissions, construction noise and construction traffic, all impacting the local communities as a nuisance/ disturbance.

- **Interactive**: where two different types of impacts (which may not be individually important) react with each other to create a new impact (that might be important) (e.g. water abstraction from a watercourse might exacerbate the impacts caused by increased sediment loading).

- **Additive or In-combination**: where impacts from the primary activity (i.e. the construction and operation of the Project) are added to impacts from third party activities e.g. other major projects in the vicinity of the Project

which are already occurring, planned or may happen in the foreseeable future).

As the IFC Handbook on Cumulative Impact Assessment and Management provides limited specific guidance on the ratings to be used for the assessment of the cumulative impacts, the ESIA aligned this terminology with the methodology used for the rest of the Project-level impact assessment within this ESIA.

Identifying of Relevant Development (s)

ERM have confirmed with the ProjectCo that there are no known further planned industrial developments within proximity of the Project site or the greater area.

Conclusion

As no additional Project developments can be identified in the Project Area at present, there are no cumulative impacts to consider (1).

(1) The cumulative impacts related to decommissioning activities have not been assessed as these are not sufficiently understood and defined for the range of projects so that robust conclusions on the significance of these cumulative impacts are not able to be provided at this stage

10 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

10.1 OVERVIEW

This *Chapter* presents the Environmental and Social Management Plan Framework (ESMP) for the construction and operation of the Project. The ESMP specifies the mitigation and management measures to which the ProjectCo is committed and shows how they will mobilise organisational capacity and resources to implement these measures. The objective is to make sure that there are appropriate mitigation measures in place and that the responsible individuals consistently follow them.

The ESMP draws together the proposed mitigation measures; groups them logically into components with common themes; defines the specific actions required and timetable for implementation; identifies training needs, institutional roles and responsibilities for implementation as well as including a monitoring programme.

10.2 PROJECT ESMP OBJECTIVE

The key objectives of the ESMP are to:

- formalise and disclose the programme for environmental and social management; and
- provide a framework for the implementation of environmental and social management initiatives.

Best practice principles require that every reasonable effort is made to reduce, and prevent negative impacts while enhancing the benefits.

A key feature of the ESMP is the idea of continual improvement – an ongoing process of reviewing, correcting and improving the system. The most common approach for this is implemented through the Plan – Do – Check – Act cycle, as shown in *Figure 10.1.*

It is recognised that the ESMP is a live document that will be regularly updated to accommodate changing circumstances as the Project evolves.

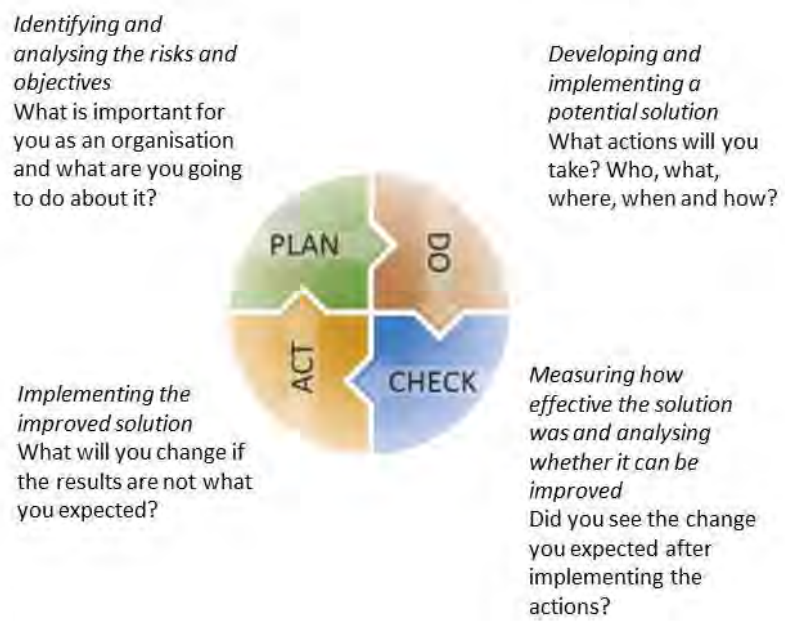

Figure 10.1 Plan - Do - Check - Act Cycle (After IFC 2014)[1]

10.3 SCOPE OF THE ESMP

The ESMP applies to all activities associated with site clearance and construction activities, as well as the operational phase of the Project, including all work sites established during construction and operations.

The ESMP includes all activities conducted by, or on behalf of the ProjectCo on the Project site, including contractors. The scope of the ESMP will be reviewed annually as part of the Management Review.

10.4 ENVIRONMENTAL AND SOCIAL MANAGEMENT PROCEDURES

The management programmes are centred on mitigation measures to avoid minimise or compensate for the risks and impacts that have been identified.

Management procedures are ordered by project phase; construction followed by operational phase. *Table 10.1* (construction) and *Table 10.2* (operation) detail the Management procedures. Decommissioning is discussed in *Section 10.5.6.*

[1] IFC, 2014, Environmental and Social Management System Implementation Handbook, Construction

10.5 PLANNING

10.5.1 Classification of Impacts

The Project has utilised the impact assessment through the ESIA process as a tool to identify key impacts and associated mitigation and management measures. This impact assessment was conducted for the construction, operation and decommissioning phases of the Project.

10.5.2 Positive Impacts

During Construction

As noted in *Chapter 8*, positive impacts are associated with economy and livelihoods through the creation of 200 workers (expected to be unskilled, semi-skilled and skilled during construction.

During Operation

During operation, up to 20 workers are expected to be required during operational activities. In addition, the generation of electricity is expected to have a significant positive impact to Malawi.

10.5.3 Adverse Impacts

During Construction

During construction, the following adverse impacts are predicted; these will be mitigated through the implementation of the ESMP:

- air quality (including dust);
- noise;
- landscape and visual amenity;
- groundwater;
- soil erosion;
- biodiversity;
- land acquisition and, physical and economic displacement;
- restrictions/disruption to access routes;
- temporary influx / community cohesion;
- transmission of vector borne or communicable diseases;
- transmission of sexually transmitted infections (STIs)/HIV;
- community safety and security;
- labour and working conditions;
- employment and the economy; and
- unplanned events including improper disposal of waste.

During Operation

The following impacts have been identified as a risk during operation which will be mitigated through the implementation of the ESMP:

- landscape and visual amenity;
- groundwater;
- land acquisition and, physical and economic displacement;
- restrictions/disruption to access routes;
- temporary influx / community cohesion;
- transmission of vector borne or communicable diseases;
- transmission of sexually transmitted infections (STIs)/HIV;
- community safety and security;
- labour and working conditions;
- employment and the economy; and
- unplanned events including improper disposal of waste.

All of the above identified impacts are addressed through management measures included in *Table 10.1* and *Table 10.2*.

10.5.4 Management Plans

Additional detailed policies and plans will be developed to support the implementation of this ESMP. The timing of the development of these plans may be staged, ensuring that the appropriate focus and level of detail is provided for construction and operational activities.

A full list of the management plans for this Project that will be finalised by the ProjectCo is provided below:

- Waste Management Plan;
- Human Resources Management Plan;
- Gender Development Plan;
- STI/HIV Management Plan;
- Emergency Response Plan;
- Hazardous Spill Response Plan;
- Livelihood Restoration Plan;
- Community Investment Plan;
- Stakeholder Engagement Plan; and
- Traffic Management Plan.

10.5.5 Contractor Environmental and Social Management Plan(s)

The Project will engage contractors to carry out project activities during both the construction and operational phases. The Project requires that all contractors will be responsible for performing all work:

- in compliance with applicable law and regulations, and with other requirements to which the Project subscribes;

- in conformance with the Project ESMP, and related management plans for specific aspects; and

- in accordance with contractual technical and quality specifications.

The Project's ESMP and related documentation will be the main contractual documentation to which the contractor and environmental and social documentation and procedures will be bridged. Contractors will be required to develop their own management plans which show how they will comply with these environmental and social requirements. In this way, the ESMP will be implemented and controlled using both the Project and the contractor management systems.

