1 EXECUTIVE SUMMARY

1.1 INTRODUCTION

This Environmental and Social Impact Assessment (ESIA) report presents an assessment of the potential environmental and social impacts associated with the proposed 200MW Combined Cycle power plant (CCPP) and Project facilities in Kanbauk, Yebyu Township, Tanintharyi Region, Myanmar ('the Project').

This report has been prepared for **Myanmar UPA Company Limited** (hereinafter referred to as **'the Sponsor'** or **'MUPA'**) by **Environmental Resources Management** (hereinafter referred to as **'ERM'**) supported by **Sustainable Environment Myanmar** (hereinafter referred to as **'SEM'**), and presents the objectives, methodology and outcomes of the ESIA study.

1.2 PROJECT BACKGROUND AND OVERVIEW

The Sponsor has been approved by the Ministry of Electric Power (MOEP) (the predecessor of Ministry of Electricity and Energy (MOEE)) of the Government of Myanmar (GOM) as a private sector Independent Power Producer (IPP) to develop the Project in Kanbauk within the framework of a Memorandum of Agreement (MoA) signed in August 2014 and under a Power Purchase Agreement (PPA) signed in March 2016. The Project comprises of the following Project facilities:

- 200MW Combined Cycle Power Plant (CCPP);
- Water Intake Pumping Station including Water Treatment Facility;
- Water Intake Pipeline; and
- The Fuel Supply Infrastructure consisting of Gas Metering Station located within the MOGE Gas Receiving Station and Gas Supply Pipeline from Gas Metering to the Power Plant.

It should be noted that the existing gas pipeline connection from the offshore gas source(s) to MOGE Gas Receiving Station and the proposed overhead transmission line from the Project Site connecting to the Sub-Station is outside the scope of this ESIA Study.

The technology of the Project is an efficient form of combined cycle power generation which was designed for high reliability and efficiency operation with lower environmental impact. The Project will operate on natural gas as its only fuel.

The electrical capacity and electricity generated will be sold under a 30 year Power Purchase Agreement ("PPA"), as agreed with Electric Power Generation Enterprise (EPGE). The total Project cost is approximately US 300 million dollars.

1.3 PROJECT NEED

Parallel to growth in GDP, electricity demand in Myanmar has increased dramatically in recent years. ADB released a report on Myanmar's energy sector in October 2012 in which the future power demand was estimated to be doubling from 12,459 million kWh in 2012-2013 to 25,683 million kWh in 2018-2019 (ADB, 2012).

As of July 2013, Myanmar's power is predominantly generated from hydropower, gas and coal, representing over 70%, 22% and 3% of the total power generation respectively. [(1)] Out of the 3,735 MW of total installed capacity, approximately 835 MW is of gas-fired power generation. Due to the lack of water during dry season, hydropower generation has not been able to operate at full capacity and therefore electricity supply has been unstable during that time.

The Project is in line with the effort of Myanmar to reduce the country's reliance on hydropower by adding 1,740MW of gas-fired generation capacity in the coming years, which will increase the gas-fired capacity to over 50% of the total generation mix. [(2)]

1.4 THE PROJECT

The Project Sponsor is planning to develop a 200MW Combined Cycle Power Plant (CCPP) in Yebyu Township, Tanintharyi region in the Republic of the Union of Myanmar.

1.4.1 Project Location

The Project site is located approximately in Kanbauk Village, Yebyu Township, Dawei District in the Tanintharyi Region, the Republic of the Union of Myanmar as shown in ***Figure 1.1.***

(1) MEPE (2013). http://www.ubifrance.com/medias/press/mepe_9_7_2013_29_31.pdf Accessed 8 June 2015.

(2) Sharma, Vikas (2013). An Overview of Electricity Market in Myanmar. http://www.slideshare.net/VikasSharma128/myanmar-electricity-industrydec2013 Accessed 8 June 2015.

Figure 1.1 Project Location

The Power Plant will be located on a brown field site, with a total of 9.47 hectares (ha). The land is currently owned by EPGE, however, the land has been allocated for this Project and the Land Lease Agreement between the Project Proponent and EPGE is being proceeded.

The following 10 villages are located in close proximity (5km radius from the Project site boundary):

- Mi Gyaung Auing village;
- Hle Gone village;
- Kanbauk village;
- On Bin Kwin village;
- Heinze village;
- Shin Byan village;
- Pet Taung village;
- Pyin Gyi village;
- Gan Gaw Taung; and
- Ye Ngan Zeik village.

The Heinze River is located approximately 3km north-west of the Project site boundary, where the Water Intake Facilities will be installed.

1.4.2 Project Facilities

The Project Facilities and Associated Facilities are described below. A total area of approximately 9.47 hectares (ha) is allocated for the Project facilities.

- ***200MW Combined Cycle Power Plant*** comprising of the following main components:
  - 1 set of Gas Turbine (GT) units;
  - 1 set of Heat Recovery System Generator (HRSG);
  - 1 steam turbine generating unit with associated auxiliary equipment;
  - 230kV Switchyard area (located in adjacent to the existing 66kV Switchyard);
  - Workshop/ warehouse and administrative building;
  - Cooling Tower and Cooling Water System;
  - Water Storage Tank; and
  - Laydown Area.
- ***Water Intake Pipeline*** connecting the CCPP with the ***Water Treatment Facility***, located on the embankment of the Heinze River, where the raw water will be withdrawn from the Heinze River, through the ***Water Intake Pumping Station***. The Water Intake Pipeline will be approximately 3.3km in length and approximately 30cm in diameter.
- ***The Fuel Supply Infrastructure*** consisting of Gas Metering Station located within the MOGE Gas Receiving Station and Gas Supply Pipeline from Gas Metering Station to the Power Plant is owned by the Project Proponent. The Gas Supply Pipeline is approximately 2.6km in length, with 25cm diameter.

200 MW Combine Cycle Power Plant (CCPP)

The Power Plant is designed to operate continuously, in combined cycle mode. During normal combined cycle operation, the heat of exhaust gas will be admitted to the Heat Recovery Steam Generator (HRSG) where superheated steam will be produced which will drive the steam turbine to generate electrical power. The exhaust gas from the HRSG will be released from the main stack of the HRSG to the atmosphere. It is anticipated that the Power Plant will operate at full load for the majority of the time.

The HRSG is designed for dual pressures with reheat steam generation (High Pressure (HP) and Low Pressure (LP)) used to maximize energy transfer from the exhaust gas of the gas turbine. The HP steam generated by the HRSG will be fed to the HP steam turbine and the reheat and LP steam will be fed to the LP steam turbine.

The power output is net 200MW during combined cycle operation. The Power Plant will use natural gas as the only fuel.

Cooling Water System

The mechanical draft cooling tower cooling water systems is selected for this Project. The main cooling water system will provide cooling water to the steam turbine condenser by means of cooling water pumps installed in the cooling tower basin. The warm water from the condenser is returned to the multi-cell mechanical draft cooling tower, where it is cooled and collected in the cooling tower basin for return to cool the condenser.

Raw Water System

The water intake system includes the Water Intake Pumping Station, the Water Treatment Facility, the Water Intake Pipeline and the Water Storage Tank. The Water Intake Pumping Station and Water Treatment Facility will be installed at Pyin Gyi.

The raw water will be taken from Heinze River, using the Water Intake Pumping station at the flow rate of approximately 860 m3/hour. The raw water will be treated by the water treatment facility, Reverse Osmosis system, installed at the Heinze River bank.

The treated water will be delivered to the Project site, via a 30cm diameter Water Intake Pipeline, with a total length of approximately 3.3km and will be stored in the Water Storage Tank, located at the Project Site. The proposed Water Intake Pipeline will run from the Water Treatment Facility to the Water Storage Tank located within the Project Site. The Water Intake Pipeline will be installed, along an existing road.

The capacity of raw water storage tank is approximately 30,000m3, which can satisfy the water consumption of the plant for 3 days including the fire-fighting system.