Table 10.1 Construction Environmental and Social Management Procedures

Ref	Potential Impact Managed/Enhanced	Objective	Mitigation / Avoidance/Enhancement Measures	Schedule for Implementation	Estimated Budget (US $)	Institutional Responsibility
			Positive Impacts			
8.1	Employment and the Economy • Employment opportunities and the need for the supply of goods and services has the potential to create jobs for the local community and improve income levels.	Provide opportunities to local communities to enhance income levels, skills/employability and improve the quality of life.	1. ProjectCo will establish a recruitment strategy for staff required pre and during construction to enable the community to access job opportunities where possible. 2. Although recruits will require a basic level of skills prior to recruitment, ProjectCo will provide training opportunities and internships to males and females in local communities in order to enhance their skills, increasing employability and career development opportunities at a later stage. 3. EPC Contractor will source goods and services required for construction and operation in Salima District as much as possible. Following this, goods and services in Lilongwe and at a national level will be sought prior to sourcing outside of Malawi 4. In addition to the LRP, which will target directly affected communities, ProjectCo will develop and implement a broader gender differentiated Community Investment Program (CIP) that will include measures to enhance livelihood, skills capacity and employability in neighbouring communities and surrounding areas. This will be established through a gender focused and participatory needs assessment.	• Pre and during construction	• Review of numbers to be embedded in the EPC contractor scope of work • USD 10,000 for review of recruitment performance	1,2,4).ProjectCo Project Manager 3) EPC Contractor Quarterly Reports of EPC and ProjectCo activities to be undertaken by ProjectCo EHS Coordinator
			Adverse Impacts			
9.1	Air Pollution: • Site preparation, construction activities, equipment, material and worker transportation will generate fugitive dust emissions which could act as a nuisance for nearby sensitive receptors.	Minimise deterioration of ambient air quality from construction activities	1. restrict the removal of vegetation and soil cover to those necessary for the Project; 2. land clearance should be sequential and where ground and earthworks are undertaken the smallest possible area for working will be exposed; 3. stripping of topsoil will not be conducted earlier than required (maintain vegetation cover for as long as possible) in order to prevent the erosion (wind and water) of organic matter, clay and silt. 4. a speed limit of 30 kph on unpaved surfaces to be enforced and the national speed limits on public roads are not to be exceeded; 5. all transported materials must be covered with tarpaulins to prevent fugitive dust; 6. where feasible, surface binding agents will be used on exposed open earthworks; 7. exposed ground and earthworks where wind generated dust occurs, should be covered as much as possible, for example with sheeting, shade cloth or tarpaulin; 8. stockpiles stored longer than six weeks should be vegetated or covered (with sheeting, shade cloth or tarpaulin) to reduce soil loss from wind or storm water runoff; 9. stockpiles will be located as far away from receptors as possible and will be covered (with sheeting, shade cloth or tarpaulin); 10. wind breaks will be erected around the key construction activities and, if possible, in the vicinity of potentially dusty works, to minimise impacts at the nearby temporary residential accommodation and permanent residential receptors; 11. all construction vehicles must be regularly maintained to minimise exhaust emissions; 12. when not in use, vehicles will be switched off, unless impractical for health and safety reasons (for example, maintenance of air conditioning); and 13. any complaints received from neighbours must be reported to the EHS Coordinator or the EPC Contractor through the Grievance Mechanism.	Regularly throughout construction	Ongoing maintenance costs included within the EPC Contractor's bid	1-12) EPC Contractor 13) ProjectCo CLO and EHS Coordinator Quarterly Reports of EPC and ProjectCo activities to be undertaken by ProjectCo EHS Coordinator

Ref	Potential Impact Managed/Enhanced	Objective	Mitigation / Avoidance/Enhancement Measures	Schedule for Implementation	Estimated Budget (US $)	Institutional Responsibility
9.2	Noise Pollution • Site preparation, construction activities, equipment, material and worker transportation will generate fugitive dust emissions which could act as a nuisance for nearby sensitive receptors.	To avoid disturbance to surrounding land-users by maintaining noise levels within required limits (55 dBA during the day time (07:00- 22:00) and 45 dBA during the night time (22.00 – 07.00))	1. maintain machines and plant equipment in good working condition and inspect regularly; 2. selection of equipment and vehicles in accordance with best available techniques for noise reduction; 3. minimise vehicle movements within and around the site as much as possible; 4. use local screening/site hoardings to screen noise where appropriate; and 5. any complaints received from neighbours must be reported to the EHS Coordinator or the EPC Contractor through the Grievance Mechanism.	Regularly throughout construction phase	1-4) Ongoing costs included in the EPC contractor's bid CLO to be hired as part of ProjectCo's operational budget	1-5) EPC Contractor 5) ProjectCo EHS Coordinator and CLO Quarterly Reports of EPC and ProjectCo activities to be undertaken by ProjectCo EHS Coordinator
9.3	Soil Erosion • Loss of arable soils and reduced soil quality.	To avoid soil erosion and the consequent loss of soil quality and quantity.	1. Mitigation measures for air emissions are applicable to this impact (*Section 9.1.5*). 2. erosion control measures such as intercept drains and toe berms will be constructed where necessary. 3. Access roads will be well drained in order to limit soil erosion.	Regularly throughout construction phase	Ongoing costs included in the EPC contractor's bid	1) As per section above 2,3) EPC Contractor Quarterly Reports of EPC and ProjectCo activities to be undertaken by ProjectCo EHS Coordinator
9.4	Groundwater Resources • Water supply for the Project during the construction phase is anticipated to be derived from the groundwater. This may have an effect on other waters users.	To prevent the contamination of surface and groundwater and to not negatively affect other water users in terms of water availability.	*Embedded Controls* 1. Monitoring of water levels within existing wells and boreholes will be undertaken during installation drilling and pump testing of project abstraction boreholes. 2. Radius of influence will be recalculated using site-specific hydrogeological parameters. Project abstractions will be located outside the radius of influence if practical. *Mitigation Measures* 3. a further assessment will be done at a later stage with updated information from all community boreholes; 4. continuous monitoring of affected village supplies and a cessation of project abstraction if the groundwater elevation in village water supply wells reaches a pre-agreed level. 5. water storage solutions (eg tanks) for water pumped during the wet season for use during the dry season.	Regularly throughout construction phase	USD 15,000 for monitoring and assessment programme Embedded controls part of design costs for Project	1-5) ProjectCo Project Manager Quarterly Reports of ProjectCo activities to be undertaken by ProjectCo EHS Coordinator
9.5.1	Biodiversity • Loss of Habitats and Fauna Disturbance	Minimise impacts on terrestrial flora, fauna and avifauna during construction.	1. Ensure that vegetation is methodically cleared from the Project site and excavations are undertaken as per designs to avoid unwarranted clearance of vegetation. 2. Planning should be conducted in advance to determine the minimum feasible extent required. Predetermined areas should be clearly demarcated on the ground, fenced where appropriate and enforcement measures taken to avoid footprint creep into surrounding areas. 3. Provisions that prohibit staff and contractors from engaging in all forms of hunting in the Project area must be included in the Worker Code of Conduct. 4. Rehabilitation of all disturbed areas (e.g. temporary access tracks and laydown areas) must be undertaken following construction. This must be done in such a way facilitate natural regeneration of vegetation.	Prior to and regularly throughout construction phase	1,2,4) EPC Contractor actions as part of EPC construction costs 3) Code of Conduct: 1000 USD	1,2,4) EPC Contractor 3) ProjectCo Quarterly Reports of EPC and ProjectCo activities to be undertaken by ProjectCo EHS Coordinator
9.5.2	Biodiversity • Loss of Threatened Flora	Minimise impacts on terrestrial flora during construction.	1. Rehabilitation of all disturbed areas (e.g. temporary access tracks and laydown areas) must be undertaken following construction. This must be done in such a way facilitate natural regeneration of vegetation;	Prior to and regularly throughout construction phase	1,2,3) EPC Contractor actions as part of EPC construction costs	1,2,3) EPC Contractor 4) ProjectCo

Ref	Potential Impact Managed/Enhanced	Objective	Mitigation / Avoidance/Enhancement Measures	Schedule for Implementation	Estimated Budget (US $)	Institutional Responsibility
					4) Code of Conduct: 1000 USD	
			2. Ensure that vegetation is methodically cleared from the Project site and excavations are undertaken as per designs to avoid unwarranted clearance of vegetation. 3. Planning should be conducted in advance to determine the minimum feasible extent required. Predetermined areas should be clearly demarcated on the ground, fenced where appropriate and enforcement measures taken to avoid footprint creep into surrounding areas. 4. Provisions that prohibit workers and contractors from clearing/utilising word and plant species in the Project Area			Quarterly Reports of EPC and ProjectCo activities to be undertaken by ProjectCo EHS Coordinator
9.5.3	Biodiversity • Risk of Increased Invasive Alien Plants		1. Invasive alien plants will be removed from areas controlled by EPC Contractor. Manual removal will be favoured over mechanised or chemical control measures to the full extent possible. 2. All alien vegetative and/or seed bearing material that is removed through control measures should be contained in a cordoned off area, dried and burnt on site to prevent the distribution of seeds. 3. Vehicles and construction equipment should be washed on a regular basis and should be kept clean to minimise distribution of seeds and invasive plant material. 4. Source areas such as vehicle parking, construction camps should be kept clean of invasive plants to minimise the presence of seeds that can be dispersed unintentionally. 5. Disturbed areas will be rehabilitated at the earliest opportunity to minimise the establishment of invasive alien plants. 6. Regular and ongoing monitoring of the presence of invasive alien plants should be conducted within construction and rehabilitated sites and removal operations implemented according to the results.	Regularly throughout the construction phase	Ongoing costs included in the EPC contractor's bid	EPC Contractor Quarterly Reports of EPC to be undertaken by ProjectCo EHS Coordinator
9.5.4	Biodiversity • Disruption of Ecosystem Services		1. Rehabilitation of all disturbed areas (e.g. temporary access tracks and laydown areas) must be undertaken following construction. This must be done in such a way facilitate natural regeneration of vegetation; 2. Maintain ongoing engagement between the Project and local communities, with communities informed in advance of any vegetation clearing to allow pre-harvesting of resources such has wood fuel, mangoes, building materials or other useable resources. 3. Piles of woody vegetation cleared for construction activities are to be made available to communities to access it for use as wood fuel or other purposes.	Regularly throughout the construction phase	1,3) Ongoing costs included in the EPC contractor's bid 2) Part of CLO responsibilities	1,3) EPC Contractor 2) ProjectCo CLO Quarterly Reports of EPC and ProjectCo activities to be undertaken by ProjectCo EHS Coordinator
9.6	Landscape and Visual Amenity • Impact on the visual character of the landscape	Minimise the visual impact on surrounding sensitive receptors	*Mitigation Measures* 1. Ongoing rehabilitation of cleared areas to minimise visual scarring and maintenance clearing will be kept to the absolute minimum and should not extend beyond the Project site boundary; 2. Any excavated or cut and fill areas will be landscaped and allowed to revegetate; 3. No debris or waste materials will be left at the work sites; and 4. Appropriate directional and intensity settings will be utilised on all lighting.	Regularly throughout the construction phase	Ongoing costs included in the EPC contractor's bid	EPC Contractor Quarterly Reports of EPC activities to be undertaken by ProjectCo EHS Coordinator
9.7	Land acquisition and displacement • Land clearance, causing economic displacement, in particular of subsistence farmers and land	Avoid and minimise displacement as well as a mitigate negative impacts and enhance positive impacts	1. Develop a Livelihood Restoration Plan (LRP) that includes the following; a. Identification of affected land users; b. Census and asset inventory to assess compensation measures for those affected; c. Assessment of eligibility and entitlements for those affected; d. Identification of gender differentiated and sustainable livelihood improvement and / or restoration measures (these may include but are not limited to financial literacy training, training on improved farming practices etc); e. Provisional implementation budgets;	August 2018	LRP development USD 60,000 LRP implementation to be determined	ProjectCo is responsible for the development and implementation of the LRP. Quarterly Reports of ProjectCo activities to be undertaken by ProjectCo EHS Coordinator

Ref	Potential Impact Managed/Enhanced	Objective	Mitigation / Avoidance/Enhancement Measures	Schedule for Implementation	Estimated Budget (US $)	Institutional Responsibility
	for livestock grazing. • Displacement of one structure used for a goat farmer in the wayleave. The structure is not used for residential purposes.		f. Roles and responsibilities, including details of an institutional structure / Livelihood Restoration Steering Committee; g. Monitoring and evaluation requirements; and h. Provisional implementation schedule. 2. Ensure an inclusive and participatory consultation process that ensures the participation of women, men, youth, elderly, disabled and other groups in the decision making process in relation to replacement land and livelihood restoration programmes.			
9.8	Access restrictions • The presence of construction equipment and activities during this period may block pathways that transect the solar site, including access to communities and farmland	Minimise restrictions to existing pathways transecting the Project site	1. Undertake consultation with communities using farmland in areas affected during construction to establish the best alternative routes and measures that the Project should put in place to minimize impacts related to access restrictions.	Prior to and regularly throughout the construction phase	As part of CLO Responsibilities	ProjectCo CLO Quarterly Reports of ProjectCo activities to be undertaken by ProjectCo EHS Coordinator
9.9	Vector borne and communicable diseases • Construction equipment and activities have the potential to create dust emissions and create breeding grounds for vector borne illnesses affecting communities living in villages adjacent to the solar site. • Additionally the presence of the workforce during this period in combination with poor sanitary conditions has the potential to increase communicable diseases	Avoid the risk of increasing prevalence of vector borne and communicable diseases	1. Provide workforce training on communicable diseases, disease prevention and treatment to raise awareness. 2. Establish a worker Code of Conduct that includes guidelines on worker-worker interactions, worker-community interactions and development of personal relationships with members of the local communities 3. Provide workers with appropriate gender friendly sanitary facilities which are appropriately designed to prevent contamination. 4. Develop a robust waste handling system to avoid the creation of new vector breeding grounds. 5. Establish measures to reduce the presence of standing water onsite during site preparation through environmental controls to avoid the creation of new breeding grounds. 6. Ensure that working areas, such as site office areas are kept clean and free from any accumulation of wastes as well as supplied with clean potable water. This includes ensuring appropriate food preparation and monitoring measures are in place. 7. Have a first aid point on site to avoid adding pressure on local health facilities. However, agreements will be made with nearby hospitals so sick Project workers who cannot be fully treated at the Project first aid point be referred for treatment. 8. In line with best practice requirements regarding the health of the workforce, develop and implement pre-employment screening measures to ensure that workers are fit for work, as well as identify any pre-existing conditions. Individuals found to be suffering from communicable diseases will need to seek treatment prior to mobilisation to site. However, no one should be denied employment on the basis of their health status as long as they are able to undertake the required duties (following treatment if relevant). 9. Implementation of measures to reduce the presence of standing water onsite through environmental controls and source reduction to avoid the creation of new breeding grounds.	Prior to and regularly throughout the construction phase	1,3,4,5,6,7,8) Part of EPC contractor bid 2) Project : USD 2000	1,3,4,5,6,7,8) EPC contractor 2) ProjectCo Quarterly Reports of EPC and ProjectCo activities to be undertaken by ProjectCo EHS Coordinator

Ref	Potential Impact Managed/Enhanced	Objective	Mitigation / Avoidance/Enhancement Measures	Schedule for Implementation	Estimated Budget (US $)	Institutional Responsibility
			10. Ensuring appropriate food preparation and monitoring measures are in place. Conduct regular assessments of food handlers, kitchens fridges and freezers. 11. Providing insecticide-impregnated bed nets as a physical barrier to repel and kill mosquitos for workers that have been provided accommodation.			
9.10	STI/HIV transmission	Avoid an increase in STI/HIV transmission and worker-community interaction and increase in GBV / inappropriate sexual interaction in communities	1. Develop and implement an STI management plan that should include, among other things, the following measures: • STI and HIV prevention training to all employees, through workshops, posters and informal information sessions; • Medical examinations to determine level of health. Workers should also be encouraged to determine their HIV status; • Supply of condoms at the construction site; • Development of a Code of Conduct / rules for worker-community interaction and on-site behaviour; • Provide support to workers and affected communities to access treatment for STIs and in particular HIV/AIDS through existing health facilities or NGO campaigns or programmes; **2.** During the construction phase support a women's NGO that is addressing gender and GBV issues in Salima and in Project affected communities, to raise awareness of such issues and to encourage prevention. This should also include monitoring of GBV and sexual abuse issues.	Prior to and regularly through construction	STI Management Plan: USD 6,000 Support for NGO USD 10,000 Implementation has part of ProjectCo's costs	1-2) ProjectCo Quarterly Reports of ProjectCo activities to be undertaken by ProjectCo EHS Coordinator
9.11	Community safety and security • Security risk in relation to petty crime, increased GBV and perceptions that people in the communities are benefitting more than others creating tensions. • Worker-community interactions, including the presence of security may pose a threat to the community.	Avoid risks associated with safety and security	1. Project will train security personnel in safeguarding of the community in high tension situations such as community protests and community conflicts resulting in human rights abuses. This will include training the existing community policing function to provide support and engage the GVH's and TA when required. 2. Project security will comply with Malawian laws and regulations as well as the requirements of the Voluntary Principles for Security and Human Rights. The security will include, among other things, selection of personnel based on a careful background screening, and monitoring of performance. 3. Project will provide security measures for the construction site to minimise safety risks and the possibility of theft. 4. Project will establish clear and visible signage in construction areas to warn the community of any risks and hazards. 5. Project will establish a community engagement programme to provide information about safety hazards and raise awareness of how these are being managed. This includes visits to all neighbouring communities and local schools. 6. Project will raise awareness to communities regarding their Grievance Mechanism to deal with community concerns and issues in a timely manner to avoid issues escalating. This will include the use of the Community Liaison Officers who will be present around the Project Site pre and during construction.	Prior to and regularly through construction	1,3,4) as part of EPC contarctor bid. 2,5,6) Part of CLO resposibilities	1,3,4) EPC contractor 2,5,6) ProjectCo CLO Quarterly Reports of EPC and ProjectCo activities to be undertaken by ProjectCo EHS Coordinator
9.12	Labour and working conditions • During peak construction the workforce may be	Avoid risks associated with labour and working conditions	1. Develop a Human Resources Policy, which includes a Labour and Employment Plan and Worker Grievance Mechanism. These will also be developed and reflected in sub-contractor contracts. Key issues within Human Resource (HR) management and contracts will include, but not be limited to the following:	Plans and Policies to be developed prior to construction	HR Policy: USD 2000 Gender Development Plan: USD 7000	1,2,5) ProjectCo 3,4,6,7,8,9,10,12) EPC Contractor