Emission Controls

The Project will be equipped with the following equipment:

- Dry Low NOx burners will be installed to achieve low NOx emissions; and
- Continuous Emissions Monitoring Systems (CEMS) will be installed with a CEMS which shall monitor the concentrations of NOx as specified in FIC EHSG and NEQ Guidelines for Thermal Power (Natural Gas Combustion Turbine > 50 MWth).

1.4.3 Associated Facilities

Currently, the existing MOGE Gas Receiving Station is located 1.7Km to the north west of the Project site, offtaking the natural gas from Yanada and Zawtika. The Gas Metering Station is located within the boundary of the MOGE Gas Receiving Station. The natural gas is transported to the Project Site via a 25cm diameter buried Gas Supply Pipeline, with a total length of approximately 2.6km.

1.4.4 Project Life Cycle Overview

For the purposes of this report, the Project is divided into 3 phases: Construction Phase, Operation Phase and Decommissioning Phase.

Construction Phase

Construction is expected to start in the mid of 2019 and be complete in the region of 30 months with commercial operation targeted at the end of 2021.

Construction activities of the Project will include: mobilisation, site clearance, onshore construction of all Project components and commissioning. Heavy equipment such as bulldozers, excavators, dump trucks, compactors, etc. will be used at the Project Site.

The EPC Contractor will be appointed to undertake the engineering, procurement and construction activities of the Project. The EPC Contractor will be responsible for implementation of the mitigation, management measures and monitoring programme defined in this report under the Sponsor's supervision.

Operation Phase

The start of operation is anticipated for the end of 2021. The Project will be owned and operated by the Sponsor. The Operation and Maintenance (O&M) of the Project will be undertaken by the Sponsor with the support of a long term service agreement (LTSA) for the GT with the manufacturer and external expertise on each function to counterpart and provide the intensive in house training during commission until 3 years after SCOD. The LTSA will cover the supply of spare parts, supervision and specialized labour for inspections, major and minor overhauls.

O&M staff with relevant experience of operating similar plants and with adequate knowledge of comparable technology will be deployed prior to commissioning and take over the Project from the EPC Contractor.

Decommissioning Phase

It shall be noted that this Project will be developed on 'Build-Operate-Transfer' (BOT) basis. It is expected that by the end of Operation Phase, the Project will be transferred to the MOEE. However, for completion of this report, the Decommissioning Phase has been considered, based on general practice only.

The design lifespan of the power plant is estimated to be 30 years. The Project facilities will be designed with decommissioning in mind. In general, facilities and machinery will be designed so that they can be isolated and decommissioned in steps which are in reverse of the installation procedure or which are most convenient to do so. The decommissioning phase activities will therefore be similar to those associated with the excavation/foundation work, installation and civil construction phases.

1.5 ALTERNATIVE ANALYSIS

The main design criteria and project type were determined by MOEP to develop the competitive tender process and are therefore beyond the remit of this report.

However, the alternative analysis was conducted for the following aspects:

- Alternatives of the Power Generation Options;
- Alternatives of Configuration on Site; and
- Alternatives of Technological Options.

1.6 ADMINISTRATIVE FRAMEWORK

The Project will conform to the legal and administrative requirements of the Republic of the Union of Myanmar. The Project will also conform to international treaties to which Myanmar is signatory, and to the International Finance Corporation (IFC) Performance Standards (IFC PS) (2012) and other associated guidelines.

1.6.1 *Overview of Myanmar Legislation*

The latest enacted Constitution (May 2008) provides information on governing laws and regulations in Myanmar. The Constitution takes precedence over any other national legislation or international agreements.

Myanmar is divided into twenty-one (21) main administrative subdivisions, which include:

- Seven states;
- Seven regions (Note that regions were previously referred to as "divisions", prior to August 2010);
- Five self-administered zones;
- One self-administered division; and
- One union territory

States and regions are divided into districts. Districts consist of townships, which are composed of towns, wards and village-tracts. Village-tracts are groups of adjacent villages. The administrative structure of the states, regions and self-administering bodies is defined in the Constitution.

Each region and state has a Regional/State Government, consisting of a Chief Minister, Ministers and an Advocate General. Legislative authority resides with the State/Regional "Hluttaw" (a parliament or legislative body), which are made up of elected civilian members and representatives of the military.

1.6.2 ESIA Requirements in Myanmar

Myanmar adopted regulatory requirements for ESIA studies on the 29th December 2015. Laws related to ESIA requirements are as follows:

- Environmental Policy, 1994, Myanmar Agenda 21, 1997, and National Sustainable Development Strategy, 2009;
- The Environmental Conservation Law, 2012;
- Environmental Conservation Rules (2013);
- Foreign Investment Law, 2012, Foreign Investment Rules, 2013, and Notifications for Investment, 2013;
- Environmental Impact Assessment Procedures (2015); and
- Myanmar National Environmental Quality (Emission) (NEQ) Guidelines (2015).

1.6.3 International Standards and Applicable Guidelines

In addition to national legislation, the Project will be undertaken to comply with a range of international standards, including the World Bank Group Safeguard Policies and the IFC Performance Standards (IFC PS). These standards are set to complement and reinforce national legislation and ensure the Project is conducted under best practices in a way that minimizes risks, impacts and ensures compliance and fair practices. The international performance standards and guidelines provide guidance on how to identify risks and impacts, and are designed to help avoid, mitigate, and manage risks and impacts as a way of doing business in a sustainable way, including stakeholder engagement and disclosure obligations of the client in relation to project-level activities.

The applicable guidelines and standards for the Project are as follows:

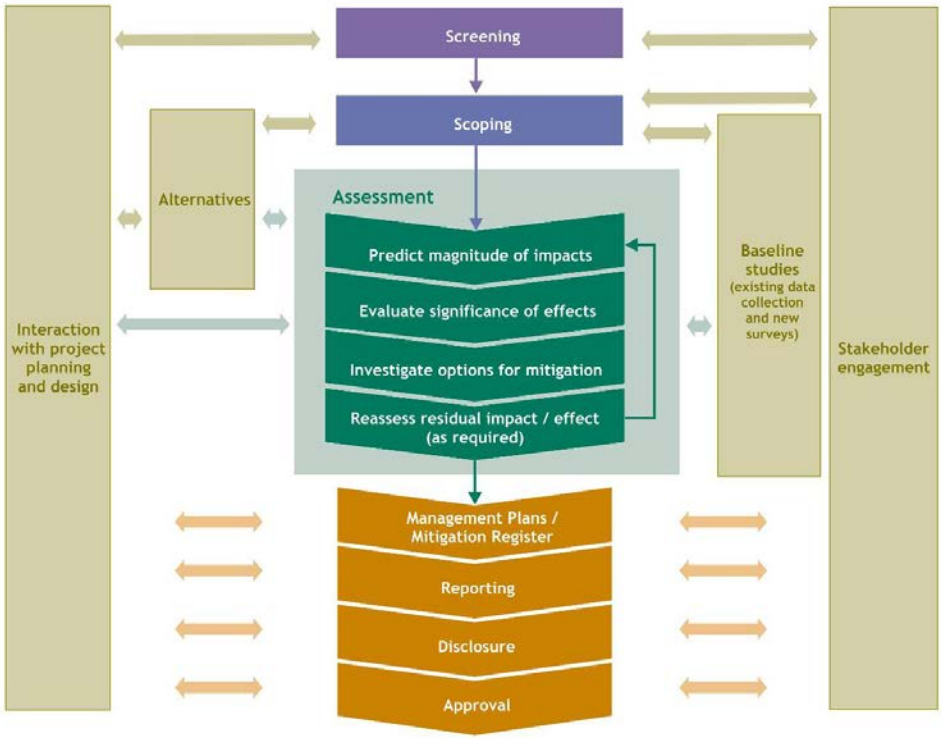
- The IFC's Performance Standards (IFC's PSs) (2012);
- IFC/World Bank Group (WBG) EHS Guidelines and WBG EHS Guidelines for Thermal Power (2007 and 2008);
- IFC's Stakeholder engagement handbook and other relevant Good Practice Notes;
- IFC's Handbook for Preparing a Resettlement Action Plan (if applicable)

- Kyoto Protocol to the UNFCC on Climate Change (1997);
- United Nations Convention on Biological Diversity (1992);
- Basel Convention (1989);
- Ramsar Convention on Wetland (1971); and
- International Union for Conservation of Nature and Natural Resources, Red List of Threatened Species (1964).