Ref	Potential Impact Managed/Enhanced	Objective	Mitigation / Avoidance/Enhancement Measures	Schedule for Implementation	Estimated Budget (US $)	Institutional Responsibility
	subject to poor labour and working conditions.		• Provision of clear and understandable information regarding rights under national labour and employment law, and any applicable collective agreements, including those related to hours of work, wages, overtime, compensation, etc. • Provision of reasonable working conditions and terms of employment. • Provision of adequate accommodation (where relevant). • Provision of employment, compensation/remuneration and working conditions, including working hours, based on equal opportunity and fair treatment, avoiding discrimination on any aspects. • Non-discrimination in all aspects of labour recruitment, management and exit. • Provision of adequate welfare facilities on site. • Implementation of a Grievance Mechanism for Project workers (including sub-contractors). • Adoption and implementation of a sexual harassment policy. • Freedom of association. 2. Prepare a Gender Development Plan to promote gender equality in relation to job opportunities as well as support the mitigation of gender based violence, and other gender related issues within the workforce and externally (eg in project affected communities) 3. Ensure that contracts will make explicit reference to the need to abide by Malawian law and international standards (in particular IFC PS 2) and the ILO conventions ratified by Malawi relating to health and safety, labour and welfare standards. 4. Ensure that as part of any contractor and supplier selection process, performance with regard to worker management, worker rights, health and safety as outlined in Malawian law and international standards will be managed and reported on. 5. Support contractors in adhering to labour and working conditions that are in line with Malawian legislation and IFC PS 2 through awareness raising and information provision, as necessary. 6. Undertake regular checks of contractors to ensure the relevant labour laws are adhered to at all times. 7. Implement a health and safety programme will be developed that includes risk assessments (such as working at heights, confined space machine guarding), work permit systems and a H&S management system, in line with industry best practice, including worker performance safety tracking (safety observations) to assure worker safety. All workers will receive induction and continuous training regarding this system. 8. Establish a hiring mechanism to ensure no employee or job applicant is discriminated against on the basis of his or her gender, marital status, nationality, ethnicity, age, religion or sexual orientation. 9. Ensure that all workers (including those of contractors and subcontractors) will, as part of their induction, receive training on worker rights in line with Malawian legislation and international standards. 10. Ensure that all workers (including those of contractors and subcontractors) will have contracts which clearly state the terms and conditions of their employment and their legal rights. Contracts will be verbally explained to all workers where this is necessary to ensure that workers understand their rights. Contracts must be in place prior to workers leaving their home location, if applicable.		Engagement activities part of CLO responsibilities	11) ProjectCo CLO Quarterly Reports of EPC and ProjectCo activities to be undertaken by ProjectCo EHS Coordinator

Ref	Potential Impact Managed/Enhanced	Objective	Mitigation / Avoidance/Enhancement Measures	Schedule for Implementation	Estimated Budget (US $)	Institutional Responsibility
			11. Ensure that a fair and transparent worker Grievance Mechanism is in place that will be accessible to all workers, whether permanent or temporary, directly or indirectly employed. The grievance mechanism shall be open to the EPC Contractor and subcontractor workforce in the event that their grievance is not adequately resolved by their direct employer. 12. Ensure that all workers (including those of the contractor and subcontractor) will have access to training on communicable diseases, STI's and community interactions in general. This training should be developed in collaboration with local health institutions and local NGO's where practical.			
9.13	Unplanned Events: • Spill events leading to land contamination, soil and groundwater contamination	Minimise the impact of unplanned spillage events	1. The Project will develop a Hazardous Spill Response Plan (HSRP) and maintain spill clean-up and response capability adequate for addressing spills for all phases of the Project. All spills will be immediately contained and cleaned up. Contaminated areas will be remediated. 2. The Project will develop and implement a Waste Management Plan. 3. Refuelling of equipment and vehicles will be carried out in designated areas on hard standing ground to prevent seepage of any spillages to ground. Collection systems will be installed in these areas to manage any spills, fuels will be collected and either reused, or removed by a local contractor. Drip trays must be used when refuelling and servicing vehicles or equipment, where it is not on a hardstanding surface. 4. Hazardous material storage will be on hard standing and impermeable surface and the storage facility will be bunded. The Project will restrict storage and handling of hazardous materials and fuels to bunded areas of sufficient capacity to contain a release.	Plans must be in place prior to construction. Other measures regularly throughout construction phase	Costs for Plans, emergency spill kits and clean-up activities included in EPC contractor's bid.	1-4) EPC Contractor Quarterly Reports of EPC activities to be undertaken by ProjectCo EHS Coordinator
9.13	Unplanned Events: • Traffic Accidents	Reduce risk for traffic accidents impacting community health and safety	1. A Traffic Management Plan, driving codes of conduct and enhanced driver safety awareness will be implemented 2. Plan traffic routes to limit road use by the Project during high traffic periods (including pedestrian traffic) and in sensitive areas such as near schools in order to reduce interaction with public road use. 3. Assess local road conditions and discuss road maintenance during Project construction to minimise traffic risks associated with roads deteriorated from Project activities. 4. The Project will provide driver training to promote safe and responsible driving behaviour. The training will also target contractors and subcontractors. 5. Engage with local communities and authorities to inform them about plans and procedures 6. Implement awareness campaigns recording traffic and road safety in communities along the transport corridor. 7. Work with the relevant local and regional government to ensure the roads used by Project vehicles are well maintained, and that potential problems or hazards are communicated to the relevant authority timeously.	Plan must be in place prior to construction. Other measures regularly throughout construction phase	Traffic Management Plan USD 7000 Engagement as part of CLO responsibilities Driver training as part of EPC contractor bid.	1,2,3,5,6,7) ProjectCo 4) EPC Contractor Quarterly Reports of EPC and ProjectCo activities to be undertaken by ProjectCo EHS Coordinator

Table 10.2 Operational Environmental and Social Management Procedures

Ref	Potential Impact Managed/Enhanced	Objective	Mitigation/Enhancement Measures	Schedule for Implementation	Estimated Budget (US$)	Institutional Responsibility
			Positive Impacts			
8.1	Economy • Generation of electricity	Not applicable				
9.4	Groundwater: • Water supply for the Project during the operations phase is anticipated to be derived from groundwater. This may have an effect on other waters users.	To prevent the contamination of surface and groundwater and to not negatively affect other water users.	1. continuous monitoring of affected village supplies and a cessation of project abstraction if the groundwater elevation in village water supply wells reaches a pre-agreed level. 2. water storage solutions (eg tanks) for water pumped during the wet season for use during the dry season.	Regularly throughout operations	Ongoing monitoring costs to be confirmed	ProjectCo Project Manager
9.6	Landscape and Visual Amenity • Impact from solar reflection	Minimise the visual impact on surrounding sensitive receptors	1. Rehabilitation of all disturbed areas (e.g. temporary access tracks and laydown areas) must be undertaken following construction. This must be done in such a way facilitate natural regeneration of vegetation; and 2. Maintain ongoing engagement between the Project and local communities with regards to potential solar reflection impacts.	Regularly throughout operations	No additional costs required.	ProjectCo Project Manager
9.8	Access restrictions • The presence of a fenced solar site may black access of pathways that transect the solar site	Avoid disruption to pathways transecting the site	1. Undertake consultation with communities using farmland in areas affected during operation to establish the best alternative routes and measures that the Project should put in place to minimize impacts related to access restrictions.	Regularly throughout operations	As part of ProjectCo's operational costs	ProjectCo Project Manager CLO
9.11	Community safety and security • Safety hazards may arise from trespassers into the solar farm and those that illegally try to connect to the transmission line.	Avoid incidents related to trespassers and opportunists attempting to steal panels or illegally connect to the transmission line	1. Security personnel will comply with Malawian laws and regulations as well as the requirements of the Voluntary Principles for Security and Human Rights. The security will include, among other things, selection of personnel based on a careful background screening, and monitoring of performance. 2. Establish clear and visible signage in operational areas to warn the community of any risks and hazards. 3. Establish a community engagement programme to provide information about safety hazards and raise awareness of how these are being managed. This includes visits to all neighbouring communities and local schools. 4. Raise awareness to communities regarding the Grievance Mechanism to deal with community concerns and issues in a timely manner to avoid issues escalating. This will include the use of a Community Liaison Officer who will be present around the Project site during operation.	Regularly throughout operations	Quarterly Audit Reports by the ProjectCo	1,2) ProjectCo Project Manager 3,4) CLO
9.12	Labour and working conditions • The workforce may be subject to poor labour and working conditions	Avoid risks associated with labour and working conditions	o Refer to *Section 9.12.5* for mitigation measures	Regularly throughout operations	Quarterly Audit Reports by the ProjectCo	ProjectCo Project Manager
9.13	Unplanned Events: Spill events leading to land contamination, soil	Minimise the impact of	1. The Project will implement a Hazardous Spill Response Plan (HSRP) and maintain spill clean-up and response capability adequate for addressing spills for all phases of the Project. All spills will be immediately contained and cleaned up. Contaminated areas will be remediated.	Regularly throughout operations	As part of ProjectCo's operational costs	ProjectCo Project Manager

Ref	Potential Impact Managed/Enhanced	Objective	Mitigation/Enhancement Measures	Schedule for Implementation	Estimated Budget (US$)	Institutional Responsibility
	and groundwater contamination	unplanned spillage events	2. The Project will implement and Waste Management Plan. 3. Hazardous material storage will be on hard standing and impermeable surface and the storage facility will be bunded. The Project will restrict storage and handling of hazardous materials and fuels to bunded areas of sufficient capacity to contain a release.			

10.5.6 Decommissioning

A detailed decommissioning and rehabilitation plan must be developed prior to decommissioning the solar PV plant and associated infrastructure. This plan should include, but not be limited to, management of socio-economic aspects such as employment loss, removal, re-use and recycling of materials and vegetative rehabilitation to prevent erosion.

The decommissioning activities will be similar to construction activities and therefore recommendations outlined to manage construction phase impacts should be adhered to during decommissioning. Management actions should focus on the rehabilitation of disturbed areas and the removal of infrastructure.

However it is important to note that the ProjectCo and ESCOM may agree to trigger a clause in the PPA which would simply extend the term beyond 20 years. Therfore, it is possible the plant will operate beyond a 20 year life span. Furthermore, the land leases for the Project are for 50 years.

10.6 ENVIRONMENTAL AND SOCIAL MONITORING PLAN

ProjectCo will undertake environmental and social monitoring during the construction and operation phases. The monitoring commitments are included in *Table 10.3 and Table 10.4.*

Table 10.3 Construction Environmental and Social Monitoring Procedures

Ref	Potential Impact Managed/Enhanced	Objective	Monitoring Indicator	Monitoring Frequency	Estimated Budget (US $)	Institutional Responsibility
Positive Impacts						
8.1	Employment and the Economy • Employment opportunities and the need for the supply of goods and services has the potential to create jobs for the local community and improve income levels.	Provide opportunities to local communities to enhance income levels, skills/employability and improve the quality of life.	• Number of males and females employed from project affected communities • Number of males and females employed from Salima • Number / type / location of suppliers of goods and services • Review of economic trends through baseline monitoring (community level and district level – in Salima)	Quarterly reporting by ProjectCo	• Review of numbers to be embedded in the EPC contractor scope of work • USD 10,000 for review of recruitment performance	1,2,4).ProjectCo Project Manager 3) EPC Contractor Quarterly Reports of EPC and ProjectCo activities to be undertaken by ProjectCo EHS Coordinator District Commissioner to undertake review of quarterly ProjectCo monitoring report
Adverse Impacts						
9.1	Air Pollution: • Site preparation, construction activities, equipment, material and worker transportation will generate fugitive dust emissions which could act as a nuisance for nearby sensitive receptors.	Minimise deterioration of ambient air quality from construction activities	• Daily visual inspection logs • Audit report • Grievances logged	Daily visual inspection Quarterly audit reporting by ProjectCo	Ongoing maintenance costs included within the EPC Contractor's bid	1-12) EPC Contractor 13) ProjectCo CLO and EHS Coordinator Quarterly Reports of EPC and ProjectCo activities to be undertaken by ProjectCo EHS Coordinator District Environmental Officer to undertake review of quarterly ProjectCo monitoring report
9.2	Noise Pollution • Site preparation, construction activities, equipment, material and worker transportation will generate fugitive dust emissions which could act as a nuisance for nearby sensitive receptors.	To avoid disturbance to surrounding land-users by maintaining noise levels within required limits (55 dBA during the day time (07:00- 22:00) and 45 dBA during the night time (22.00 – 07.00))	• Grievances logged • Equipment/vehicle inspection logs • Equipment/vehicle manuals • Audit Report	Daily visual inspection Quarterly audit reporting by ProjectCo	1-4) Ongoing costs included in the EPC contractor's bid CLO to be hired as part of ProjectCo's operational budget	1-5) EPC Contractor 5) ProjectCo EHS Coordinator and CLO Quarterly Reports of EPC and ProjectCo activities to be undertaken by ProjectCo EHS Coordinator District Environmental Officer to undertake review of quarterly ProjectCo monitoring report
9.3	Soil Erosion • Loss of arable soils and reduced soil quality.	To avoid soil erosion and the consequent loss of soil quality and quantity.	• Daily visual inspection logs • Audit report • Grievances logged	Daily visual inspection Quarterly reporting by ProjectCo	Ongoing costs included in the EPC contractor's bid	1) As per section above 2,3) EPC Contractor Quarterly Reports of EPC and ProjectCo activities to be undertaken by ProjectCo EHS Coordinator District Environmental Officer to undertake review of quarterly ProjectCo monitoring report
9.4	Groundwater Resources	To prevent the contamination of surface and groundwater and to not negatively	• Monitoring Report	Monthly reporting by ProjectCo	USD 15,000 for monitoring and assessment programme	1-5) ProjectCo Project Manager

Ref	Potential Impact Managed/Enhanced	Objective	Monitoring Indicator	Monitoring Frequency	Estimated Budget (US $)	Institutional Responsibility
Positive Impacts						
	• Water supply for the Project during the construction phase is anticipated to be derived from the groundwater. This may have an effect on other waters users.	affect other water users in terms of water availability.	• Grievances logged • Evidence of water storage solutions		Embedded controls part of design costs for Project	Quarterly Reports of ProjectCo activities to be undertaken by ProjectCo EHS Coordinator EAD to undertake quarterly review of ProjectCo monitoring report
9.5.1	Biodiversity • Loss of Habitats and Fauna Disturbance	Minimise impacts on terrestrial flora, fauna and avifauna during construction.	• Daily visual inspection logs (including photographic evidence) • Audit Reports	Quarterly reporting by ProjectCo	1,2,4) EPC Contractor actions as part of EPC construction costs 3) Code of Conduct: 1000 USD	1,2,4) EPC Contractor 3) ProjectCo Quarterly Reports of EPC and ProjectCo activities to be undertaken by ProjectCo EHS Coordinator District Environmental Officer to undertake review of quarterly ProjectCo monitoring report
9.5.2	Biodiversity • Loss of Threatened Flora	Minimise impacts on terrestrial flora during construction.	• Daily visual inspection logs (including photographic evidence) • Audit Reports	Quarterly reporting by ProjectCo	1,2,3) EPC Contractor actions as part of EPC construction costs 4) Code of Conduct: 1000 USD	1,2,3) EPC Contractor 4) ProjectCo Quarterly Reports of EPC and ProjectCo activities to be undertaken by ProjectCo EHS Coordinator District Environmental Officer to undertake review of quarterly ProjectCo monitoring report
9.5.3	Biodiversity • Risk of Increased Invasive Alien Plants		• Daily visual inspection logs (including photographic evidence) • Audit Reports	Quarterly reporting by ProjectCo	Ongoing costs included in the EPC contractor's bid	EPC Contractor Quarterly Reports of EPC to be undertaken by ProjectCo EHS Coordinator District Environmental Officer to undertake review of quarterly ProjectCo monitoring report
9.5.4	Biodiversity • Disruption of Ecosystem Services		• Daily visual inspection logs (including photographic evidence) • Audit Reports • Grievances logged	Quarterly reporting by ProjectCo	1,3) Ongoing costs included in the EPC contractor's bid 2) Part of CLO responsibilities	1,3) EPC Contractor 2) ProjectCo CLO Quarterly Reports of EPC and ProjectCo activities to be undertaken by ProjectCo EHS Coordinator District Environmental Officer to undertake review of quarterly ProjectCo monitoring report
9.6	Landscape and Visual Amenity • Impact on the visual character of the landscape	Minimise the visual impact on surrounding sensitive receptors	• Daily visual inspection logs (including photographic evidence) • Audit Reports	Quarterly reporting by ProjectCo	Ongoing costs included in the EPC contractor's bid	EPC Contractor Quarterly Reports of EPC activities to be undertaken by ProjectCo EHS Coordinator