1.7 IMPACT ASSESSMENT METHODOLOGY

The ESIA methodology follows the overall approach illustrated in ***Figure 1.2***. The ESIA has been undertaken following a systematic process that evaluates the potential impacts the Project could have on aspects of the physical, biological, social/ socio-economic and cultural environment; identifies preliminary measures that the Project will take to avoid, minimise/reduce, mitigate, offset or compensate for potential adverse impacts; and identifies measures to enhance potential positive impacts where practicable.

Figure 1.2 Overall Impact Assessment Process



The stages of the ESIA process are described below.

Screening

At the initial stage of the ESIA, preliminary information was provided to aid in the determination of what legal and other requirements apply to the Project. This step was conducted utilising a high level description of the Project and its associated facilities.

Scoping

During the scoping study, potential interactions between the Project, environmental and human resources/receptors were identified, and prioritised in terms of their potential to cause impacts of concern. A scoping report was submitted to ECD in December 2016.

Project Description

In order to set out the scope of the Project features and activities, with particular reference to the aspects which have the potential to impact the environment, a Project Description has been prepared.

Baseline Conditions

To provide a context within which the impacts of the Project can be assessed, a description of physical, biological, social / socio-economic and cultural conditions that would be expected to prevail in the absence of the Project is presented. The baseline includes information on all receptors and resources that were identified as having the potential to be significantly affected by the proposed Project.

Stakeholder Engagement

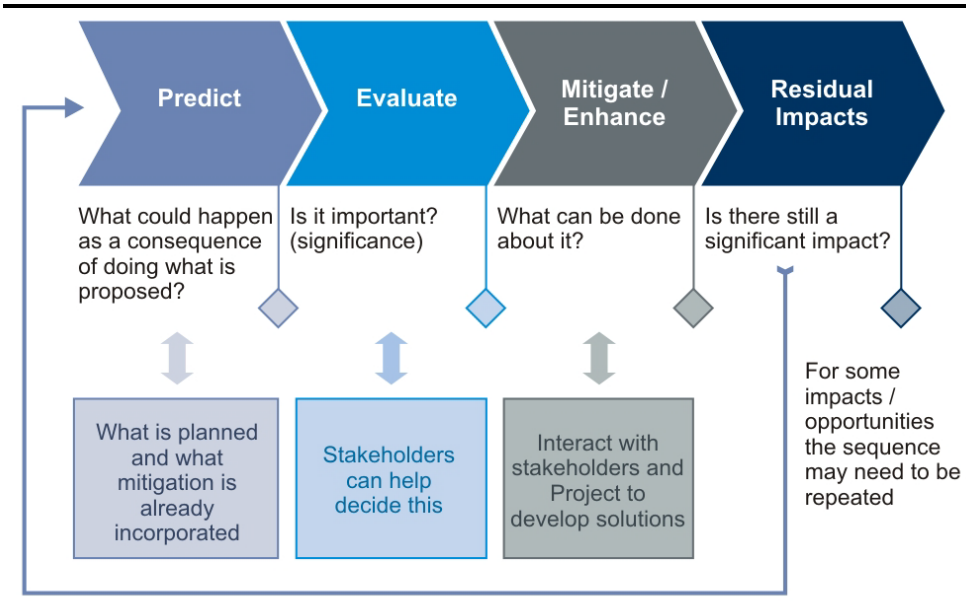
An effective ESIA Process requires engagement with relevant stakeholders throughout the key stages. This assists in understanding stakeholder views on the Project and in identifying issues that should be taken into account in the prediction and evaluation of impacts.

Impact Assessment

Impact identification and assessment starts with scoping and continues through the remainder of the ESIA Process. The principal ESIA steps are summarized in ***Figure 1.3*** and comprise:

- **Impact prediction:** to determine what could potentially happen to resources/receptors as a consequence of the Project and its associated activities;
- **Impact evaluation:** to evaluate the significance of the predicted impacts by considering their magnitude and likelihood of occurrence, and the sensitivity, value and/or importance of the affected resource/receptor;
- **Mitigation and enhancement:** to identify appropriate and justified measures to mitigate negative impacts and enhance positive impacts; and
- **Residual impact evaluation:** to evaluate the significance of impacts assuming effective implementation of mitigation and enhancement measures.

Figure 1.3 Impact Assessment Process



Identification of Mitigation and Enhancement Measures

Once the significance of a potential impact has been characterised, the next step is to evaluate what mitigation and enhancement measures are warranted. For the purposes of this ESIA, ERM has adopted the following Mitigation Hierarchy:

- Avoid at Source, Reduce at Source;
- Abate on Site;
- Abate at Receptor;
- Repair or Remedy; and
- Compensate in Kind, Compensate Through Other Means.

Management, Monitoring and Audit

The final stage in the ESIA Process is definition of the basic management and monitoring measures that are needed to identify whether: a) impacts or their associated Project components remain in conformance with applicable standards; and b) mitigation measures are effectively addressing impacts and compensatory measures and offsets are reducing effects to the extent predicted.

The Environmental and Social Management Plan (ESMP) has been developed as part of the ESIA report. The ESMP generally refers to the Project specific plan which will set out how the requirements, management and mitigation measures, and any other commitments will be implemented, managed and monitored. It will lay out information such as the responsible parties for implementing the Project commitment, any monitoring requirements and associated standards or thresholds, the timing of monitoring, check methods and corrective actions, and any training requirements.

1.8 DESCRIPTION OF THE ENVIRONMENT

The biophysical environmental baseline conditions within the Project Study Area are based on secondary data from published sources as well as primary data collected to fill data gaps.

The Study Area refers to the area that needs to be studied in order to adequately understand and describe the baseline conditions likely to be affected by the Project. This area varies according to the potential impacts on a resource or receptor (influenced by spatial and temporal dimensions). For the purpose of this study, a circular area of 5Km in diameter around the proposed CCPP project site has been considered alongside a 500 meters area each side of the Water Intake Pipeline. When necessary data have also been collected outside of these area if a potential impact from the Project was expected.

The baseline studies were carried out through field trip during both the rainy and the dry season where teams of specialists were deployed on site to collect data on the biophysical environment. The social, socio-economic and cultural baseline study was conducted in parallel of the Public Participation Engagement in November 2016.

1.8.1 Climate and Meteorology

Most of Myanmar belongs to the tropical region. The climate of Myanmar is roughly divided into three (3) seasons: Summer, Rainy Season, and Winter Season. Summer months are from March to Mid-May; the rain falls from Mid-May to the end of October and the Winter Season starts in November up to the end of February.

Most rainfall is received at the Project site from May to October, with June, July and August being the most consistently wet months in comparison to the rest of the year.

Mean wind speeds tend to fluctuate throughout the year, with two distinct peaks and troughs. Easterly and south easterly winds dominate. The prevailing wind direction will mean receptors to the West and North West of the Project site will be impacted.

1.8.2 Ambient Air Quality

Ambient air quality monitoring was undertaken at 3 selected baseline air sampling locations, located in the vicinity of the Project Site. Ambient air quality monitoring was undertaken at each of the selected monitoring sites using two (2) approaches so as to capture both short and long term trends in ambient air quality in both the dry and wet season. Monitoring was undertaken using the Haz-Scanner for a 72-hour period at each monitoring location in both the dry and wet season and have been used as indicative of the short term (24-hour) trend in ambient air quality in the study area. Monitoring was also undertaken using the diffusion tube methodology for a continuous three (3) week period at each monitoring location in both the dry and wet season. This information has been used as indicative of long term (annual) concentrations of both NO_x and NO_2.

The results from the monitoring conducted in the area indicate that ambient concentrations of NOx and NO2 are below the relevant air quality standards; however ambient concentrations of SO2, PM2.5 and PM10 are found to exceed the relevant air quality standards..

1.8.3 Noise

Baseline noise monitoring was conducted at 3 existing noise sensitive receivers (NSRs) located near the Project Site. Hourly A-weighted equivalent continuous sound pressure levels (LAeq, 1 hour) were recorded continuously over 24 hours at each location during both weekday and weekend. At each location, daytime and night-time LAeq were calculated by averaging the hourly sound pressure levels measured between 0700 and 2200 hours and between 2200 to 0700 hours, respectively.

The averaged background noise levels are 61dB(A) and 50dB(A) during daytime and night-time periods, respectively. The background noise levels are typical of a general rural environment and dominant noise sources were traffic along access roads and community activities around stations. The background noise levels exceeded both the noise limits set out in NEQ and IFC General EHS guideline values during daytime and night-time periods. In accordance with the NEQ and IFC Guidelines, noise impacts should not result in a maximum increase in background levels of 3dB(A) at the nearest receptor

1.8.4 Surface Water Quality

The Project lies in Tanintharyi Region, which consists of several rivers and small streams originating from the mountains along the eastern border region.

The main river within the Project area is Heinze River. The Heinze River is located approximately 3km north-west of the Project site boundary. The river becomes brackish during the dry season. The catchment area in Kanbauk is approximately 37 km2. Most part of this river is under tidal influence. It flows into the Andaman Sea through a funnel-shaped estuary. The estuary and creeks are navigable by small craft and are fringed by mangrove forest. There are number of villages located on its banks, therefore, the river is currently used for fisheries, navigation and marine logistic purposes.

Results of wet season survey indicate that Arsenic and Cyanide levels were compliant with the criteria at all monitoring locations. Concentrations of Lead (0.0043mg/l) and Iron (1.16mg/l) at SW4 were found to exceed the USEPA CCC criteria of 0.0025mg/l and 1.0mg/l respectively but were complaint with the standard at all other locations. The results for total dissolved solids indicated high concentrations at SW1 (10,998mg/l) and SW2 (9,858mg/l). This is likely due to the dissolved salt in the brackish water.

Results of dry season survey indicate that Arsenic was found at levels above the EPA Criteria (chronic) at SW2 and SW6. This is likely due to arsenic content in the nearby soils being carried by runoff, as high arsenic levels were also found in soil samples.

In addition, the results indicated high concentrations of total dissolved solids (TDS) at all stations, as well as very high conductivity. This is again likely due to the dissolved salt in the brackish water.

Total Coliform Bacteria levels were also found to be higher than during the wet season survey. The presence of total coliform bacteria indicates that there is at least some existing faecal contamination of the River. Sources of total coliform include sewage waste from humans and fecal matter from warm-blooded animals such as livestock, both of which could either be directly discharged into the river or carried in runoff during rainfall.

1.8.5 Soils

Soils in the Study Area are classified primarily as Gleysol Soils. The soils are composed of Saline Muddy Soil Mangroves. This soil has high salt and water, low oxygen and high hydrogen sulphide contents. It contains a high proportion of humus (Macnae, 1968). The best growth and development of mangroves takes place on alluvial and muddy soils, which are generally formed by the deposition of water-borne soil particles. Mangrove soils are mostly anoxic except for the surface layer in which roots spread (Rag, 1987). Soil samples were collected from two (2) sample points in the study area on the 26th September 2016 and tested for heavy metal content. Top soil was collected from 10 - 30 cm in depth and sub soil from 2.7 - 3.0 m in depth.

The results indicate that concentrations of arsenic at both sampling sites were in exceedance of the USEPA screening criteria. The measured concentrations of all other heavy metals were below the USEPA RSL for resident soil.

1.8.6 Groundwater

Groundwater samples were collected from three (3) household wells in riparian communities located within 1 km of the Project site on the 26th September 2016. The results indicate that heavy metal levels are compliant with the US EPA National Primary Drinking Water Regulations and WHO standard at all monitoring locations. The pH was found to be lower than the US EPA Standards which is in agreement with the previous groundwater results from the survey done by TEAM Consulting in 2013.

1.8.7 Landscape and Visual

The proposed CCPP will be located on a vacant brown field site. It is on rolling terrain with the highest ground level area at the central northeast side (ground level: 28 m above mean sea level (MSL)), the northern tip of land at 12-17 m MSL and lower ground level at the southern and eastern side at 7.5 m MSL. Some land along the northern section of the site is lower than 5 m MSL. This Project site is surrounded by agricultural land and old rubber plantations and the main Heinze River is approximately 3km north-west of the CCPP site boundary. To the north of the site boundary is a paved road and agricultural area, to the south a tributary of the Heinze River and some agricultural land and to the east a paved road, habitation, agricultural

area and a monastery. To the west there is an existing dirt road and the closest village houses within the villages of Mi Gyaung Auing and Hle Gon.

The proposed Water Intake Pumping Station and Treatment facility is located on the Heinze River on the border with Pyin Gyi Village. The location is on a small inlet surrounded by mudflats and mangrove habitat.

The longstanding residents of the villages have a high level of association with the landscape, particularly the surrounding agricultural land. All agricultural land is accessible to these people, and it is highly likely that they place great value on this landscape due to the high contribution it makes to livelihoods in the area. There are also a number of local pagodas and worshipping sites in the area. Visitors to these sites will classically confer a high value to the landscape and visual context of these sites and are considered to have high sensitivity.

1.8.8 Terrestrial and Aquatic Biodiversity

The Project Study Area resides within the lowland evergreen and semi-evergreen rain forests of the western side of Arakan Yoma and Tenasserim ranges along the west coast of Myanmar. According to the World Wide Fund for Nature (WWF) Wildfinder database, it is located in the Ecoregion known as the Myanmar Coastal Rain Forests .

This EcoRegion is within a tropical wet climate and receives monsoonal rainfalls during April to October. The remaining periods of the year tend to be dry. The habitats contained in the EcoRegion vary from tropical rainforests to lowland forest and mangroves along the coastal areas. The EcoRegion's position means that it acts as a corridor between the Sundaic, Indochinese, and Indian sub-regions.

The EcoRegion has low endemism but contains a broad mix of flora and fauna. Protected Areas are not well represented in the EcoRegion with around 4% contained within a Protected Area.

Coastal areas of the EcoRegion are currently in a degraded state with large tracts of land cleared for agriculture. Land around the port cities of Dawei and Myeik is particularly degraded.

In Myanmar, Key Biodiversity Areas (KBAs) fall in different land management categories including protected areas, public protected forests, community-conserved forests, community forests, reserve forests and other resource and land use areas. Therefore, they accommodate different management systems such as government, private, community-led and joint management. Within the last decade, KBAs were reviewed and updated in order to identify and prioritize investment opportunities for biodiversity conservation in Myanmar.

A total of 132 KBAs were identified for Myanmar and prioritized based on Species-based Vulnerability and Site-based Vulnerability. A total of three KBAs were identified under Alliance for Zero Extinction (AZE), one as a Ramsar site, 53 important bird areas, and six ASEAN Heritage Parks.

The Project Area is located 18km SW from the Tanintharyi National Park which is an Important Bird Area (IBA) and was assessed in 2004 . The National Park is 259,000 ha in size. The Project Area is also 30KM NE from the Moscos Kyun Archipelago Wildlife Sanctuary which also an IBA. The Project area is not located within a KBA. The Project Area is located near to two Protected Areas being the Tanintharyi National Park (18km SW) and the Moscos Kyun Archipelago Wildlife Sanctuary (30KM NE). The Project Area is not located within a Protected Area.