Ref	Potential Impact Managed/Enhanced	Objective	Monitoring Indicator	Monitoring Frequency	Estimated Budget (US $)	Institutional Responsibility
Positive Impacts						
			• Grievances logged			District Environmental Officer to undertake review of quarterly ProjectCo monitoring report
9.7	Land acquisition and displacement • Land clearance, causing economic displacement, in particular of subsistence farmers and land for livestock grazing. • Displacement of one structure used for a goat farmer in the wayleave. The structure is not used for residential purposes.	Avoid and minimise displacement as well as a mitigate negative impacts and enhance positive impacts	• Livelihood Restoration Plan	A monitoring plan will be included in the LRP. Quarterly reporting by ProjectCo	LRP development USD 60,000 LRP implementation to be determined	ProjectCo is responsible for the development and implementation of the LRP. Quarterly Reports of ProjectCo activities to be undertaken by ProjectCo EHS Coordinator District Commissioner to undertake review of quarterly ProjectCo monitoring report
9.8	Access restrictions • The presence of construction equipment and activities during this period may block pathways that transect the solar site, including access to communities and farmland	Minimise restrictions to existing pathways transecting the Project site	• Meeting minutes with affected communities to determine and avoid access restrictions • Grievances Logged	Quarterly reporting by ProjectCo	As part of CLO Responsibilities	ProjectCo CLO Quarterly Reports of ProjectCo activities to be undertaken by ProjectCo EHS Coordinator District Lands Officer to undertake review of quarterly ProjectCo monitoring report
9.9	Vector borne and communicable diseases • Construction equipment and activities have the potential to create dust emissions and create breeding grounds for vector borne illnesses affecting communities living in villages adjacent to the solar site. • Additionally the presence of the workforce during this period in combination with poor sanitary conditions has the potential to increase communicable diseases	Avoid the risk of increasing prevalence of vector borne and communicable diseases	• Health Statistics • Grievances logged • Incident Records • Worker Code of Conduct	Quarterly reporting by ProjectCo	1,3,4,5,6,7,8) Part of EPC contractor bid 2) Project : USD 2000	1,3,4,5,6,7,8) EPC contractor 2) ProjectCo Quarterly Reports of EPC and ProjectCo activities to be undertaken by ProjectCo EHS Coordinator District Health Officer with support from the officers from the Ministry of Gender to undertake review of quarterly ProjectCo monitoring report
9.10	STI/HIV transmission	Avoid an increase in STI/HIV transmission and worker-community interaction and increase in GBV / inappropriate sexual interaction in communities	• STI/HIV prevalence records • Grievances Logged • Health worker outreach reports and number of people targeted by providers • Number of condoms distributed • Assessment of NGOs addressing GBV and other gender issues • Impact monitoring of selected NGO	Quarterly reporting by ProjectCo	STI Management Plan: USD 6,000 Support for NGO USD 10,000 Implementation has part of ProjectCo's costs	1-2) ProjectCo Quarterly Reports of ProjectCo activities to be undertaken by ProjectCo EHS Coordinator District Health Officer with support from the officers from the Ministry of Gender to undertake review of quarterly ProjectCo monitoring report
9.11	Community safety and security • Security risk in relation to petty crime, increased GBV and perceptions that people in the communities are benefitting more than others creating tensions.	Avoid risks associated with safety and security	• Incident records • Grievances Logged • Meeting minutes from community engagement, including registers, photos and communication materials	Quarterly reporting by ProjectCo	1,3,4) as part of EPC contarctor bid. 2,5,6) Part of CLO resposibilities	1,3,4) EPC contractor 2,5,6) ProjectCo CLO Quarterly Reports of EPC and ProjectCo activities to be undertaken by ProjectCo EHS Coordinator

Ref	Potential Impact Managed/Enhanced	Objective	Monitoring Indicator	Monitoring Frequency	Estimated Budget (US $)	Institutional Responsibility
Positive Impacts						
	• Worker-community interactions, including the presence of security may pose a threat to the community.					District Health Officer with support from the officers from the Ministry of Gender to undertake review of quarterly ProjectCo monitoring report
9.12	Labour and working conditions • During peak construction the workforce may be subject to poor labour and working conditions.	Avoid risks associated with labour and working conditions	• 3rd Party review of Employment Contracts • Construction Camp Review • Worker grievance reported • Incident records • Grievances Logged • EPC/contractor contracts • Health and safety training records • STI training records • Gender Development Plan • Recruitment statistics	Quarterly reporting by ProjectCo	HR Policy: USD 2000 Gender Development Plan: USD 7000 Engagement activities part of CLO responsibilities	1,2,5) ProjectCo 3,4,6,7,8,9,10,12) EPC Contractor 11) ProjectCo CLO Quarterly Reports of EPC and ProjectCo activities to be undertaken by ProjectCo EHS Coordinator District Commissioner to undertake review of quarterly ProjectCo monitoring report
9.13	Unplanned Events: • Spill events leading to land contamination, soil and groundwater contamination	Minimise the impact of unplanned spillage events	• Daily visual inspection logs (including photographic evidence) including of hazardous material and waste containment and clean up kits. • Audit Report • Grievances Logged • Incident Report • Waste Management Plan • Hazardous Spill Response Plan	Quarterly Audit Reports by the ProjectCo	Costs for Plans, emergency spill kits and clean-up activities included in EPC contractor's bid.	1-4) EPC Contractor Quarterly Reports of EPC activities to be undertaken by ProjectCo EHS Coordinator EAD to undertake review of quarterly ProjectCo monitoring report
9.13	Unplanned Events: • Traffic Accidents	Reduce risk for traffic accidents impacting community health and safety	• Daily visual inspection logs (including photographic evidence) including of hazardous material and waste containment and clean up kits. • Audit Report • Grievances Logged • Incident Report	Quarterly Audit Reports by the ProjectCo	Traffic Management Plan USD 7000 Engagement as part of CLO responsibilities Driver training as part of EPC contractor bid.	1,2,3,5,6,7) ProjectCo 4) EPC Contractor Quarterly Reports of EPC and ProjectCo activities to be undertaken by ProjectCo EHS Coordinator District Commissioner to undertake review of quarterly ProjectCo monitoring report

Table 10.4 Operational Environmental and Social Monitoring Procedures

Ref	Potential Impact Managed/Enhanced	Objective	Monitoring Indicator	Monitoring Frequency	Estimated Budget (US$)	Institutional Responsibility
Positive Impacts						
8.1	Economy • Generation of electricity	Not applicable				
Adverse Impacts						
9.4	Groundwater: • Water supply for the Project during the operations phase is anticipated to be derived from groundwater. This may have an effect on other waters users.	To prevent the contamination of surface and groundwater and to not negatively affect other water users.	• Monitoring Report • Grievances logged • Evidence of water storage solutions	Bi-annual Audit Reports by the ProjectCo	Ongoing monitoring costs to be confirmed	ProjectCo Project Manager EAD to undertake review of annual ProjectCo monitoring report
9.6	Landscape and Visual Amenity • Impact from solar reflection	Minimise the visual impact on surrounding sensitive receptors	• Audit Reports • Grievances logged	Bi-annual Audit Reports by the ProjectCo	No additional costs required.	ProjectCo Project Manager EAD to undertake annual review of annual ProjectCo monitoring report
9.8	Access restrictions • The presence of a fenced solar site may black access of pathways that transect the solar site	Avoid disruption to pathways transecting the site	• Meeting minutes with affected communities to determine and avoid access restrictions • Grievances logged	Bi-annual Audit Reports by the ProjectCo	As part of ProjectCo's operational costs	ProjectCo Project Manager CLO District Commissioner to undertake review of annual ProjectCo monitoring report
9.11	Community safety and security • Safety hazards may arise from trespassers into the solar farm and those that illegally try to connect to the transmission line.	Avoid incidents related to trespassers and opportunists attempting to steal panels or illegally connect to the transmission line	• Incident reports • Community engagement records, including registers, photos and communication materials • Signage in hazardous locations • Audit Reports • Grievances logged	Bi-annual Audit Reports by the ProjectCo	Quarterly Audit Reports by the ProjectCo	1,2) ProjectCo Project Manager 3,4) CLO District Commissioner to undertake review of annual ProjectCo monitoring report
9.12	Labour and working conditions • The workforce may be subject to poor labour and working conditions	Avoid risks associated with labour and working conditions	• Refer to *Section 9.12.5*	Bi-annual Audit Reports by the ProjectCo	Quarterly Audit Reports by the ProjectCo	ProjectCo Project Manager District Commissioner to undertake review of annual ProjectCo monitoring report
9.13	Unplanned Events: Spill events leading to land contamination, soil and groundwater contamination	Minimise the impact of unplanned spillage events	• Annual review of Plans • Incident reports •	Bi-annual Audit Reports by the ProjectCo	As part of ProjectCo's operational costs	ProjectCo Project Manager EAD to undertake review of annual ProjectCo monitoring report

10.7 IMPLEMENTATION

The Project is committed to providing resources and establishing the systems and components essential to the implementation and control of the ESMP. These include appropriate human resources and specialised skills, training programmes, communication procedures, documentation control and a procedure for the management of change.

10.7.1 Environmental and Social Management Organisation

The Project is ultimately responsible for the management and supervision of all Project activities and will have principal responsibility for implementing this ESMP and the mitigation measures.

During construction, the Project will delegate some responsibility to construction contractors. The Project will be responsible for operation but may engage contractors for certain operational aspects and in these cases, contractors would be delegated some responsibility for environmental and social performance. As a contractual requirement, the contractors will be required to demonstrate compliance of their activities against the ESMP. This includes providing resources to ensure compliance of next tier contractors and a process for emergency stop-work orders in response to monitoring triggers.

The Project will manage its contractors to ensure that this ESMP is implemented and monitored effectively through contractual mechanisms and regular direct oversight.

10.7.2 Roles and Responsibilities

The Project is committed to provide resources essential to the implementation and control of the ESMP. Resources include the appropriate human resources with specialised skills. The Project will have dedicated personnel judged to be competent on the basis of appropriate education, training, and experience to manage and oversee the EHS aspects of project construction.

Table 10.5 Environmental Management Organisation Roles and Responsibilities

Position	Responsibility
The Project Team	
Project Manager	Technical aspects of the Project including subcontractor supervision during construction.
EHS Coordinator	Ensuring that the Project and subcontractors operate in accordance with the applicable regulatory environment, health and safety requirements and plans. Ensure that environment, health and safety regulatory requirements are met and that ESMP requirements are properly implemented.
Community Liaison Officer (CLO)	Liaise with local communities and government regulators on the Project's behalf. Implement EHS awareness and education programmes with communities.
EPC Contractor	Responsible for subcontractor technical and EHS performance and compliance.

Supervision of subcontractor activities will be conducted by the Project Manager.

The Project's Construction Manager and EHS Coordinator will be placed locally at the Project site to supervise subcontractors during construction while the Project's Operations Manager and EHS Coordinator will supervise subcontractors during operational activities. The organisation includes a CLO whose role is crucial to the successful implementation of the ESMP and the continuation of liaison with the local community.

10.7.3 Training and Awareness

The Project will identify, plan, monitor, and record training needs for personnel whose work may have a significant adverse impact upon the environment or social conditions. The Project recognises that it is important that employees at each relevant function and level are aware of the Project's environmental and social policy; potential impacts of their activities; and roles and responsibilities in achieving conformance with the policy and procedures. Training and awareness-raising therefore forms a key element of both EHS and the expediting of this ESMP.

Key staff will, therefore, be appropriately trained in key areas of EHS management and operational control with core skills and competencies being validated on an on-going basis. The identification of training and awareness requirements and expediting of the identified training/awareness events will be the responsibility of the EHS Coordinator:

This will be achieved through a formal training process. Employee training will include awareness and competency with respect to:

- Environmental and social impacts that could potentially arise from their activities (including, air quality and noise);
- Legal requirements in relation to environmental and social performance;
- Necessity of conforming to the requirements of the EISA and ESMP, in order to avoid or reduce those impacts;
- Activity-specific training on waste management practices, documentation systems and community interactions; and
- Roles and responsibilities to achieve that conformity, including those in respect of change management and emergency response.

The EHS Coordinator is responsible for coordinating training, maintaining employee-training records, and ensuring that these are monitored and reviewed on a regular basis. The EHS Coordinator will also periodically verify that staff are performing competently through discussion and observation.

Employees responsible for performing site inspections will receive training by drawing on external resources as necessary. Training will be coordinated by the EHS coordinator prior to commissioning of the facilities. Upon completion of training and once deemed competent by management, staff will be ready to train other people.

Similarly the Project will require that each of the subcontractors institute training programmes for its personnel. Each subcontractor is responsible for site EHS awareness training for personnel working on the job sites. The subcontractors are also responsible for identification of any additional training requirements to maintain required competency levels.

10.7.4 Communication

The Project will maintain a formal procedure for communications with the regulatory authorities and communities. The EHS Coordinator is responsible for communication of EHS issues to and from regulatory authorities whenever required. The Project manager is kept informed of such communications and pertinent information arising from such interactions will be communicated to contractors through the EHS Coordinator.

The CLO will be responsible for disseminating information and coordinating community communications through the course of the Project.

The Project will implement a grievance mechanism whereby community members can raise any issues of concern. Grievances may be verbal or written and are usually either specific claims for damages/injury or complaints or suggestions about the way that the Project is being implemented. When a grievance has been brought to the attention of the Project team it will be logged and evaluated. The person or group with the grievance is required to present grounds for making a complaint or claiming loss so that a proper and informed evaluation can be made.

Where a complaint or claim is considered to be valid, then steps are required to be undertaken to rectify the issue or agree compensation for the loss. In all cases the decision made and the reason for the decision will be communicated to the relevant stakeholders and recorded. Where there remains disagreement on the outcome then an arbitration procedure may be required to be overseen by a third party (eg government official). Local community stakeholders will be informed on how to implement the grievance procedures.

10.7.5 Documentation

The Project will control EHS documentation, including management plans; associated procedures; and checklists, forms and reports, through a formal procedure. All records will be kept on site and will be backed up at offsite locations (including secure cloud storage facilities). Records will be kept in both hard copy and soft copy formats. And all records will be archived for the life of the project.

The EHS Coordinator is responsible for maintaining a master list of applicable EHS documents and making sure that this list is communicated to the appropriate parties. The EHS Coordinator is responsible for providing notice to the affected parties of changes or revisions to documents, for issuing revised copies and for checking that the information is communicated within that party's organisation appropriately.

The subcontractors will be required to develop a system for maintaining and controlling its own EHS documentation and describe these systems in their respective EHS plans.

10.7.6 Managing Changes to Project Activities or Project Setting

Changes in the Project may occur due to unanticipated situations. Adaptive changes may also occur during the course of the project life cycle. The Project will implement a formal procedure to manage changes in the Project that will apply to all project activities.

The objective of the procedure is to ensure that the impact of changes on the health and safety of personnel, the environment, plant and equipment are identified and assessed prior to changes being implemented.

10.8 CHECKING AND CORRECTIVE ACTION

10.8.1 Introduction

Checking includes inspections and monitoring as well as audit activities to confirm proper implementation of checking systems as well as effectiveness of mitigations. Corrective actions include response to out-of-control situations, non-compliances, and non-conformances. Actions also include those intended to improve performance.

10.8.2 Inspection

EHS inspections will be conducted weekly on an *ad hoc* basis and formally at least once every six months. The results of the inspection activities will be reported to the Project management to be addressed.