ERM's sub-contractor undertook site surveys in both dry and wet seasons. These surveys were conducted to determine the location of any priority biodiversity values within the Project Area and Area of Influence. These priority values focused on Critical Habitat triggers as well as species of conservation significance. The surveys consisted of a desktop assessment to identify species and habitats to be prioritized for survey; identification of sampling locations (including local villager interviews); field surveys targeting major flora and fauna groups; and taxonomy and mapping of flora and fauna records identified. Habitat assessments were also undertaken to inform Natural Habitat and Modified Habitat mapping as required by IFC PS6.

1.9 *DESCRIPTION OF THE SOCIO-ECONOMIC BASELINE*

Myanmar is divided into a number of States and Regions (sometimes also referred to as Divisions), which are further divided into Townships for governance purposes. The Project site is located in the Yebyu Township in the Tanintharyi region.

Receptors that may be impacted or influenced by the Project due to their proximity to the Project site and/ or Project associated facilities includes:

- Mi Gyaung Auing village. The village is located directly next to the Project site. The village is also located along the road that connects the Project site to Kanbauk;
- Hle Gone village. The village is located approximately 0.6 km south west of the Project site;
- Kanbauk village. The village is located approximately 2.1 km south west of the Project site;
- Shin Byan village. The village is located approximately 2.5 km north east of the Project site;
- Pyin Gyi village. The village is located approximately 3.3 km north west of the Project site and next to the Water Intake Pumping facility;
- Gan Gaw Taung village. The village is located approximately 3.3 km south east of the Project site;
- Pet Taung village. The village is located approximately 4.5 Km south west of the Project Site;
- On Bin Kwin village. The village is located approximately 4.5 Km north west of the Project Site;

- Ya Ngan village. The village is located approximately 3.9 Km north east of the Project Site;

A desktop review of publicly available information was conducted, and primary data was collected through a visit to the study area. Primary data were collected through a variety of methods so that the data could be triangulated. This included:

- Key informant interviews with village leaders.
- Focus groups with key sectors within each of the villages.
- Household surveys (total of 300 household surveys).

1.9.1 *Demographic Profile*

As of January 2017, it was estimated that the population of Myanmar was approximately 57 million. The population in the Tanintharyi Region was estimated to be 1.4 million, divided into 3 districts and 16 townships in 2014.

As of 2016, it was estimated that 65.7% of the population lives in rural areas, while 34.3% of the population resides in urban areas. For the Tanintharyi region, the percentage of people living in rural area was approximately 75%. Yebyu Township has a population of approximately 100,760 people, most of whom (approximately 96%) live in rural areas.

The largest ethnic group in Myanmar is the Burmans, which make up more than half of the population (68%). This is followed by Shan (9%), Karen (7%), Rakhine (4%), Chinese (3%), Indian (2%), Mon (2%) and other (5%).

In terms of the villages located in the Project area, the largest village is Kanbauk, with a population of approximately 9,976 people, while the smallest village is Phet Taung, with a population of approximately 125 people. The villages in terms of ethnicity, language and religion, reflect the broader Myanmar population – i.e. are Buddhist Burmans that speak Myanmar, but Kanbauk also house an Hindu temple and a Mosque.

1.9.2 *Community Health*

The life expectancy in Myanmar is 64 years of age for men and 68 years of age for women. The leading causes of morbidity are largely associated with communicable diseases and pregnancy/ child birth. In terms of mortality, again the leading causes are largely associated with communicable diseases i.e. human immunodeficiency virus (HIV)/ acquired immune deficiency syndrome (AIDS).

The prevalence of communicable diseases can be exacerbated by availability of and access to clean drinking water and sanitation facilities. According to the Ministry of Health, in 2012, Myanmar had 987 public hospitals with a total of 54,503 beds. In addition to existing health facilities, the use of traditional medicine is widespread and forms an integral part of the country's health services.

In the study area, based on interview with public health officer, communicable and non-communicable diseases are present. Leading causes of morbidity appear to be hypertension, diabetes, acute respiratory infection (ARI), stroke and common fever linked to influenza are observed as most occurring diseases. Pregnancy and/ or child birth is not considered by health officers as being an health issue in the study area with a maternal mortality rate of 0.2 per 1000 birth and infant mortality rate of 0.18 per 1000 birth, similar to the number at the regional level.

Malaria, hypertension, liver diseases and accident (traffic) were all mentioned as the most usual cause of mortality in the study area. There has been a reduction of death due to malaria in the recent years while the number of fatality related to traffic accident has been increasing

1.9.3 Economy and Livelihood

In 2015, Myanmar's gross domestic product (GDP) was estimated to be $62.6 billion. The per capita GDP was approximately $1,160 - one of the lowest in Southeast Asia and lower than the previous year.

Myanmar is in a transition from a centrally directed economy to a market-oriented economy. This has been supported by a reform program launched by the government in 2011. The key sectors of the economy include agriculture, forestry and fishing.

Agriculture

Traditionally, Myanmar has been reliant on the agriculture sector (and to a lesser extent forestry and fishing). Approximately half of all agricultural land in Myanmar is devoted to cereal crops, such as rice. Other agricultural products include beans, sesame, groundnuts, sugarcane, and hardwood. The agricultural sector is the primary employer in the Project area.

The crops cultivated in Yebyu Township are paddy, sesame, crane and corn. In addition, rubber, oil palm, betel and coconut are cultivated as long term plantation. The main cash crops are rubber, betel, palm, cashew, jack fruit, rambutan, cane and durian. Other crops are pineapple and pepper. Cashew and betel nuts are sold at Dawei Market. Most of the household also own an orchard but few own a paddy rice field.

In addition to crops, livestock rearing is another source of income in Myanmar. A variety of animals are raised, including duck, cattle, water buffalo, goats, sheep, chickens, and pigs. In 2014/2015, duck was the most commonly raised livestock, with 18.3 million, followed by cattle and chicken.

In the Tanintharyi Region, the most commonly raised livestock is duck, followed by chicken. Villagers raise a variety of livestock, including pig, goat, duck, buffalo, sheep and poultry. However, more households are involved in crop production, than livestock rearing and even more in fishing.

In many instances the livestock are reared for personal consumption and in limited occasion, sold to the market. Both men and women are involved in the rearing of livestock. This includes fodder collection, dung cake preparation, milking and selling of milk or taking it to cooperatives, and vaccination and other veterinary services.

Forestry

Approximately 48% of Myanmar was covered by forest in 2011, but According to the FAO, between 2010-2015, Myanmar lost 3.2 million hectares of forests, about 10.8 per cent of its forest cover. In 2011, the forestry sector contributed approximately 0.5% to GDP, and employed approximately 36,000 people but the government has agreed a temporary national logging ban between August 2016 and March 2017, closing the forests for one complete logging season.

According to the land Record Department, the majority of the Yebyu Township is covered by forest land with 527,883 acres of forest reserves. Gurjan, Karen wood, Dropping fig, Shiral, Dog fruit, Kalod, Bumese ironwood are the species the most commonly observed.

There is no forest reserve in the villages located in the study area and no villages have declared being involved in the forestry activity. The collection of forest products on the other hand is widely developed for household consumption in particular to collect wood for cooking. Villagers in the study area use wood for cooking. The wood is collected from areas close to the villages – e.g. nearby agricultural properties.

Fisheries

The fishing industry contributes approximately 8% to GDP. The industry is separated into three components – inland fisheries, marine fisheries and aquaculture. The marine sector makes up approximately 52% of the industry, followed by inland fisheries (27%) and aquaculture (20%).

Even though fishing is popular in some villages in the study area, it is generally not the primary livelihood in the study area. Fishing is significant especially in Pyin Gyi, Mi Gyaung Auing and Oh Pin Kwin and mainly takes place in Heinze river. The types of boats used in fishing are usually 5 metres long and the motor capacity is 5/6 hp. The boats' carrying capacity is about 300 kilos. Gillnetting, Drift Netting, Hook and Line, Hand and Crab trap are widely used for fishing in the studied area.

1.9.4 Community Infrastructure and Public Services

The limited access to and the poor state of existing infrastructure and services have been identified as impediments to development in Myanmar. This includes the provision of basic health and education services, as well as other infrastructure such as roads, telecommunications, drinking water and waste management (World Bank 2015).

Access to Electricity

In terms of lighting, a range of sources are available. The most commonly used are electricity, candle, and batteries.

The access to electricity is likely to change in the future given the investment that the Myanmar government is making in the power sector. A number of new power plants are being developed in order to provide an increasing number of people with electricity.

Most of the household in the study area have access to the electricity. Among these almost half of them get 24 hours service. Some villages only get electricity for 3 hours while the norm seems to be 10 hours per day. However, electricity shortage occurs frequently especially in the peak time during summer. For domestic energy, most of the household use gas and charcoal. People can purchase gas at Kanbauk and for charcoal they can buy the charcoal within the village which is imported from Min Thar Village.

Transportation

A variety of transport methods are used in Myanmar, including roads, rail, air and water. In some areas the various modes of transport are well developed, while in other areas they are quite limited.

Within the Project area, the main transportation mode is motorbike. Moreover, there are shuttle buses not only to other villages but also to Dawei. Most of the respondents travel to other villages almost every day. The roads in the study area are well maintained except the road between Kanbauk and Pet Taung.

Waste Management

In Myanmar, it is anticipated that approximately 0.45 kilograms of waste is produced per capita per day. This includes organic waste, commercial waste and paper and plastic waste. It is estimated that nearly 65% of the waste generated is organic waste. This is attributed to the size of the agricultural sector, as the agricultural sector largely generates organic waste.

In the study area, wastewater is largely directed back into the ground or into the nearest stream. Solid waste disposal is the responsibility of each household. Specific disposal areas exist in Kanbauk, Hle Gone and Mi Chaung Aing but there is no collective system or collect organised. Burning within the compound, dump in waste dump site or discharge into the nearest stream are common practice.

1.9.5 *Cultural Heritage*

Desktop study supplemented by field survey conducted identified no known archaeological resources; or ancient above ground resources but several items of living heritage sites within the cultural heritage study area. All the identified items are pagoda complexes and monasteries as well as churches and a mosque. Most of these items are located within or in close proximity to human settlements. No tangible cultural heritage resources were identified within the project's footprint (i.e. the CCPP site boundary and proposed water intake facilities and pipeline).

A range of national festivals and ceremonies (i.e. intangible cultural heritage) are held throughout Myanmar. Examples include the Water Festival and Myanmar New Year. Pagoda complexes and monasteries are often at the centre of these festivals and ceremonies.

1.10 *STAKEHOLDER ENGAGEMENT*

Project stakeholders have been engaged at a number of points during development of the ESIA. The focus of the engagement activities has been to:

- Introduce the Project and provide ongoing updates as the design of the Project is further refined;
- Provide an overview of the likely impacts and proposed management measures and corresponding monitoring activities;
- Gather stakeholder insights and input, including feedback on the identified impacts, proposed management measures and monitoring activities; and
- Respond to key issues raised by stakeholders.

Stakeholders were encouraged to ask questions and raise concerns throughout the engagement process. A range of issues and concerns were raised by stakeholders. Key issues included:

- Employment. Most of the villages indicated that they would like to benefit from the employment opportunities that will be created by the Project;
- Availability and quality of surface and ground water. Stakeholders expressed concern that Project activities (e.g. discharge of waste water, use of water from the Heinze River) may impact the quality of water and/ or reduce the amount of water available for use by local villagers;
- Access to electricity. Many of the Project area villages do not have access to reliable electricity. There is a keen interest from villagers to be address this issue through the Project, including regarding lower prices;
- Monitoring of the management plans and engagement taken by the Project Sponsor. Many villagers enquired about the responsibilities in term of monitoring of the Management Plans by the company or the ECD.
- CSR Programme. In all the villages, stakeholders expressed interest in MUPA's CSR programme in the area.

- Baseline. Some stakeholders requested to have access to the data collected during the baseline, in particular for surface water quality.

The issues and concerns captured during the stakeholder engagement activities have been incorporated into development of the ESIA. The information has been used to inform the impact identification and assessment process as well as the identification of management measures and monitoring activities.

Engagement will continue to occur throughout construction and operation of the Project and the comments received during Public Participation for the presentation of the draft study will be followed-up by MUPA, in particular regarding grievance redressal process.

1.11 KEY ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

All construction and operation activities that were likely to cause environmental and social impacts were identified, and evaluated to assess their magnitude, duration, and potential receptors.

1.11.1 Construction Phase

The activities which have the potential to cause impacts on surrounding environment and receptors during the construction phase are identified as:

- Site preparation;
- Transportation of construction material and machinery for the power plant by road/ rail and heavy machinery/ equipment by barges up to temporary jetty location;
- Wastewater discharges and runoff, including contaminated surface water runoff, and increased erosion and sedimentation from excavation and foundation works; Inappropriate waste storage and disposal; and
- Pressure on local water supplies due to Project's water intake requirements.
- Dredging of water channel up to the temporary jetty depending on available water depth during the heavy lift transportation;
- Construction of the main buildings and infrastructure at the power plant and the water intake facilities including the pumping station, the water treatment facility and the water intake pipeline;
- Excavation of equipment foundations and installation of power plant components;
- Laydown areas for temporary use during construction phase;
- Storage and handling of hazardous materials, waste and wastewater; and
- Accommodation and transportation for the construction workforce and the Sponsor personnel.

- vehicle movements over unpaved surfaces within construction areas and on unpaved roads;
- earthworks including site clearance, site formation and levelling involving excavation and spoil dumping;
- concrete batching;
- construction of the main buildings and infrastructure at the power plant and the water intake facilities including the pumping station, the water treatment facility and the water intake pipeline; and
- air emissions from construction vehicles and non-road machinery within the construction site boundaries and on access roads.

Air Quality

The construction of the Project has the potential to generate dust and particulate matter (Total Suspended Particulate (TSP), PM_{10} and $PM_{2.5}$) to air as a result of material transfer, soil movements, stockpiling materials and the use of construction vehicles on unmade access roads. Fugitive dust and particulate matter (PM) has the potential to cause health impacts on air sensitive receivers in the vicinity of construction activities if not managed accordingly.

Dust emissions from the Project site may also result in nuisance issues when depositing onto surfaces, for example, property, vehicles and washing. In addition, dust deposition can affect sensitive vegetation due to the soiling of leaves hindering photosynthesis and the blockage of leaf pores.

With implementation of the recommended control measures (namely, dust suppression measures and good site practices at the construction worksites), the magnitude of the air quality impact is considered to be **minor**.

Greenhouse Gas

During construction, the Project will involve Scope 1,Scope 2, and Scope 3 emissions as follows;

- Scope 1 direct emission mainly from mobile combustion from heavy machinery (e.g. excavators, bulldozers, cranes, etc.) and vehicles using diesel.
- Scope 2 indirect emission from purchased electricity.
- Scope 3 indirect emissions from transmission loss.

Based on the calculated GHG emissions, the emissions from the construction phase are estimated to be 3,079 tonnes CO_2e (Scope 1, Scope 2, and Scope 3). This is considered insignificant emissions according to IFC. GHG emissions are global pollutants. The concentration of GHG in the atmosphere beyond the level of naturally occurring concentrations could result in more heat being held within the atmosphere. Although overall the atmosphere is sensitive to impacts from GHG emissions, the local atmosphere is not expected to be any more or less sensitive to potential impacts to GHG.

Surface Water Quality

During the construction phase, potential water quality impacts may arise from wastewater discharge and runoff, inappropriate waste storage and disposal, and Project water use.

Potential impacts to surface water quality are expected to be long-term and localised in nature, and can be controlled with the implementation of good construction practices and adequate wastewater treatment systems on-site. Therefore, the residual impact is considered to be **minor**.