10.8.3 Monitoring

Monitoring will be conducted to ensure compliance with regulatory requirements as well as to evaluate the effectiveness of operational controls and other measures intended to mitigate potential impacts. Monitoring parameters are included in the ESMP.

In addition, lender requirements may include other forms of external monitoring as specified by the lending institution.

All key monitoring activities will be undertaken by the ProjectCo and recorded. Any monitoring and inspection from government authorities will be agreed to prior to construction.

10.8.4 Auditing

Beyond the routine inspection and monitoring activities conducted, audits will be carried out internally by the Project to ensure compliance with regulatory requirements. Audits to be conducted will also cover the subcontractor self-reported monitoring and inspection activities. The audit shall be performed by qualified staff and the results shall be reported to the Project management to be addressed.

The audit will include a review of compliance with the requirements of the ESIA and ESMP and include, at a minimum, the following:

- Completeness of EHS documentation, including planning documents and inspection records;
- Conformance with monitoring requirements;

- Efficacy of activities to address any non-conformance with monitoring requirements; and

- Training activities and record keeping.

There will also be a cycle of audits into specific areas or activities of the Project. The frequency of audits will be risk based and will vary with the stage of the Project and will depend on the results of previous audits.

10.8.5 Corrective Action

Impacts will be identified and associated risks addressed before an incident occurs. Investigating a 'near miss' or actual incident after it occurs can be used to obtain valuable lessons and information that can be used to prevent similar or more serious occurrences in the future.

The Project will implement a formal non-compliance and corrective action tracking procedure for investigating the causes of, and identifying corrective actions to, accidents or environmental or social non-compliances. This will ensure coordinated action between the Project and its subcontractors. The EHS coordinator will be responsible for keeping records of corrective actions and for overseeing the modification of environmental or social protection procedures and/or training programs to avoid repetition of non-conformances and non-compliances.

10.8.6 Reporting

If required, the Project will provide appropriate documentation of EHS related activities, including internal inspection records, training records, and reports to the relevant authorities. Subcontractors are also required to provide EHS performance reporting to the Project on a regular basis through weekly and monthly reports. These will be used as inputs to the above.

Quarterly and annual monitoring reports will be provided to various government authorities as requested.

11 IMPACT SUMMARY

This is the ESIA Report for the construction and operation of a 60 MW solar PV project and 4km transmission line in Salima, Malawi. The ESIA has been conducted to evaluate the impacts associated Project in accordance with international best practice (such as the IFC PS) and national legislative requirements.

11.1 IMPACTS REQUIRING DETAILED ASSESSMENT

Following a Scoping exercise, this IA was focussed on interactions between the Project activities and various resources/receptors that could result in significant impacts. *Table 11.1* presents the outcomes of the comprehensive assessment of identified impacts as a result of the various phases of the Project. Impacts are classified as *negligible* to *moderate* significance, with the implementation of mitigation measures captured within the ESMP Framework table; there are no residual impacts of *major* significance.

Positive impacts are expected through the employment of up to 200 people for the construction activities. Up to 20 people are expected to be employed during the operational activities associated with the ongoing maintenance requirements. Enhancement measures have been included in the ESIA to maximise on positive impacts. In addition, the generation of electricity will be a significant positive impact for the country.

Table 11.1 Summary of Impact Assessment Findings

Potential Impact	Project Phase	Significance (Pre-mitigation)	Residual Significance (Post-mitigation)
Generation of electricity	Operation	Positive	Positive
Employment and economy	Construction and Operation	Positive	Positive
Nuisance and impact to air quality from dust emissions	Construction	Moderate	Minor
Nuisance from construction noise	Construction	Moderate	Minor
Soil erosion and reduced soil quality	Construction	Moderate	Minor
Reduction in groundwater quality and availability	Construction	Moderate	Minor
Biodiversity- loss of habitat and faunal disturbance	Construction	Minor	Negligible
Biodiversity- loss of threatened flora	Construction	Moderate	Minor
Biodiversity- risk of increased invasive alien plants	Construction	Minor	Negligible
Biodiversity-disruption of ecosystem services	Construction	Moderate	Minor
Change in landscape and visual amenity	Construction	Moderate	Minor
Change in landscape and visual amenity from solar reflection	Operation	Moderate	Minor
Physical and economic displacement from project land take	Construction	Major	Minor
Access restrictions from project land take	Construction and Operations	Moderate	Minor
Increased risk of vector borne or communicable diseases	Construction	Minor	Negligible
Increase risk in STI/HIV transmission	Construction	Minor	Negligible
Increase risk to community safety and security	Operation	Minor	Negligible
Increase risk to community safety and security	Operation	Moderate	Minor

There is always the potential for unplanned events such as spills/ improper disposal of waste and traffic accidents. These have been identified (see *Section 9.13)* and preventative measures will be put in place to reduce the likelihood of these occurring. With these measures in place the likelihood and risk of the event will be reduced significantly.

11.2 SUMMARY OF IMPACT MANAGEMENT AND MONITORING COSTS

Impact monitoring and management costs are divided between the ProjectCo and the EPC contractor. The management and monitoring tables in *Section 10* allocated responsibility for the costs. Many of the costs will form part of the EPC contractor's day to day activities during construction and therefore will form part of the costs. Where additional items are required for the production of plans or monitoring activities, the responsibility and estimated costs are allocated.

The ProjectCo are planning to develop a 60 MW PV plant on a 168 ha land plot in Salima District situated in the Central Region of Malawi. Accordingly the ProjectCo appointed ERM to undertake the ESIA of the Project.

An impact assessment process was undertaken in line with Malawian Environmental Management Act of 1996 and international best practice (IFC Performance Standards) by evaluating the Project activities against the existing baseline conditions at the Project site in Salima District, Central Malawi. A Scoping Report was submitted in June 2018 and disclosed to the lenders. The purpose of the Scoping Report was to identify the potential interactions between the Project related activities and the existing environmental and social resources/receptors and to prioritise the scope of work for the ESIA assessment. Formal stakeholder engagement was undertaken with Government departments and project affected communities.

The Scoping Report identified a number of potential impacts that required further assessment in the ESIA stage:

- Air quality impacts (including dust).
- Noise Impacts.
- Landscape and visual amenity impacts.
- Groundwater impacts (quality and quantity).
- Soil erosion.
- Impacts on biodiversity.
- Land Acquisition and, Physical and Economic Displacement.
- Restrictions/Disruption to Access Routes.
- Temporary Influx / Community Cohesion.
- Transmission of Vector Borne or Communicable Diseases.
- Transmission of Sexually Transmitted Infections (STIs)/HIV.
- Risk to Community Safety and Security.
- Unfair/unsafe Labour and Working Conditions.
- Employment and the Economy.
- Generation of Electricity.
- Unplanned Events.

Following the Scoping phase, an ESIA was undertaken. This ESIA assessed the impacts described in the bullet list above. The assessment demonstrated that, with the implementation of committed mitigation measures during the construction and operational activities of the Project, the majority of impacts are of *moderate or minor significance*. The following impacts were identified to have *major* significance prior to mitigation:

- Land acquisition and, physical and economic displacement.

- Land and groundwater contamination from unplanned spills/improper disposal of waste; and

- Traffic accidents.

Mitigation and preventive measures have been included within the ESMP which will minimise the potential negative impacts and the residual risk remains of moderate or minor significance. Positive impacts are expected from the creation of local employment opportunities during the construction phase, capacity building and economic development as well as long term local employment opportunities through on the job training and capacity development. Enhancement measures have been proposed to maximise the potential positive benefits. In addition, the generation of electricity will have a significant positive impact on Malawi.

The land acquisition for the Project has been undertaken in two phases. Phase I refers to an initial 80 ha plot of land (government-led land acquisition process already completed) and Phase II refers to additional 88 ha plot of land (land acquisition process in progress). The land acquisition process for Phase I was led by the Salima District Office and undertaken at the end of 2017. 72 people were compensated by Phase I of land acquisition: 50 people in Kanzimbe Village (24 males and 26 females) and 22 people in Mayambo Village (8 males and 14 females). In terms of Phase II, a total of 166 people are impacted (77 males and 89 females).

As there is only economic resettlement, a Livelihood Restoration Plan (LRP) will be developed in parallel with the ESIA. The plan will set out the extent and scale of displacement impacts, engagement related to land acquisition, eligibility and entitlements for affected persons and the implementation, monitoring and evaluation requirements.

In summary, ProjectCo is committed to working with the local community and authorities during the construction and operation of the Project and will maintain open dialogue as part of their ongoing stakeholder engagement activities. On the basis and the basis of the whole ESIA, it is recommended the Project continue as planned.