Noise

The construction activities of particular importance for potential noise impacts are: Site preparation, pile driving and foundation works, installation of equipment and construction of the infrastructure such as internal access roads, storm water drains and security fence.

The predicted noise levels at the two identified representative NSRs do not comply with the NEQ and IFC General EHS Guidelines during daytime period. Noise mitigation measures are considered necessary to mitigate the noise impact due to construction of the Project. With the implementation of mitigation measures (such as the use of noise barriers) the impact due to the construction of the Project is considered to be a **negligible** significance at the nearest receptors.

Landscape and Visual

Visual impacts from earthworks, light emissions, disturbance and physical presence of new facilities will be local to the confines of the Project Sites although some light emissions will be visible further away and any facilities higher than current fencing surrounding of the CCPP site will become more visible as they rise above it. Based on the implementation of the proposed mitigation measures, the significance of these impacts is considered to be a **minor to moderate** Negative Impact post mitigation.

Soil and Groundwater

During construction phase, the following impacts to soil and groundwater may occur:

- Loss of soil structure, quantity and quality due to improper management during site clearance activities;
- Soil and groundwater contamination due to improper construction waste storage and disposal;
- Soil and groundwater contamination due to improper discharge of waste water discharges and runoff; and
- Soil and groundwater contamination due to potential accidental leaks and spills.

Construction of the Project will be carried out by the EPC Contractor appointed by the Sponsor. The EPC Contractor will handle, store and dispose of all waste in accordance with applicable guidelines to prevent soil and ground water contamination. With other

mitigation measures such as proper storage of chemicals and fuel, drip or spill trays for spills and leaks, site specific emergency response plan for soil clean –up and training by contractors, demarcating routes for heavy vehicle movement, retaining top soil for reuse, the impact to soil and groundwater would be mostly **negligible**.

Waste

During the construction phase, a range of waste materials will be generated either due to the daily activities of the construction workforce (e.g. generation of putrescible waste) as well as a range of general construction waste such as concrete, steel pipes, plastic pipes, steel plates, structural steel and wooden crates during the civil works phase of construction. Whilst most of these are likely to be non-hazardous, some of these may be hazardous include used paint, engine oils, hydraulic fluids, spent solvents, spent batteries etc.

Improper waste management may result in indirect impacts to community and work health and safety due to contamination of drinking water or food; accidental leaks or spills of oil, fuel or other hazardous materials could potentially pollute surface waters; and soil may be contaminated by pollution from spills or leaks of fuel, oil and other hazardous liquid wastes which are incorrectly stored. Implementation of proper mitigation measures including waste management plan (both non-hazardous and hazardous) will minimise the impacts. With implementation of the mitigation measures, the residual impact is expected to be **negligible**.

Terrestrial and Aquatic Biodiversity

Construction activities such as clearance of vegetation disturbance and displacement of species, motality from machinery strike, and introduction of invasive species have the potential to impact the local and downstream biodiversity as well as impacts to priority biodiversity values.

Mitigation measures can be implemented to manage the disturbance during construction such that biodiversity values are **not significantly impacted** or impacts are reduced by the application of the mitigation hierarchy.

Community Health and Safety

The community health and safety impacts, as those associated with changes in environmental conditions, increased prevalence of diseases and heavy traffic movement are assessed as moderate. Impacts due to construction workers camp, laydown areas and logistics on the community health and safety will be temporary and can be considered as **moderate**.

Social Impacts

In terms of overall social impact, the construction phase in one hand will generate employment, benefit local enterprises, while on the flipside will cause labour influx, cause some displacement/disruption of communities, and will have noise and dust impacts to some extent. Mitigation measures include maximising local procurement and employment to reduce and manage influx, labour management measures,

ensuring no local resources are indiscriminately used by the Project, developing resettlement and livelihood restoration plan, developing compensation plan, consultation with stakeholders, review of land acquisition/procurement, health interventions etc. The residual impact is expected to remain, however, it is considered to be **negligible**.

Cultural Heritage

There are no known archaeological or ancient above ground resources in the area; but a number of items of living heritage sites were identified within the cultural heritage study area.

No significant intangible cultural heritage was identified and no adverse impact is anticipated through interview with villagers and stakeholder's meeting. Religious buildings, in particular the Monastery located in Pyin Gyi may be impacted by construction activities of the Water Intake Facilities, in particular the pipeline laying activities. With the appropriate mitigation measures described in this report, the impact can be considered **negligible**.

Air Quality

The key emission sources associated with the operation of the Project are stack emissions from the combustion of natural gas during plant start up, normal combined cycle operation; and from the combustion of diesel from the backup generator during emergency conditions.

The main substances of concern for a gas-fired combined cycle power plant and diesel generators include oxides of nitrogen (NO_x), nitrogen dioxide (NO_2), sulfur dioxide (SO_2) and particulate matters (PM) including respirable suspended particulates (PM_{10}) and fine suspended particulates ($PM_{2.5}$) [3].

Whilst emissions of SO_2, PM_{10} and $PM_{2.5}$ are likely from the combustion of natural gas, they are expected to be minimal provided that the combustion process is efficient and the hydrogen sulfide (H_2S) content of the gas remains low. Thus, impacts on air quality from Project operations are considered **negligible**.

Greenhouse Gas

During operation phase, electricity for the Power Plant will be supplied by the Plant itself, so there would be no Scope 2 emissions to consider. Scope 1 emissions of GHG from the plant operation will mainly come from the gas turbine generators.

The emissions from Power Plant are calculated to be 1,570,642.28 tonnes of CO_2eq or 1.57 million tonnes CO_2eq per annum. Compared to Myanmar's GHG emissions of 357.02 million tonnes CO_2eq in 2010, the total GHG releases from the Project is

[3] PM_{10}: shall mean particulate matter which passes through a size-selective inlet as defined in the reference method for the sampling and measurement of PM10, EN 12341, with a 50 %efficiency cut-off at 10 µm aerodynamic diameter; $PM_{2.5}$: shall mean particulate matter which passes through a size-selective inlet as defined in the reference method for the sampling and measurement of PM2.5, EN 12341, with a 50 %efficiency cut-off at 10 µm aerodynamic diameter. Definition from the European Union Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe

approximately 0.44%.The estimated GHG emissions from the Power Plant during operation will exceed the threshold that defines significant emitters of GHGs by the ADB SPS and EP III (100,000 tonnes CO_2e per year) and IFC PS3 (25,000 tonnes CO_2e per year). Therefore, the Project is required to implement measures for GHG reduction, and report annual GHG emissions as per the applicable reference framework.

The Project employs the most effective GHG reduction measure and mitigation measures have been put in place to monitor the GHG emission. As there will be no reduction in the impact level, the post-mitigation impact significance is considered a **moderate** Negative Impact.

Surface Water Quality

During the operation phase, potential surface water impacts may arise from domestic wastewater discharge, inappropriate waste storage and disposal,pressure on local water supplies due to Project's water intake requirements, and impacts to surface water hydrology from increased impervious surfaces.

As the wastewater generated at various areas of the plant will be collected and treated at the wastewater treatment plant, meeting the discharge standards of the Myanmar NEQ and World Bank/ EHS guidelines, the impact is considered to be **minor**.

Noise

The sources of noise associated with the operation of the power plant are expected to include the heat recovery steam generators (HRSG), gas turbines, steam turbine and cooling tower.

The predicted operational noise levels at NSR1 exceed both the NEQ and IFC General EHS Guidelines during daytime and night-time periods, meanwhile, the predicted noise levels at NSR2 exceed noise criteria during night-time period. Noise mitigation measures are considered necessary to mitigate the noise impact due the operation of the Project. With the implementation of mitigation measures (such as the use of noise barriers) the impact due to operation of the Project is considered to be a **negligible** significance at the nearest receptors.

Landscape and Visual

The long term presence of the Project is anticipated to have impacts upon both the landscape and visual amenity. For the CCPP plant there is just one stack, reaching up to 50m. While this is high, there is only one such tall structure that will be visible to a farther distance than the main CCPP Plant itself. The majority of the plant is considered to be no more than two-storey buildings with some taller facilities up to a maximum of 10m high. Overall the bulk of the CCPP Plant is considered of medium scale within this rural context.

Based on the implementation of the proposed mitigation measures, the significance of the impact is considered to be a **minor** to **moderate** Negative Impact post mitigation

Soil and Groundwater

During the operation phase, potential soil and groundwater impacts may arise from:

- Loss of soil due to increased erosion potential during operations;
- Soil and groundwater contamination due to potential leaks, spills and leaks;
- Soil and groundwater contamination due to improper construction waste storage and disposal; and
- Soil and groundwater contamination due to improper discharge of waste water discharges and run-off.

It is noted that soil and groundwater contamination due to improper waste storage and disposal would be the result of contaminated surface water run-off being discharged from waste storage and disposal areas. Therefore, the impacts and mitigation measures are also discussed in surface water quality and waste management sections. With the implementation of good site practices and controls, the residual impacts are considered to be **negligible**.

Waste

The impacts on surface water, soil and groundwater contamination from generation of hazardous and non-hazardous wastes are assessed as **moderate**. The operations of the proposed Project would result in generation of various types of non-hazardous and hazardous wastes from office and canteens; gas turbine; laboratories; compressors; lube oil systems; DG sets; and power house and workshop area.

The solid waste generated during the operation phase will be collected and segregated for recycle and non-recycle waste (i.e. paper, plastic). Project will use incineration on site and compost. There will also be minimal other waste such as wood crates from maintenance activities which will be provided to the local community as fire wood.

MUPA will handle, store and dispose of all waste in accordance with applicable guidelines.

Further mitigation measures as the development of a waste management plan and periodic audits will be maintained. With implementation of the recommended mitigation measures, residual impact significance would be **minor**.

Terrestrial and Aquatic Biodiversity

Operational activities that have potential to disturb native fauna include the use of night lighting at infrastructure and facility locations. In addition, mortality of individual fauna species as a result of vehicle or machinery strike or falling debris during transmission line maintenance vegetation clearing activities. However, the impact significance is considered to be **negligible** to **minor**. There are also no residual impacts to biodiversity values identified that require be offsetting or compensating.

Community Health and Safety

An increase in the transmission of communicable diseases may occur as the result of the introduction of workers into the area, creation of vector habitat, and/ or the presence of commercial sex workers.

Given the existing management measures, the local extent and scale of the impact, the impact was assessed as **moderate** and **negative**. The impact would have been assessed as minor, however, the duration (and consequence) of the impact was identified as potentially long-term – i.e. long-term health issues and in some cases death.

The Project will increase the number of vehicles using local roads and waterways through the transport of workers, goods, materials and machinery to and from the Project site, in particular during the construction phase.

Due to the existing management measures, the local extent and scale of the impact, the impact was assessed as **moderate** and **negative** during construction, while **minor** and **negative** during operation. The impact would have been assessed as minor, however, the duration (and consequence) of the impact was identified as potentially long-term – i.e. the outcome of a traffic accident can have long-term implications.

Social Impacts

Some of the social impacts predicted due to the operations of the Project are Employment Generation and In-Migration of Skilled workforce resulting in increased opportunities for local business which will have a **positive impact** on local stakeholders.

During construction, the workforce will reach 600 workers. Although the company will try to source workforce from local villages when possible, it is anticipated that a number of workers will come from other areas. The introduction of projects such as the one proposed may induce the arrival of unskilled workers (indirectly related to the Project) and opportunistic job-seekers into the Project SAoI. Influx in the SAoI could also place additional pressure on existing infrastructure and services.

The impact of influx is widespread and the entire community in the Project SAoI could be affected. Vulnerable community stakeholders and public infrastructures and services could be particularly impacted as well as users of the road between Kanbauk and Pyin Gyi. The impact of the Project pre-mitigation on community health is considered a **moderate** negative Impact and **negligible** after mitigation.

1.12 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

1.12.1 Mitigation Measures

Many of the mitigation measures suggested during the construction phase of the Project associated with good construction and housekeeping practices and are included in the Environmental and Social Management Plan (ESMP).

Mitigation measures for the operation phase (such as those for air emissions and noise generation) of the Project are part of the design and will be incorporated into the Project design specifications.

The construction phase of the Project is anticipated to be 30 months, whereas the operation phase of the Project is 30 years, as per the Power Purchase Agreement.

A summary of mitigation measures identified for the construction and operation phases of the Project is presented in the ESMP. This also identifies lead responsibility for implementing of the mitigation measures and its verification along with reporting requirements and sources of funds for such implementation.

The Sponsor will ensure that the mitigation measures stated in the ESMP are implemented throughout the life span of the Project.

1.12.2 Monitoring Programme

Key roles and responsibilities of the Sponsor and the appointed EPC contractor have been defined for implementation and monitoring of environmental and social impacts. For environmental monitoring, physical, biological and social environmental management components of particular significance have been identified as performance indicators. A comprehensive monitoring plan for each performance indicator will be prepared for all phases of the Project which gives parameters to be measured, methods to be used, sampling locations, frequency of measurements, detection limits, cost and responsibilities for implementation and supervision.

1.12.3 Training Programme

Prior to commencement of construction activities at site, a suitably qualified in-house/ external expert will be appointed by the EPC contractor in consultation with the Sponsor to develop and deliver a training programme on implementation of the ESMP. Environmental and social monitoring programme and reporting will be implemented in line with the applicable reference framework for the Project.

Prior to the commencement of the Plant operation, a suitably qualified in-house/ external environmental expert will be engaged by the Sponsor to develop and deliver a training programme on operation phase environmental monitoring and reporting. The topics will be mostly same as that during the construction phase. The reporting and verification will be semi-annual during construction phase and annual during operation phase (unless specify otherwise in the ESMP) and the reports will be submitted to the relevant authorities (i.e. MOEE, MONREC, etc.) and the Lenders.

1.13 CONCLUSIONS

The environmental assessment of the Project ascertains that the Project is unlikely to cause any major environmental impacts. Many of the impacts are localised and short-term or temporary in nature and can be readily addressed based on the built-in mitigation measures in the engineering design of the Project.

It is to be noted that the results from baseline air quality monitoring shows that the existing conditions are considered as non-degraded air shed. Nevertheless, the built-in dry low NOx burners will be installed in order to reduce NOx emission at stack to below 25ppm at all times. Therefore, the impacts from the stack emissions at identified air sensitive receivers (ASRs), during normal combined cycle operation or simple cycle operation, is considered negligible.

With regards to impacts to surface water, groundwater, and soil, it is noted that the assessment of such impacts for this Project is highly important due to the Project's vicinity to the Heinze River, as well as the reliance of the local population on surface water, groundwater, and soil resources within the Project area and surroundings for their health and livelihood.

Although a number of potential environmental, social and health impacts were identified, the assessments found that impacts are typically short term in duration have minor residual significance after implementation of mitigation measures. The potential for impacts is well understood with little or no evidence of adverse consequences on the majority of environmental, social or health receptors provided that adequate in-place controls and/or mitigation measures are implemented. The suggested mitigation measures in the ESMP are well established amongst international practice, and proven to be effective in managing any impacts that might occur to acceptable levels.

In terms of social aspect, the results from initial stakeholder engagement indicate that the Project has received favourable support from local people and other stakeholders. Stakeholders appreciated that in addition to providing a reliable power supply to the region, the Project will have several other benefits such as supporting economic growth in the region, potential employment (direct and indirect) and that the negative impacts can be easily mitigated.

In addition, the ESMP has been prepared as part of this report to manage and mitigate such impacts, a range of measures have been developed to reduce the overall impacts to acceptable levels and as low as reasonably practicable.

The effective implementation of the ESMP and adherence with the Myanmar NEQ, and IFC guidelines will assist in minimising the environmental impacts to acceptable levels.